ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE AND MEDICINE
SCHOOL OF ANESTHESIA

ASSESEMENTS OF PREVALANCE AND ASSOCIATED FACTORS OF INTRAOPERATIVE HYPERGLYCEMIA AMONG ADULT NON DIABETIC PATIENTS WHO UNDERWENT ELECTIVE SURGERY AT TIKUR ANBESA SPECIALIZED HOSPITAL, 2024.CROSS SECTIONAL STUDY DESIGN

THESIS SUBMITTED IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER OF SCIENCE IN ADVANCED CLINICAL ANESTHESIA OF ADDIS -ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF MEDICINE, DEPARTMENT OF ANESTHESIA

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Title of the research project	Assessments of prevalence and associated factors of Intraoperative hyperglycemia among adult non diabetic patients who undergo elective surgery at tikur anibessa specialized hospital , Ethiopia, 2024
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ABSTRACT

Background: Hyperglycemia is a common complication of surgery, and it is caused by the hyper metabolic stress response, which increases glucose production and leads to insulin resistance. Intraoperative hyperglycemia has been linked with many post operative complications like myocardial infarction, stroke, surgical site infection and mortality. Patients with diabetics are not the only affected by this problem. Non diabetic patients also exposed to this problem. Despite this, earlier research did not determine the risk variables for this problem.

Objective: To assess prevalence and associated factors of Intraoperative hyperglycemia among adult non-diabetic patients who underwent elective surgery at tikuranbesa specialized hospital from March 1 to May 30/2024.

Methods: cross-sectional study was conducted from February 1 to April 30/2024 for 240 non diabetic elective surgical patients at Tikur Anbesa specialized hospital. The data was coded, entered to Epidata software version 6.4.0.0 then exported and analyzed by SPSS software version 26. Systematic random sampling technique was used to select the samples. The data was described using descriptive statistics and Variables that are statistically significant in bivariate analysis, at the level of significance of p <0.25, were included in the multivariate logistic regression analysis. A p value of less than 0.05 was used to define statistical significance and the normality of data distribution was checked by Hosmer and lemshow test.

Result: The prevalence of Intraoperative hyperglycemia in this study was 33.3%. Use of Intraoperative Steroid [AOR=7.171, 95%CI,(2.376-21.646), P<0.001)], use of Intraoperative vasopressor [AOR=3.565,95%CI,(1.789-7.104), P<001] Intraoperative blood transfusion [AOR=4.75.,95%CI,(2.344-9.626), P<0.001] and general anesthesia [AOR; = 10.322, 95%CI, (3.497-30.471), P<0.001] were significant factors.

Conclusion and recommendation: The prevalence of Intraoperative hyperglycemia on non diabetic elective surgical patients were high (33.3%). Type of anesthesia, patient taking Intraoperative steroids, Intraoperative blood transfusion, and Intraoperative vassopressor use were strongly associated factors on non diabetic elective surgical patients. During the clinical practice of anesthesia, it was recommended to monitor blood glucose of the patients during the intra-operative period for non diabetic patients strictly. Adopt guidelines or develop a local protocol that will help to treat Intraoperative hyperglycemia on non diabetic patients.

Key word: Non diabetic, prevalence, Intraoperative hyperglycemia, associated factors.

List of Acronyms and Abbreviations

AACE	American Association of Clinical Endocrinologists
ASA	American Society of Anesthesiologists
ADA	American Diabetes Association's
BMI	Body Mass Index
CAL	Colorectal Anastomotic leakage
CBG	Capillary blood glucose
CDC	Center for Disease Control
DM	Diabetic mellitus
EC	Ethiopian calendar
ENT	Ear, Nose and throat
MRN	Medical record number
FBS	Fasting blood sugar
GC	Gregorian calendar
HgA1c	Glycated hemoglobin
SPSS	Statistical Packages for Social Science
SSI	Surgical site infection
USA	United States of America
TASH	TikerAnibesa specialized hospital
WHO	World health organization
MSc	Master of science

1. Introduction

1.1. Back ground

Hyperglycemia is a medical term for high blood glucose in our body, it occurs when the blood plasma contains an excessive amount of glucose and when patients body has insufficient insulin or unable to properly use insulin. Hyperglycemia is a common complication of surgery, and it is caused by the hyper metabolic stress response, which increases glucose production and leads to insulin resistance in hospital admitted patients, hyperglycemia is linked to a higher risk of death and morbidity(1).After cardiac surgery, perioperative hyperglycemia is prevalent, occurring in 60 percent to 90 percent of diabetic patients and roughly 60 percent of patients without a history of diabetes(2).

Raised glucose level that increases the susceptibility to infection with the aid of using changing both the innate and the adaptive immune systems. Hyperglycemia has been related to unfavorable consequences in hospitalized patients, particularly severely diseased patients; and those negative consequences are occurred with the aid of using hospital-related infections(3).

Perioperative hyperglycemia affects 20 to 40% of individuals following general surgery. Sepsis, myocardial infarction; surgical site infection (SSI) and death have all been linked to perioperative stress hyperglycemia. Patients admitted for a variety of surgical procedures, including general, cardiac, vascular, and orthopedic surgery, might develop perioperative stress hyperglycemia(4).

In patients having surgery, hyperglycemia is closely linked to increased mortality and morbidity, and undetected insulin resistance is becoming increasingly common on the day of operation. The carefully regulated equilibrium between hepatic glucose synthesis, glucose consumption in peripheral tissues, and an increase in the secretion of counter-regulatory hormones is disrupted by the stress of surgery and anesthesia. Excessive release of inflammatory cytokines such as tumor necrosis factor-, interleukin-6, and interleukin-1 is caused by catecholamine's such as cortisol, glucagon, and growth hormone(5–7)

The cutoff limits was 7.8 mmol/L (140 mg/dl) based on the American Diabetes Association's (ADA) definitions of hyperglycemia (2023). The criterion for treating hyperglycemia is glucose >10mmol/L(180mg/dl) referred to as severe hyperglycemia based on American Diabetes Association (2023).The American Association of Clinical Endocrinologists (AACE) and the American Diabetes Association have created a consensus statement on inpatient glycemic control, which defines hyperglycemia as a blood glucose level of more than 140 mg/dl without evidence of previous diabetes(8). Fasting blood glucose >6.9 mmol/L (124 mg/dl) or random blood glucose >11.1 mmol/L(200 mg/dl) with evidence of previous diabetes, and preexisting diabetes with deterioration of pre-illness glycemic control, according to the American Diabetes Association's consensus criteria(9).

The majority of outcomes in patients with intra operative hyperglycemia has focused on the cardiac surgical population, and there is emerging knowledge on how to handle perioperative high glucose in this population(10).

Many postoperative problems ,including surgical site infaction ,myocardial infarction ,stroke and mortality have been linked to Intraoperative hyperglycemia .This condition is not limited only with diabetic patients. It is unclear how common Intraoperative hyperglycemia is in non-diabetic individuals, nevertheless. Furthermore, prior research did not adequately determine the risk variables for these patients(11) In Ethiopia there is some researches done on prevalence of postoperative hyperglycemia and its associated factors on non diabetic adult surgical patients (12) but prevalence of Intraoperative hyperglycemia and its associated factors on non diabetic surgical patients were not studied.

1.2 Statement of problems

Hyperglycemia affects 32%–38% of all hospitalized patients resulting in increased morbidity and mortality(13)Hyperglycemia affects 285 million people worldwide (6.6 percent of the global population), however at least half of all hyperglycemic patients are uninformed of their illness, and in some countries, this number could exceed 80 percent(14). Patients with 12 to 30% who develop hyperglycemia during intra operative period do not have a history of hyperglycemia(15)

One of the major problems in surgical patients encountered during surgery and anesthesia is intra operative hyperglycemia. The incidence of intra operative hyperglycemia in surgical patient was

higher than preoperative and postoperative hyperglycemia and it is associated with complications such as surgical site infections, impaired immune system, delayed wound healing, renal failure, delirium, delayed awakening from anesthesia and increased length of stay in hospital patients including cardiac surgery, general surgery, and ICU patients(16–18)

Hyperglycemia had also higher rate of prevalence of surgical complication and intra operative hyperglycemia had two to four folds increased risk of a cardiovascular complication. Intra operative hyperglycemia would have major consequences with increase intra-operative and post-operative cardiovascular morbidity and mortality. The incidence of intra operative hyperglycemia in adult non diabetic surgical patient was very high and common. Despite high prevalence of hyperglycemia there is no screening, treatment and long-term monitoring among non-diabetic patients(19).

