COLLEGE OF MEDICINE AND HEALTH SCIENCE

FACULTY OF MEDICAL SCIENCE

DEPARTMENT OF ANESTHESIA

PREVALENCE AND ASSOCIATED FACTORS OF PREOPERATIVE FRAILTY AMONG ELDERLY PATIENTS UNDERWENT ELECTIVE SURGERY IN TEACHING HOSPITALS OF SOUTHERN ETHIOPIA, 2023: A MULTICENTER, CROSS-SECTIONAL STUDY

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A THESIS PAPER SUBMITTED TO HAWASSA UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE, FACULTY OF MEDICAL SCIENCE AND DEPARTMENT OF ANESTHESIA IN PARTIAL FULFILLMENT FOR MASTER OF SCIENCE IN ADVANCED CLINICAL ANESTHESIA.

JUNE, 2024

HAWASSA, ETHIOPIA

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HAWASSA, ETHIOPIA

HAWASSA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

ADVISORS'APPROVAL SHEET

(Submission sheet-1)

This is to certify that the student research paper entitled **"The prevalence and associated factors of preoperative frailty among elderly patients underwent elective surgery in teaching hospitals of southern Ethiopia,"** submitted in partial fulfillment of requirement for the master's degree (MSc) in advanced clinical anesthesia of postgraduate program of department of Anesthesia, college of Medicine and Health Science, has been carried out by **Fraol Husen**, under our supervision. Therefor we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department.

_____	_____	_____
Name of major advisor	Signature	Date
_____	_____	_____
Name of co-advisor	Signature	Date

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(Submission sheet-2)

We, the undersigned, members of the board of examiners of the final open defense by **Fraol Husen** have read and evaluated his thesis entitled "**The prevalence and associated factors of preoperative frailty among elderly patients who underwent elective surgery in teaching hospitals of southern Ethiopia**" and examined the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree of masters in advanced clinical anesthesia.

_____	_____	_____
Major Advisor	Signature	Date
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External examiner	Signature	Date
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SGS Approval	Signature	Date

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TABLE OF CONTENTS

ABBREVIATION AND ACRONYM

ASA	American Society of Anesthesiologist
AIDS	Acquired Immunodeficiency Syndrome
BHUTH	Bule Hora University Teaching Hospital
CFS	Clinical Frailty Scale
COPD	Chronic Obstructive Pulmonary
DURH	Dilla University Referral Hospital
FRAIL	Fatigue, Resistance, Ambulation, Illnesses and Loss of weight
GC	Gregorian calendar
HIV	Human Immunodeficiency Virus
HUCSH	Hawassa University Comprehensive Specialized Hospital
IRB	Institutional Review Board
OR/AOR	Odd Ratio/Adjusted Odd Ratio
SNNPR	South Nation Nationality and People Regional
SPSS	Statistical Package for the Social Sciences
WCSH	Worabe Comprehensive Specialized Hospital
WSURH	Wolaita Sodo University Teaching Referral Hospital
WUNEH	Wachemo University Nigist Elleni Mohammed Memorial Specialized Hospital

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Background: Frailty impairs the mental, physical, and emotions, making it difficult to maintain stability. This is especially important for older surgical patients, who are more likely to experience postoperative complications. These complications can lead to disability, loss of independence, decreased quality of life, infections, and death. Understanding this abnormality and its impact on the surgical settings will improve the quality of post-operative care.

Objective: To assess the prevalence and associated factors of preoperative frailty among elderly patients underwent elective surgery in selected teaching hospitals of southern Ethiopia, from February 8 to June 7, 2023 GC.

Method: A multi-center cross-sectional study was conducted among 422 elderly surgical patients aged 50 years and older. After receiving ethical approval from the institutional review board, data were collected by a systematic random sampling in selected hospital using a semi-structured and pretested questionnaire. The data was then encoded, entered into Epi-Data, and exported to SPSS, version 26. A binary logistic regression analysis was used to identify any associated factors for preoperative frailty, and variables with a P value less than 0.25 were entered into the multivariable logistic regression. A p-value of < 0.05 was considered statistically significant.

Result: Our study found that the overall prevalence of preoperative frailty is 49.8%. Age 50-64 years [AOR=0.038, 95%CL (0.012-0.128)], female [AOR=2.480 CI (1.004-6.450)], BMI<18.5 [AOR=4.748, 95% CI (2.010-11.216)], preoperative anemia [AOR = 2.386, 95% CI (1.015-5.611)], and absence of preoperative hypertension [AOR = 0.005, 95% CI (0.001-0.024)] were associated with preoperative frailty.

Conclusion and recommendation: Preoperative frailty was high among elderly elective surgery patients. This shows that screening for preoperative frailty and associated risk factors is crucial for elderly surgical patients in order to achieve better perioperative quality.

Keywords: Elderly, Frailty, Preoperative, Surgery

CHAPTER ONE: INTRODUCTION

1.1 Background

Frailty is defined as a loss of physiological and functional reserves across different organ systems, which results in a diminished ability to adapt to outside stresses such as surgery (1, 2). It is not synonymous with aging and is a reliable predictor of mortality, morbidity, and longer hospital stays (3). The World Health Organization (WHO) predicts that by 2050, the number of people over the age of 60 will double (4). In 2010, the majority of people aged 60 and over lived in developing nations (5). Chronic diseases may develop as life expectancy rises while physical and cognitive functions decline (6). In the United States, the elderly represent more than 40% of all surgeries performed (7).