Hyperglycemia that leads accumulation of metabolic byproducts from brain cells can lead to acidosis in the brain tissue and causes an accumulation of lactic acid in brain cells due to anaerobic glycolysis, which promotes the generation of free radicals and peroxides, leads severe hypoxia. Neuronal injury and Neuronal permanent damage can occur in severe cases of intra operative hyperglycemia(20).During non-cardiac surgery, intra operative hyperglycemia due to glucose level > 180 mg/dl or 10 mmol /L between anesthesia start and anesthetic end is an independent predictors and highly associated with 30-day morbidity and mortality due to multiple organ failure(21).

Intra-operative hyperglycemia associated with several factors such as type of anesthesia, intra operative hypothermia, Intraoperative hypotension, increased age, systemic chronic diseases, steroid administration; anemia, intra-operative blood loss, type of surgery and intravenous administration of glucose containing fluid(22–24).

Various strategies are recommended to minimize the occurrence of intra operative hyperglycemia in non diabetic elective surgical patients by using different technique like, preoperative recognition of hyperglycemia, adequate control of pain during induction and procedure, avoidance of steroid administration, treatment of hypothermia, hypotension and anemia, optimization of patient and minimize surgical related stress(25–28).

Evidences are limited regarding the prevalence and associated factors of intra operative hyperglycemia on non diabetic elective surgical patients .Therefore, this study will be expected to address size, severity, distribution and fill information and knowledge gaps about the prevalence and possible factors responsible for Intra operative hyperglycemia on non diabetic adult elective patients in Ethiopia, particularly in TASH.

1.3. Significance of the study

Intra-operative hyperglycemia is a common surgical problem affected by different factors like; socio-demographic factors, clinical factors, surgical factor, steroid administration, vasopressor administration and life style related factors which are common during surgical procedures. Few studies done in the world to assess the prevalence and associated factors of Intra-operative hyperglycemia on specific cases but my study is designed to assess factors associated with intra-operative hyperglycemia in different cases with differences in associated factors, coexisting diseases and to assess the factors associated with intraoperative hyperglycemia on non diabetic surgical patients. In surgical patients, better control of intra operative hyperglycemia changes can lead to a reduction in intra operative and postoperative morbidity and mortality. Even though, there is no screening, treatment and long-term monitoring among non-diabetic patients.

As a result, the current study was conducted in order to know the prevalence of Intraoperative hyperglycemia in adult non diabetic elective surgical procedures during intra operative period and to identify the predictive factors of Intraoperative hyperglycemia on non diabetic elective surgical patients and It also prevents unnecessary managements that predispose the the patient to Intraoperative hyperglycemia and to tackle the anesthetists failure to monitor and manage Intraoperative hyperglycemia on non diabetic surgical patients and encourage and give clue to anesthetists how to prevent Intraoperative hyperglycemia and its associated consequences on non diabetic patients. It also significant opportunities for practice improvement in measurement, treatment and monitoring of Intraoperative glucose. There is limited research on the study area it was used as a base line data for those who will conduct research on this topic. There is also no data on prevalence and associated factors of intra-

operative hyperglycemia on non diabetic elective surgical patients in Ethiopia level. Therefore, this study is intended to determine the prevalence of intra-operative hyperglycemia level in relation to various contributing factors among elective non diabetic surgical patients in TASH, Ethiopia. The result of this study will give some suggestions to the policy makers and strategy designers and other government bodies for giving attention to appropriate solutions for existing problems related with raised intra-operative hyperglycemia on non diabetic elective surgical patients. In addition, the research findings of the study will contribute to academic knowledge and add to ongoing research efforts on intra-operative hyperglycemia.

2. Literature review

2.1. Definition and mechanism of intra-operative hyperglycemia

Hyperglycemia is a condition in which the blood glucose level is abnormally high. It is not a disease on itself, but can be triggered by a variety of causes such as diabetes mellitus(DM) or pre-diabetes, inflammation, tissue injury, acute sickness, and medicines(29).Fasting blood glucose(FBS)>140mg/dl without indication of diabetes in the preoperative period is described as hyperglycemia, which is frequently caused during surgery. surgery can cause hyperglycemia in patient with and without diabetes by disrupting glucose metabolism by activating the endocrine system, resulting in increased hepatic glucose production and insulin secretion and action inhibition(30,31)

2.2 Prevalence of intra operative hyperglycemia

According to Vasanti Tilaket al, cross-sectional study in (2013) at USA Factors Associated with Increases in Glucose Levels in the Perioperative period in non-diabetic Patients, Two hundred ninety-five non-diabetic(295) individuals between the ages of 18 and 80 who were receiving elective non-cardiac surgery were included. Patients with maximal intra operative glucose levels of 126 mg/dl or above accounted for 49% of the total(32).

According to Sher-i-Kashmir Institute of Medical Sciences,10.2 % of patients had intra-operative hyperglycemia with a cross-sectional observational study of in (2020) by Abdul Qayoom Lone pre-operative and intra-operative dysglycemia in adult patients having elective surgical procedures (SKIMS).(33)

According Richards et al,(2014), at Vanderbilt university United State of America, prospective observational cohort study at a university-based Level one trauma center over a 9-month period Stress hyperglycemia and surgical site infection in stable non-diabetic adult patients with orthopedic injuries. One thousand four hundred fifty-five (1455) capillary blood glucose (CBG) values were available for study analysis. A total of 171 patients met the inclusion and exclusion criteria. Forty patients 40(23.4%) were hyperglycemic, with seven (17.5%) of them having a Hgb A1C of greater than or equal to 6.0%(34).

Another observational prospective cohort study done at Amsterdam university, Netherland, by Reudink M et al. in (2021), there is a relationship between intra operative blood glucose and anastamotic leakage in colorectal surgery. Intra operative hyperglycemia was common and severe in non-diabetics respectively (45%) (P0.001). Intra operative hyperglycemia was experienced by nearly half of the non-diabetic patients (45%), resulting in a nearly five-fold increased risk of CAL (Colorectal anastomotic leakage)(35).

According to Cornelia Knaak et al,(2019)Intra operative abnormal glucose level Risk Factors in Elderly Surgical Patients Intra operative abnormal glucose level affected 46 (52.9%) of the 87 patients. 31.8 % of intra operative blood glucose readings were found to be outside the intended range. The development of intra operative abnormal glucose level was linked to diabetes [OR 9.263 (95 percent CI 2.492, 34.433); p=0.001] and surgery time [OR 1.005 (1.000, 1.010); p=0.036](36).

A prospective observational study in Adult Traumatic Brain Injury Patients Having a Craniotomy in India(2014): Per operative Glycemic Status twenty percent(20%) (40/200) of the total patients had at least one episode of intra operative hyperglycemia (CBG>180 mg/dL). At least one episode of severe hyperglycemia (CBG > 200 mg/dl) occurred in twenty-one patients (10.50%)(37).

Study by Amy M. Shank'setal in USA (2018),3150 patients out of 13,954 satisfied the inclusion criteria and had their glucose levels measured intra operative. Patients with hyperglycemia accounted for 49% (n = 1531), while infectious complications accounted for 15% (n = 482). There was a statistically significant risk-adjusted increase in infectious complications in patients with mild (adjusted odds ratio 1.30, 95 percent confidence interval [1.01 to 1.68] p-value = 0.04) and moderate hyperglycemia (adjusted odds ratio 1.57, 95 percent confidence interval [1.08–2.28], p-value = 0.02) hyperglycemia. The c-statistic for the model was 0.72 [95% confidence interval 0.69–0]. .74](38).

Another cohort a study by Cornelia Knacketalin berlin Germany (2021) on the association between intra operative hyperglycemia and cerebrovascular markers, the association between intra operative hyperglycemia and cerebrovascular markers is significant. There were 65

patients in all, with eighteen (28%) having intra operative hyperglycemia (glucose maximal 150 mg/dl)(39).

One year retrospective observation study on 85 patients undergoing liver resection for hepatocellular carcinoma in (2014) Intra operative hyperglycemia during liver resection, predictors and association with the extent of hepatocytes injury During surgery, thirty patients (35.5%) developed hyperglycemia (blood glucose > 180 mg/dl). Longer (OR 7.34, P = 0.004) was found to be a risk factor for hyperglycemia, cirrhosis (OR 4.07, P = 0.022), reduced prothrombin time (OR 0.01, P = 0.025), and higher total cholesterol levels (OR 1.04, P = 0.003)(40).

Another multicenter prospective observational study in (2019)Western Cape Province, South Africa 379 people included 61 diabetics (16.2 percent; 95 percent confidence interval (CI) 12.4 - 19.8). After eliminating 8 patients with inconclusive evidence, 5/310 individuals were given a new diagnosis of diabetes mellitus (1.6 percent) Diabetes mellitus was found to be present in 17.8% of the population (66/371; 95 percent confidence interval 13.9-21.7(41).

Study at (2014)university of Rwanda Prevalence, risk factors, and impact on the immediate clinical outcome of patient. A total of 400 adult patients were enrolled in the trial, with an average age of 40.29± 16.89 years. The majority of the patients, 261 (65.2%), were men. Hyperglycemia was found to be prevalent 35.0% pre-operatively, 62.5% intra-operatively, and 31.0% post-operatively(42).

2.3. Associated factors of intra operative hyperglycemia

According to the study done at University of health science, Istanbul, Turkey in 2018 effects of per-operative administration of steroids on the blood glucose levels of patients with and without diabetes undergoing laparoscopic cholecystectomy (p=0.002 and p0.001, respectively), increases in blood glucose levels at the 30- and 120-minute marks were statistically significant relative to pre-induction blood glucose levels in the non-diabetic group (p=0.002 and p0.001, respectively). When blood glucose levels were evaluated at 30- and 120-minute intervals, there was a statistically significant increase over time (p0.001)(43).

According to a study done in India, Department of Cardiac Anesthesiology (2018) comparing the changes in raised intra operative blood glucose levels in obese and non-obese non-diabetic patients undergoing general anesthesia for craniotomy procedures, the change in CBG increases progressively with the duration of surgery and decreases with the duration of surgery. The increase in CBG in the non-obesity group was 21.17 percent from baseline after 120 minutes, whereas it was 32.63 percent in the obese group, with statistical significance(44).

Another cross sectional study was conducted in (2018) on 100 adult patients using accidental sampling technique, consisting of 74 women and 26 men Factors Associated with Fasting Hyperglycemia. The majority of women (14.9 percent) had fasting hyperglycemia, p=0.551. It was also greater (16.7 percent) among those over 40 years old (p=0.302)(45)

According to study (2015) in Germany that undergoes gastrointestinal surgery at two university hospitals hyperglycemia and obesity had an impact on hospitalization expenses and clinical outcomes in general surgery patients. In total, 1575 patients had hyperglycemia (74.8 percent). Patients with diabetes and non-diabetes who had hyperglycemia experienced more issues than those with normal blood glucose level (35.8% vs. 30.0 vs. 8.9%, p0.0001) respectively(46) .

An observational Cohort Study in Canada (2013) Glucocorticoid-Induced Hyperglycemia is prevalent and unpredictable for Patients undergoing cancer Therapy: They assessed 90 patients who were taking glucocorticoids as part of their cancer treatment. The average total daily glucocorticoid dose in this group was 238.5 mg hydrocortisone equivalents. Increase blood glucose 8.0 mmol/L was observed in 58.9% (53 of 90) of the patients, and diabetes mellitus DM range hyperglycemia glucose 11.1 mmol/L in 18.9% (17 of 90) (47).

According to another study conducted in (2014) an operating room of university hospital preoperative base line glucose levels in general and spinal anesthetic patients were comparable and not statistically different in non-diabetic and diabetic patients. Patients undergoing general anesthesia had significantly higher glucose levels during surgery and at the end of surgery compared to baseline values in both diabetic and non-diabetic patients (P 0.05). A substantial increase in glucose level was found in non-diabetic and diabetic patients undergoing general anesthesia compared spinal anesthetic (P 0.05)(48).

Maitra S, et al. conducted a prospective randomized parallel group trial in (2013) which 200 non-diabetic patients (100 in each group) between the ages of 18 and 60 were enrolled. Patients in Group A got Ringer's lactate solution as a maintenance fluid, whereas those in Group B received 0.45 percent sodium chloride with 5% dextrose and 20 mmol/L potassium chloride. The level of CBG was measured before the initiation of intravenous fluid therapy and then every hour until the surgery was finished. At least one episode of hyperglycemia was experienced by 63 percent of participants in group B. CBG 150 mg/dl), whereas only 29% of Group A participants did. Group B ingested significantly more insulin than Group A in order to maintain a normal blood glucose level(49).

In another study conducted in India (2018) prospective randomized study on diabetics'verseus non diabetics' patient. Diabetics had higher baseline blood glucose values than non-diabetics according to a study on the effect of low-dose Dexamethasone on per operative blood glucose concentrations in diabetics and non-diabetics patients. The administration of Dexamethasone to diabetics and non-diabetics resulted in a statistically significant increase in blood glucose levels from baseline. The greatest rise in blood glucose in dexamethasone patients was 40–45 mg/d

Acording to the study done in Thailand in 2022 on Incidence and risk factors of Intraoperative hyperglycemia in non-diabetic patients: a prospective observational study Intraoperative hypothermia, Intraoperative blood transfusion and Intraoperative steroid use are significant association with Intraoperative hyperglycemia(50).

Study done in india NM joseph et al.(2020) on stress hyperglycemia after pancreatobiliary surgery on non diabetic patients ,tourniquet applay is associated with Intraoperative hyperglycemia(51)

The study done by M Goal,R (2024) in idia on clinical impact of adrenaline on blood lucose levels in patient undergoing dental extraction, use of adrenaline has association with Intraoperative hyperglycemia(52)

The study in Korea republic done by Soo hyun kim et al., 2014, on Association of blood glucose at admission with outcomes in patients treated with therapeutic hypothermia after cardiac arrest. results show that blood glucose level at admission is associated with survival and favorable neurologic outcomes at hospital discharge in patients treated with therapeutic hypothermia after cardiac arrest(53)

Shah, N.J., Leis, A., Kheterpal, S. *et al.* Association of intraoperative hyperglycemia and postoperative outcomes in patients undergoing non-cardiac surgery: a multicenter. Of the glucose testing cohort, 1414 patients (28.2%) had a glucose > 180 mg/dL , These patients were more likely to have diabetes (76.4% vs. 59.8%, $p < 0.001$), hypertension (79.4% vs. 75.2%, $p = 0.002$), obesity (56.1% vs. 45.7%, $p < 0.001$), and intraoperative insulin administration (55.7% vs. 6.6%, $p < 0.001$) (54)

2.4 Conceptual frame work

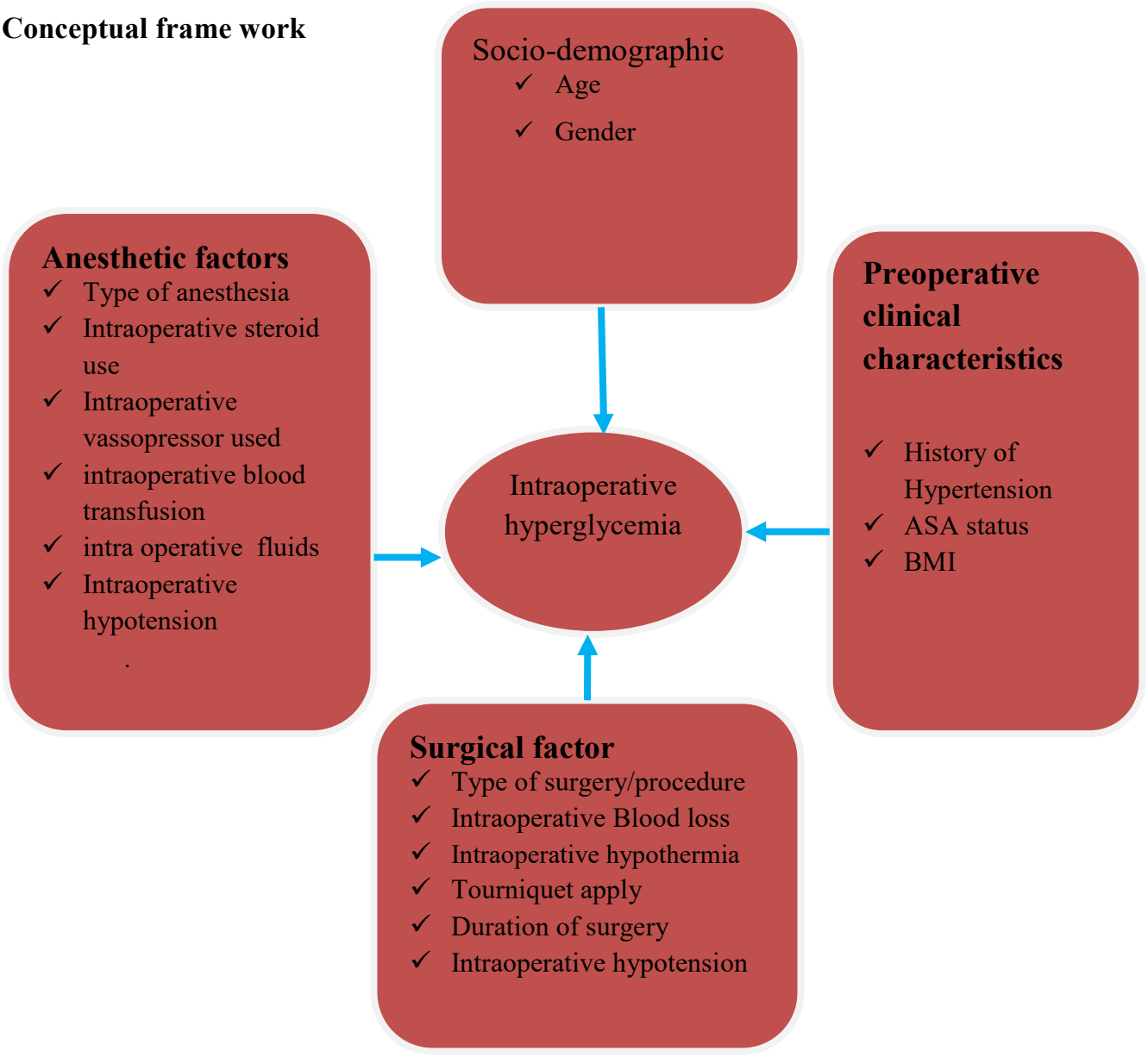

Figure 1 conceptual frame work of factors associated with intra-operative hyperglycemia for non diabetic patients who undergo elective surgery at Tikuranibesa specialized hospital adapted from different literatures(43–48,50)(52,55)(53)(54).

3. Objective

3.1. General objective

- ✓ To assess prevalence and associated factors of intra operative hyperglycemia among adult non diabetic patients who undergo elective surgery at tikur anbesa specialized hospital from February 1 to April 30/2023/24G.C

3.2 Specific objectives

- ✓ To assess prevalence of intra operative hyperglycemia among adult non diabetic patients who undergo elective surgery at Tikur anbesa specialized hospital from feburary1 to April 30/2024G.C.
- ✓ To identify associated factors of intra operative hyperglycemia among adult non diabetic patients who underwent elective surgery at Tikur anbesa specialized hospital from Feburary 1 to April 30/2024G.C

4. Method and Materials

4.1 Study area

This study was conducted at Tikur Anbessa specialized hospital (TASH). Tikur Anbessa Specialized Hospital is the teaching hospital of Addis Ababa University School of Medicine, College of Health Sciences, and the largest tertiary specialized hospital in Ethiopia with an 800-bed capacity. It was established in 1964, and is now the main teaching center for both clinical and pre-clinical training of most disciplines. It is also an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation. It is also the largest surgical center in Ethiopia. The various departments, faculties and residents under specialty training in the School of Medicine provide patient care in the hospital. In addition, almost all regional and federal hospitals in Addis Ababa are affiliated to the School of Medicine as clinical services and training sites. Currently TASH gives surgical service in the following departments:-cardio-thoracic surgery, neurosurgery, pediatric surgery, gynecologic surgery, urologic surgery, ENT, orthopedic surgery, gastrointestinal surgery, and vascular surgery.

4.2 Study design and period

Cross sectional study design was conducted in TASH from February 1 to April 30/2024 G.C

4.3 Source population

All adult non diabetic patients who underwent elective surgery in TASH.

4.4 Study population

- ✔ All adult non diabetic patients who underwent elective surgery in TASH from February 1 to April 30/2024 G.C.

4.6 Eligibility criteria

4.6.1Inclusion Criteria

- ✔ All adult non diabetic surgical patients scheduled for elective surgery in TASH during study period.

4.6.2 Exclusion Criteria

- ✔ Baseline hyperglycemia CBG>140 mg/dl.
- ✔ Baseline hypoglycemia CBG<70 mg/dl.
- ✔ Confirmed pregnancy.
- ✔ Patient Refusal
- ✔ Psychiatry patient

4.7 Operational definitions

- ✔ **Elective surgery:** It's a procedure that can be safely scheduled in advance that the patient best time and place for it.
- ✔ **Intra operative hyperglycemia:** Hyperglycemia is a condition in which the patient capillary blood glucose>140mg/dl non diabetics (ADA).
- ✔ **Hypoglycemia:** Hypoglycemia occurs when the patient capillary blood glucose <70 mg/dl.
- ✔ **Intra operative:** The period that extends from induction of anesthesia until the patient is transfer to PACU.
- ✔ **Preoperative:** The time that extends from decision to have surgery to induction of anesthesia.
- ✔ **Intraoperative hypotension:** Intraoperative MAP fell below 65 mm HG for 15 min or above.
- ✔ **Preoperative anemia:** For elective surgical patients hemoglobin for male <13 g/dl and for female < 12g/dl(56).

4.8. Study variables

4.8.1. Dependent variables

- ✔ Intra operative hyperglycemia

4.8.2. Independent variables

Socio demographic characteristics

- ✔ Age
- ✔ Gender

Preoperative clinical characteristics

- ✔ BMI
- ✔ History of Hypertension
- ✔ ASA class
- ✔ Preoperative anemia

Anesthetic factors

- ✔ Type of anesthesia
- ✔ Intraoperative Steroid used
- ✔ Intraoperative vasopressor
- ✔ Intraoperative blood transfusion
- ✔ Intraoperative dextrose solution administration

Surgical factors

- ✔ Type of surgery/procedure
- ✔ Intraoperative hypothermia
- ✔ Intra operative bleeding
- ✔ Tourniquet apply
- ✔ Intraoperative hypotension

4.9. Sample size and sampling technique

4.9.1Sample size determination

The sample size was calculated using single population proportion formula by considering the following assumptions: P=50%; there is no known prevalence done in Ethiopia for intra-operative hyperglycemia among adult non diabetic surgical patients.

Level of confidence = 95%

Level of significance = 5%

Margin of error (d) =5%

n= where; n- The minimum sample size required.

P- Estimated proportion of patients who develop intra-operative hyperglycemia.

d- Margin of error

Z - Standard normal value at (1- α) 100% confidence level

n= (1.96)2 X0.5 (1-0.5)/ (0. 05)2=384

By using correction formula for finite population since source population is less than 10,000.

nf= n/1+n/N

n = where is n is the minimum sample size

N = is the total number of adult non diabetic patients operated. Which are 500 from situational analysis within three month

n==384/1+384/500 ,nf=218

After obtaining sample size of n=218 and adding 10%for non-response rate the total sample is 240.

4.9.2. Sampling procedure

A study participants were selected using systematic random sampling technique using skip interval from the daily schedule for operation in the ORT those patients underwent elective surgery. Situational analysis was done for one month; averages of 165 adult elective surgeries are done within a month under anesthesia, at TASH. Thus, 500 elective operations are done per the study period (3months) the sampling interval; K was determined using the formula: K=N/n; where, n = total sample size, N = population per 3 months. K= 500/240≈2. Therefore, the sampling interval is 2 and the first study participant was selected using lottery method from the daily schedules of elective surgery type who fulfills inclusion criteria.

4.10. Data Collection Procedures

The questionnaire was developed and adapted after reviewing different literatures prepared in English language and orientation on data collecting instrument, objectives of the study and how to facilitate data collection for data collectors was given by principal investigator, to make the data collection easier. After having informed written and verbal consent data collection was from patient history before operation, medical record charts and recording blood glucose before induction and at the end of the surgery was taken. The observed values of blood glucose during anesthesia were recorded in anesthesia sheet. Intra-operative hyperglycemia is defined as elevated blood glucose level >140mg/dl. Completeness, accuracy, and clarity of the collected data was checked carefully and stored appropriately.

4.1.1. Data Quality Control

One 4thyr BSc Anesthesia student and one 1styr MSc anesthesia student were involved in data collection. To maintain quality of data before data collection objective based and standardized questionnaire and instrument was prepared, Training was given for anesthetists before the actual data collection. Pretest was conducted with 5% (12 non diabetic elective patients) of sample size in St.paouls medical hospital, to check the validity and reliability of data collection tools and to make necessary modifications. Training and orientation about the objectives and relevance of the study, each item included in the study tools, and the whole process of data collection was provided for data collectors and supervisors. The contents of the questionnaire were modified based on the result of the pretest. Data Completeness, logical consistency and correction was made and accuracy of the instruments for measurement was checked. Day to day supervision was performed by supervisors.

4.12. Data processing and analyzing

After the data were coded and entered in to epidata software version 4.6.0.0 and exported to Statistical Package for the Social Sciences (SPSS) version 26 for statistical analysis. Descriptive analysis was done in frequencies, percentages, means, and standard deviation, and presented by tables, graphs, and pi-chart.

Binary logistic regression analyses were computed to see the frequency distribution and to test whether there is an association between Intraoperative hyperglycemia and selected independent variables, respectively. Factors associated with

Intraoperative hyperglycemia on binary logistic regression analysis were identified, and the variables with P-values of <0.25 were taken to multivariable logistic regression, and analysis was done by controlling the effects of confounders by checking multicollinearity with tolerance >10% and variance inflation factors (VIF) < 10% to the independent variables.and normal distribution of the continuous variable was chalked by hosmer and lemshow test. To decide whether a variable is significant associations with the dependent variable were determined with a p-value less than or equal to 0.05.Finally,the result was expressed by crude and adjusted odds ratios together with their corresponding 95% confidence intervals and interpreted accordingly.

4.13 Ethical consideration

Ethical approval of research proposal was obtained from the Institutional review board (IRB) of the college of health science at Addis Ababa University. A formal letter was obtained from the anesthesia department, and an acceptance letter was provided from TASH to perform the study. Each respondent was informed about the study's goal during the data collection period and agreement was obtained from each of the study participant by written consent. Throughout the study, confidentiality and anonymity were preserved.

4.14 Dissemination plan

The final report of this study will be submitted and presented to Addis Ababa University College of medicine and Health Sciences, school of anesthesia. It will also be sent to TASH. Finally, it may be disseminating the result through publication and presenting in scientific conferences.

5. Result

5.1 Socio-demographic and preoperative characteristics of patients

In this study, a total of two hundred forty (240) study participants who fulfilled inclusion criteria and had volunteered by giving consent were included. The mean age and standard deviation of participants were 48.17 ± 18.04 respectively. Two third (39.2%) of patients' age was found in the 40-60 age group

Table 1 Socio-demographic and preoperative clinical characteristics of non diabeticpatients who underwent elective surgery at TASH, from March 1 to June 30/2024(n=240).

Variables	*Category*	*Frequency*	*Percent*
Gender	Male	122	50.8%
	Female	118	49.2%
Age	18-39	86	35.8%
	40-60	98	39.2%
	>60	56	22.4%
ASA Status	Class I	100	40%
	Class II	122	48.8%
	Class III	18	7.2%
BMI	Underweight	3	0.125%
	Normal weight	148	61.66%
	Overweight	46	19.16.0%
	Obesity	43	18%
History of Anemia	Yes	7	2.9%
	No	233	97.1%
History of Hypertension	Yes	75	31.2%
	No	165	68.8%

5.2. Surgical characteristics of patients

Regarding types of surgery, there were various types of surgery done the majority of participants were General surgery patients 108(45%) then followed by others.

Table 1: Factors associated with Intraoperative hyperglycemia of non diabetic patients who underwent elective surgery at TASH, from February 1 to April 30/2024 (n=240).

Category	Variables	Frequency	Percent
Types of anesthesia	General anesthesia	146	60.8%
	regional anesthesia	60	25%
	Spinal and general anesthesia	34	14.2%
Body temperature	Hypothermia	115	47.9%
	Normothermia	125	52.1%
BMI	Under weight	3	1.25%
	Normal weight	148	61.6%
	Over weight	43	18.0%
	Obesity	46	19.2%
Intraoperative blood transfusion	Yes	116	48.3%
	No	124	51.7%
Intraoperative steroid	Yes	53	22.1%
	No	187	77.9%
Intraoperative vasopressor used	Yes	39	16.25%
	No	201	83.75%

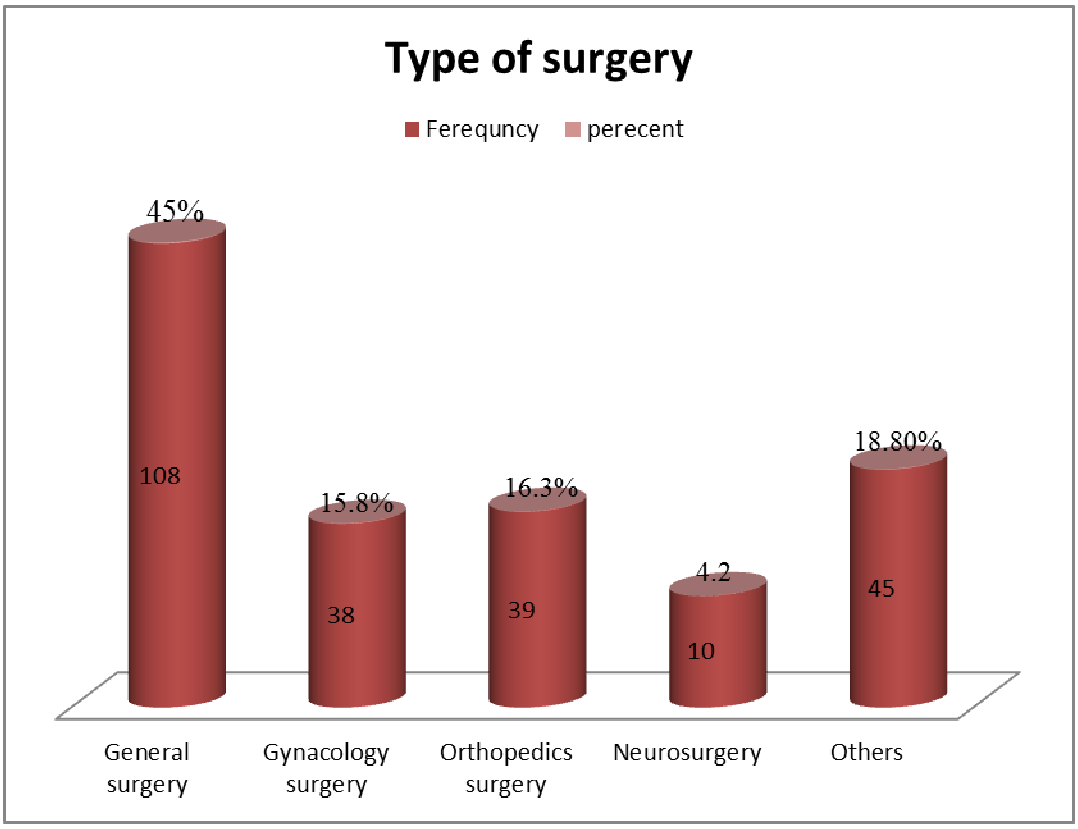

Figure 1 Type of elective non diabetic surgery performed at TASH ,from February 1 to April 30/2024

5.3. Anesthetic characteristics of patients

More than half of the patients underwent surgeries under General anesthesia 146 (60.8%), and one fourth of the patients underwent the rest underwent under Regional anesthesia and the rest Combined General and regional anesthesia.

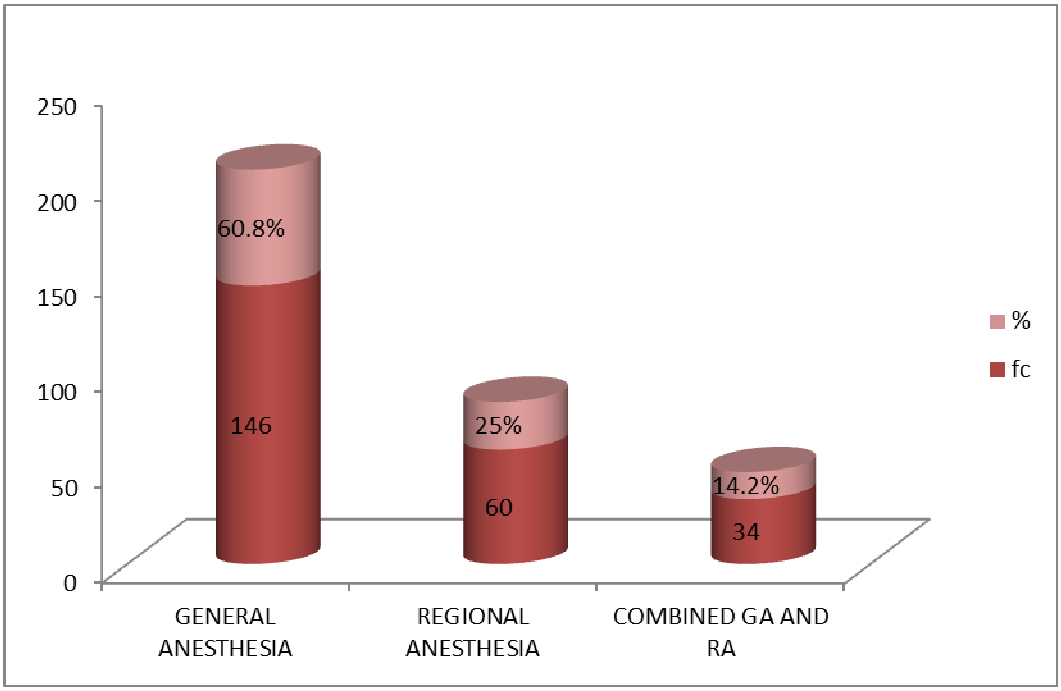

Figure 1Types of anesthesia used during elective non diabetic surgery at TASH, from February 1 to April 30/2024.

Out of the total, 173(72.1%) of patients lost less than 500ml of blood during the Intraoperative period and the rest of the patients lost greater than or equal to 500ml of blood in the Intraoperative period. 115 (47.9%) of patients developed Intraoperative hypothermia and from the total procedures, the tourniquet was applied only in 12(5%) surgery.

5.4. Prevalence of Intraoperative hyperglycemia on non diabetic elective surgical patients

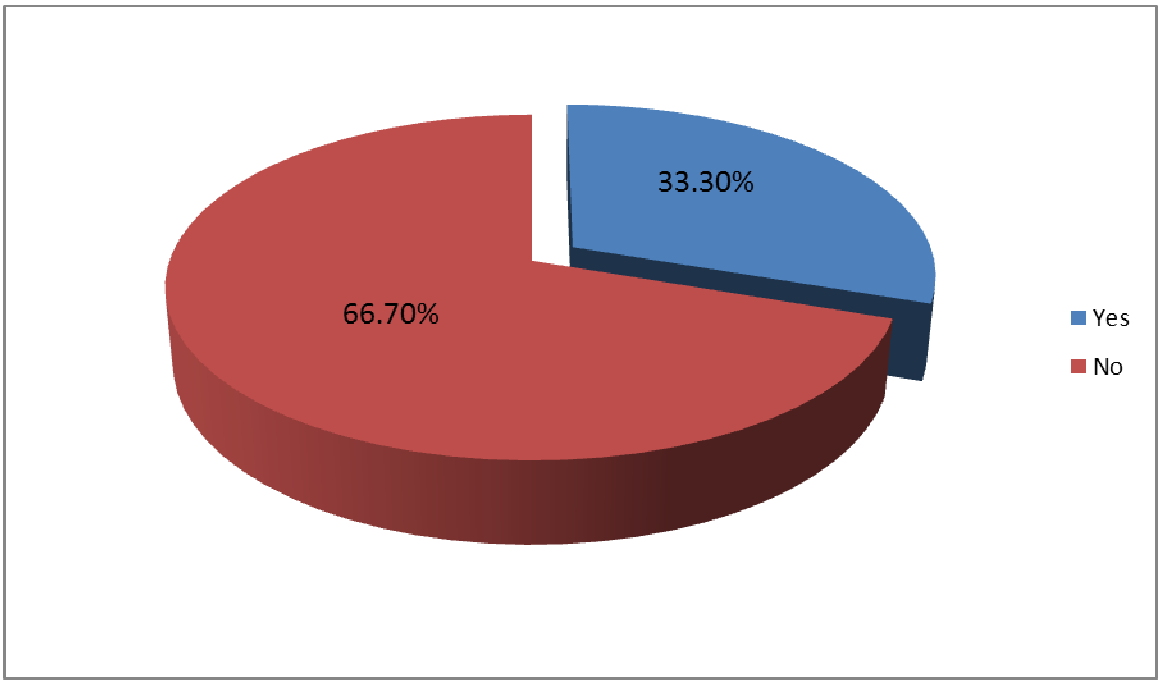

Figure 2 Prevalence of intraoperative hyperglycemia of non diabetic patients who underwent elective surgery at TASH Addis Ababa Ethiopia, from February 1 to April 30/2024.

5.5. Factors associated with intraoperative hyperglycemia

5.5.1. multivariable analysis Result

As results of binary logistic regression analysis gender, type of anesthesia, Intraoperative blood transfusion, hypothermia, duration of surgery, intra operative vasopresser use, body mass index of the patients and steroid administration were associated with intra-operative hyperglycemia.

In the final model multivariable binary logistic regression analysis after excluding variables that do not fit the model using P-value >0.25. Among the study subjects, patients who took vassopresser, blood transfused, steroid, and General anesthesia were significantly associated with Intraoperative hyperglycemia.

Patients who taken vassopressor during the surgical procedure were 3.565 times more likely to develop Intraoperative hyperglycemia than patients not taken vassopresser during the procedure.[AOR=3.565(1.789,7.104)].

Patients who taken steroid was 7.174 times more likely to develop Intraoperative hyperglycemia than patients who were not taken steroid during Intraoperative period. [AOR =7.174, 95%CI, (2.376, 21.646)].

Patients who taken blood during the procedure were 4.75 times more likely to develop intra operative hyperglycemia than not transfused blood during the procedure [AOR=4.755.97 (95%CI,(2.344,9.626)].

Patients who took General anesthesia 10.322 times more likely to develop Intraoperative hyperglycemia than combined regional and general anesthesia, Regional anesthesia was 0.78 times less likely to develop Intraoperative hyperglycemia than combined Regional and general anesthesia [AOR=10.322, 95% CI (3.497-30.471)][AOR=0.78(1.27,12.82)] respectively.

Table 2 Factors associated with intra-operative hyperglycemia of non diabetic patients who underwent elective surgery at TASH from February 1 to April 30, 2024.

Variables	**Category**	**Hyperglycemia N (%)**		**COR 95%CI**	**AOR 95% CI**	**p-value**
		Yes	No			
Gender	Male	46(37.7%)	76(62.3%)	1	1	
	Female	34(28.8%)	74(71.2%)	1.495(0.87-2.57)	1.97(0.99-3.92)	0.145
BMI	18.5-25	19(22.2%)	26(77.8%)	1	1	
	25-30	51(32.1%)	98(67.9%)	1.369(0.684-2.742)	1.430(.614,3.327)	0.467
	30-40	10	36	2.592(1.027,6.545)	2.878(0.901,9.19	0.074
	<18.5	1	2	1.440(0.121,17.122)	2.600(0.62,109.36	0.617
Intraoperative Hypotension	Yes	23(50%)	38(50%)	(.748-7.499)	1.382(0.21-5.98)	0.665
	No	57(29.7%)	122(70.3%	1	1	
Blood transfusion	Yes	21(48.3%)	95(51.7%)	2.368(0.748-7.49)	4.75(2.74-9.626)	0.000***
	No	59(28.9%	65(71.1%)	1		
Types of Surgery	General	29(20.8%)	56(79.2%)	9.187(1.803-46.8)		0.475
	Gynecology	11(19.6%)	29(75.4 %)	0.438(0.075-2.552)		0.476
	Neurosurgery	3(48.6%)	13(451.4%)	0.583(0.097-3.506)		0.835

	Maxillofacial	1(18.8%)	2(81.2%)	1.024(0.272-3.865)		0.702
	Orthopedics	14(36.9%)	19(63.1%)	0.404(0.070-2.339)		0.279
	Thoracic	2(25%);	5(75%)	1.658(0.414-6.639)		0.772
	Urology	18(20.0%)	29(80.0%)	0.429(0.108-1.70)		0.365
	ENT	2(36.4%)	7(63.6%)	1		
Types of anesthesia	General	33(27.9%)	143(72.1%)	3.852(1.771-8.379)	10.32(3.49,30.47)	0.000**
	Spinal anesthesia	29(48.33%)	31(51.67%)	1.203(0.218-.745)	0.78(1.27,12.82)	0.180
	Combined	18(52%)	16(48%)	1	1	
Vassopressor	Yes	31(75%)	108(25%)	3.756(2.745-2)	3.565, 95%CI(1.78,7.10)	0.000**
	No	49(27.9%)	52(72.1%)	1	1	
Body temperature	Hypothermia	45(49%)	70(51%)	3.144 (1.969-5.019)	0.707(.359,1.391)	0.315
	Normothermia	35(23.4%)	90(76.6%)	1		
Types of intraoperative fluid	Ringer lactate	26(32.5%)	55(67.5%)	1		
	Normal saline	49(27.9%)	100(72.1%)	0.805(.477-1.358)		
	5% DW	5(50%)	5(50%)	16.593(1.97-139.4)		
Blood lose	<500	19(25.8%)	48(74.2%	1		
	>500	61(38.6%)	112(61.4%)	1.808(1.163-2.809)		
Intraoperative steroid use	Yes	7(40.7%)	46(59.3%)	1.918 (1.205-3.052)	7.644(2.544,22.9)	0.000***
	No	73(26.4%)	114(73.6%)	1	1	

COR =Crudes Odds, Ratio AOR=adjusted odds ratio, CI =confidence interval, 1 = Reference Group and statistically significant*** =P < 0.05

6. DISCUSSION

In this study, the overall prevalence of Intraoperative hyperglycemia in adult surgical non diabetic patients was 33.3%.

The prevalence of the current study was comparable to the study of USA (30%)(40) and Germany (28%)(39).

Relative to other similar studies conducted in the USA, Netherlands, Germany, and the University of Rwanda hospital with magnitude of **(**49%,45%,52.9%,, and 62.5%),respectively(36,38,42,53) The result of our (33.3%) study was lower. And. this variation might be due to, the area of the study, the designs of the study; sample sizes used, the socio-demographic, definition of Intraoperative hyperglycemia, the life style of the studied population, and the composition of the study population.

Our study finding (33.3 %.) was higher than two studies in India 10.2 % of patients had intra-operative hyperglycemia. And patients having a craniotomy which 10.5%(37), USA (23.4%)(58) were hyperglycemic during surgery. This possible reason could be due to population difference which was analyzed by 87 patients ≥ 65 years old, setting, and methodological differences.

In multivariable analysis, Intraoperative blood transfusion, vasopressor used, general anesthesia, spinal anesthesia, and use of intra operative steroid were significantly associated with Intraoperative hyperglycemia.

In our finding, patients who were taking Intraoperative steroid 7.171 times more likely to develop Intraoperative hyperglycemia than patients who were not taking Intraoperative steroid AOR=7.171, 95%CI, (2.376, 21.646). This was similar to a study conducted on the Effects of the administration of steroids on the blood glucose levels of patients with and without diabetes(55), a Study in Britain on Glucocorticoid-induced Hyperglycemia(45), a study in Saudi Arabia the administration of steroid to diabetics and non-diabetics(48)and the study done in Thailand on the incidence of Intraoperative hyperglycemia and its associated factor in non diabetic patients(50).The likely reason might be during surgery and trauma steroid administration causing insulin resistance to the peripheral tissue.

Patients who took General anesthesia were 10.322 times high likely to develop Intraoperative hyperglycemia than combined regional and general anesthesia .This is in line with a study on Comparative Study of Intraoperative blood Sugar Level In Spinal Anesthesia and General Anesthesia in Patients undergoing general anesthesia who had significantly higher glucose levels during surgery and at the end of surgery compared to baseline values in both diabetic and non-diabetic patients,(59) . This possibility might be due to volatile anesthetic agents inhibiting insulin production and increasing hyperglycemic response to surgery and also it might be inadequate pain management and light anesthesia during Intraoperative period.

In our study blood transfused patients are 4.75 time more likely to develop Intraoperative hyperglycemia than patients not transfused blood intraoperatively. [AOR=4.75(2.74-9.626)].This study is in line with the study done in Thailand in 2022 on incidence of Intraoperative hyperglycemia on diabetic and non diabetic patients and its associated factors(50).the possible reason might be blood has dextos containing preservative and after transfusion the dextrose increases the serum blood glucose level.

In our finding also patients who were given Intraoperative vassopressor have 3.565 times more likely to develop Intraoperative hyperglycemia than patients who were not taking vaospressor during Intraoperative period. [AOR=3.565, 95%CI (1.789, 7.104)]. This might be catecholamine's increases production of glucose from the liver by gluconeogenisis.

Our study is contradict with the study done in India, clinical assessment of adrenaline on blood glucose level in patients undergoing dental extraction 2024(52). And similar with the study done in seoul Korea by c. park et al.(60)

This might be due to methodological and sample size difference.

In this study Patients whose BMI was, not significantly associated with Intraoperative hyperglycemia. Our finding contradicted a study comparing the changes in raised Intraoperative blood glucose levels in obese and non-obese non-diabetic patients undergoing general anesthesia for craniotomy procedures, the change in CBG increases progressively with the duration of surgery and decreases with the duration of surgery in non obese patient (43).The possible reason for this contradicting result with the current study would be the methodological difference.

Age category was not significantly associated with Intraoperative hyperglycemia in this study. That was different from the study assessing the impact of age on blood glucose, insulin, and cortisol responses after mild to moderate stress, increasing age may potentially contribute to increasing hyperglycemia due to changes in carbohydrate metabolism during the surgical procedures. The possible reason for this contradicting result might be in our study 98 (39.2%) found in the age category of 40-60 and in their study the study participants age group was >65 (44).

Gender was not significantly associated with Intraoperative hyperglycemia. It was contradicted with study conducted in Benin. It might be because of the small representative sample of the male patient in that study(28).

History of hypertension is also another factor not associated with the likelihood of exhibiting Intraoperative hyperglycemia compared with patients who were not diagnosed with hypertension. (61).which contradicts the result of the current study due to the small representative hypertensive patients in this study.

ASA Classifications also not significantly associated with Intraoperative hyperglycemia. This result also contradicted with the study done in Thailand on Incidence and risk factors of Intraoperative hyperglycemia in non-diabetic patients(50) This might be due to population differences, the level of economic status, decreased number of representatives, lifestyle, sample size, and methodological differences.

7. Strengths and limitations of the study

7.1 Strengths

- Studies were not done on this study population by this title.
- This will make the study to be used as a baseline for further nationwide study.
- The clinical importance of this study could allow us to easily identify individuals at risk of Intraoperative hyperglycemia,

7.2 Limitations

- We were not able screening the patients by their hgbA1c level, because it has highly accurate than measuring capillary glucose level of patients, to rule out undiagnosed diabetic patients.
- Lack of published articles on this topic in Ethiopia on this study population to discuss our study.
- The same limitations that apply to all cross sectional study designs also apply to this study.
- Undiagnosed endocrine metabolic diseases, such as liver disease, thyroid, and adrenal dysfunction, can predispose some people to abnormal glucose metabolism.

8. Conclusion

The overall prevalence of Intraoperative hyperglycemia was high (33.3%); general Anesthesia, use of Intraoperative vassopresser, blood transfusion and patient-taken steroid Intraoperative were significant risk factors to develop Intraoperative hyperglycemia on non diabetic patients who underwent elective surgery.

9. Recommendation

Based on this study findings, the recommendations forwarded.

For Anesthesia and surgical team

- Based on this study the anesthetist monitor the glucose level of the non diabetic patients as you monitor diabetic patients especially those patients who was taking steroid, vassopressors, blood transfused during Intraoperative period and patients under general and spinal anesthesia.

For the institution

- Giving training on
    - the effect of Intraoperative hyperglycemia on non diabetic elective patients
    - factors which predispose the patient for Intraoperative hyperglycemia
    - Preventive mechanism of Intraoperative hyperglycemia on non diabetic elective patients.

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12. Annexes

Annex 1: English Version Questionnaire

Questionnaire designed to study intra-operative hyperglycemia and associated factors among adult non diabetic patients who undergo major elective surgery in Tikuranbesa specialized hospital, Ethiopia.

Part I: Study Participant Information Sheet and informed consent

My name is _____. I am working as the data collector of the study being conducted in this health facility. I kindly request you to lend me your attention to explain you about the study in general. Aim of this study is to determine the prevalence and associated factors of intra-operative hyperglycemia among adult non diabetic patients who undergo major elective surgery in Tikuranibessa specialized hospital, Ethiopia. The main purpose of the research is to assess the prevalence and associated factors of intra-operative hyperglycemia and to fill information gap among health care providers for better patients care. The data collectors will collect the necessary information from study subjects and from respective charts, using interviewer administered structured questionnaire. Participating in this study does not have any risk or harm, direct benefit and incentives. The information acquired from patient and his/her file will be confidential. Participating in this study is fully voluntary.

For further explanation, use the Principal Investigator's Address;

Name: Musema Mohammed

Email: abufeysel765267@gmail.com

Cell phone: +251 934765267

Interviewer

Name ---------- Signature ----------

Questionnaire code----------

Date of data collection----------

Are you voluntary to participate in this study?

1. Yes: Continue to the next page
2. No: Skip to the next participant

Annex II Classification of obesity based on BMI

BMI (kg/m2) Description

<18.5 Underweight

18.5–24.9 Normal

25–29.9 Overweight

30–34.9 Obesity (class I)

35–39.9 Obesity (class II)

≥40 morbid obesity (class III)

Adopted from Paul Barash 6th edition

Annex III Informed consent and questioner Amharic version

ክፍለ 1 ለጥናቱ ተሰታፊዎች ስለጥነቱ የተዘገጀ መግለጫ

ስሜ----------ይበለል፡፡ እኔ ---------- ሆስፒታል ዉስጥ ቀዶ ህክምና ለሚሰራለቸው ታማሚዎች ህክምናው ሲሰራለቸው የሚፈጠረውን የደም ሱከር መጠንና መንስኤዎችን ከሚያጠኑ ቡድን አንዱ ነኝ፡፡ ጥናቱን የሚያጠናዉ ኣድስ ኣበባ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ ዉስጥ በአንስቴዥርያ ትምህርት ክፍል የ2ተኛ ድግሪ ተማሪ የሆናዉ ሙሰማ መሃምድ ነዉ፡፡ የጥናቱ ዓለማ ቀዶ ህክምና ሲሰራ የሚፈጠረውን የደም ሱከር መጠን መንስኤዎችንና ሱከሩ ለመፈጠር ምክንያት ልሆኑ የሚችሉትን ለማጥናት ሲሆን የሚጠየቁትን ጥያቄ ትክክኛ ነዉ ብለዉ የሚያምኑትን መልስ እንድ ሰጡኝ በትህትና እጠይቃለዉ፡፡ እርስዎ በዚህ ጥናት ተሳታፉ በመሆን ስለ የደም የሱከር መጠን ዙሪያ ያለዉን ችግርና የአፈታት ዘዴ እንድፈጠር ይረዳል፡፡ መጠየቁ ቢበዛ ደቂቃ የሚፈጅ ሲሆን ለዚህ ጥናት የእርስዎ ስም አይጻፍም፤ ሪፖርትም አይደረግም፡፡ ጥናቱ ለይ ስለተሳተፉ ተብሎ በገንዘብ መልክም ሆነ ለማበረታቻ የሚደረግ ነገር አይኖርም፡፡ ከእርስዎ የሚገኝ መረጃ ሁሉ በሚስጥር ይያዛል ከጥናቱ ቡድን ዉጪ ሊታወቅ አይችልም፡፡ የእርስዎ ተሳትፎ ፍፁም በፉቃደኝነት ለይ የተመሰረተ ሲሆን ማንኛዉም ጥያቄ ያለፍለጎትዎ እንድ መልሱ አይገደዱም፡፡ ያልተመቸዎትን ጥያቄ ካለበፈለጉት ሰዓት መዝለልና ከጅምሩም ማቆም ይችለሉ፡፡

የጥናቱ ዓለማ ከሞለ ጎደል ገለጭ አለዉ ብዬ አምናለዉ፡፡ ከጥናቱ ጋር በተያየዘ ጥያቄ ካለዎት አሁን መጠየቅ ይችለሉ፡፡ በተጨማሪም የጥናቱ ባለቤት የሆነዉን ሙሰማ መሃመድ በዚህ አድራሻ መጠየቅ ይቸለል::

ስልክ ቁጥር +251934765267

ኢ-ሜይል abufeysel765267@gmail.com

በጥናቱ ተሳታፊ ለመሆን ፍቃደኛ ኖት?

1. አዎ ----------ወደ የሚቀጥለዉን ገፅ ይለፉ፡፡

2. አይደሞ ----------ወደ የሚቀጥለዉ ተሳታፉ ይለፈ፡፡

Questioner VI

Questioner developed for collection of data for the study of the prevalence and associated factors of intra-operative hyperglycemia among adult non diabetic patients who undergo elective surgery at tikuranbisa specialized hospitel.

Guide to data collectors: Read the questions and fill the data carefully by making appropriate circle or writing the response on the space provided accordingly**.**

Part one: Socio demographic

MRN **----------**Dx **----------**

1. Age ----------

2. Gender ---------- male ----------female----------

3. Weight ----------K.g

4. What is Current height in centimeter of the patient Height ----------cm

5. What is BMI of the patient in (Kg/m^2) ----------kg/m^2

Part two- Preoperative data

1. ASA status class I Class II Class III Class IV

2. Preoperative hemoglobin ---------- g/dl

3. Has history of Hypertension? i. Yes ii. No

Part three- Anesthetic and Surgical factors

1. Type of procedure?

I. General surgery
II. Gynecologic surgery
III. Neurosurgery
IV. Maxillofacial surgery
V. Orthopedic surgery

VI. ENT surgery

VII. GI surgery

VIII. Vascular surgery

IX. Cariothoracic surgery

2. Type of anesthesia?

i. General anesthesia

ii. Regional anesthesia

iii. Combined General and Regional anesthesia

3. Estimated Duration of surgery ----------hr.

4. Is tourniquet applied during procedure? i. Yes ii. No

5. Axillary body temperature in C^o before extubation.

6.Types of preoperative fluid

I. R/L ----------

II. N/S----------

III. D5W ----------

7. Estimated intraoperative blood loss ---------- ml.

8. Is there preoperative or intraoperative blood product transfusion? I. yes ii. No If yes,

9. is there preoperative/after induction corticosteroid use? I. yes ii. No If yes,

11. Is there intraoperative vasopressor use? I. yes ii. No If yes,

10. Intraoperative hypotension----------1.yes 2.no

12. Capillary blood glucose level of patients before extubation----------mg/dl.