People of the same chronological age may have biological ages that differ; a person in their 70s may have an increased risk of cardiovascular disease. Older adults are a diverse group, with a wide range of health and functional status outcomes influenced by genetic, biological, and environmental factors (8). It is caused by the failure of several physiological systems, including the endocrine system, immune system, skeletal muscle, and brain (9). Furthermore, the loss of physiological reserves in the respiratory, renal, cardiovascular, hematopoietic, and nutritional systems can affect elderly people's health (10).

Frailty makes older inpatients more vulnerable to external stressors, increasing the risk of falls, delirium, and disability (11). The frailty index and frailty phenotype, which both measure health-related deficits, can be used to assess the status of humans and animal models to gain a better understanding of the molecular mechanisms of frailty (12, 13). Delirium, or frailty, is the combination of delirium and frailty that makes older people more vulnerable to negative outcomes, such as cognitive impairment and dementia. The brain changes structurally and physiologically as it ages, particularly in neurons with high metabolic demands (14,15).

Frailty was also linked to a faster rate of cognitive decline, indicating that frailty and dementia are not linked (16). With age, the production of three major circulating hormones - growth hormone, oestradiol, and testosterone - decreases, additional the activity of the adrenocortical cells responsible for producing steroid precursor dehydroepiandrosterone (DHEA) and DHEA sulfate decreases (17,18).

Frail people had significantly lower levels of IGF-1 than age-matched controls and were more prone to weight loss, anorexia, and decreased energy expenditure (19). Chronically elevated cortisol levels are associated with increased catabolism, which leads to muscle mass loss and weight loss (20).

A decline in stem cells, changes in T-lymphocyte production, and decreased phagocytic activity of neutrophils, macrophages, and natural killer cells characterize the aging immune system (21). There is evidence that inflammation contributes to the pathophysiology of frailty through an abnormal, low-grade inflammatory response (22). Advanced Glycation End Products (AGEs) are molecules produced by the glycation of proteins, lipids, and nucleic acids that have the potential to cause widespread cellular damage by upregulating inflammation. They have been linked to aging, chronic disease, and mortality, as well as possibly playing a role in frailty (23,24).

Muscle loss (sarcopenia) is defined as the progressive loss of skeletal muscle mass, strength, and power and is considered an important component of frailty (25). The brain, endocrine system, and immune system coordinate the balance, which is influenced by nutritional factors and physical activity level (26).

1.2 Statement of the Problem

Millions of elderly people worldwide are frail. However, the global prevalence of frailty is unknown, in part because frailty research has been conducted primarily in high-income countries (27). A retrospective cohort study of 11 years indicated that frailty increased with age, affecting 10% of adults aged 50–64 and 43.7% of adults aged ≥65 (28).

A study conducted in UK hospitals found that 17.0% of elective surgery patients aged 65 or older were fragile (29). Frail patients who underwent orthopedic surgery had higher postoperative delirium rates than non-frail patients (28% vs. 3.4%)(30). A meta-analysis done on both elective and emergency surgery predicted an increase in the prevalence of frailty rate between 10 and 37 % (31).

Systematic reviews have indicated that the prevalence of frailty is 53% among long-term care residents (32). The prevalence frailty among individuals with HIV infection is 5–29% (33), while 37% in patients with end-stage renal disease (34). Similarly, a median frailty prevalence of 42% has been reported in patients with malignancies (35).

According to various studies, frailty among patients undergoing surgery is associated with an increased risk of adverse health outcomes such as mortality, loss of activities of daily living, and hospitalization, particularly in surgical patients (36). Thus, frailty is a prominent, potentially modifiable patient characteristic in surgical practice (37).

Research conducted in Vietnam on patients receiving gastroenterological surgery demonstrates that 18.5% were frail (38). The risk of postoperative complications that lead to disability, loss of functional independence, poorer quality of life, lengthened hospital stays, infections, and death is higher in the preoperative frailty population (39).

Based on clinical home-based assessments completed at 18-month intervals and death certificates, the cause of death was determined, frailty (27.9%) was the most prevalent condition that caused mortality, followed by organ failure (21.4%), cancer (19.3%), dementia (13.8%), and other causes (14.9%) (40)

Increasing age, lower weight, female gender, living conditions, low levels of exercise, polypharmacy, smoking status, drinking status, malnutrition, low education level, no spouse, comorbidities, lower vitamin D levels, low B12, low folate, low albumin, low total cholesterol, and low hemoglobin are all considered risk factors for frailty in the elderly (41–45).

Frailty is associated with a declined health-related quality of life (46), which has both personal and economic consequences. Among these adverse outcomes include the increased occurrence of falls 20%, fractures 38% (47), cognitive impairment 26%, dementia 21%, Alzheimer's disease 15% (48) depression 40% (49), increase in healthcare cost 54%–101% (50), increase length of hospital stay and were more likely to die at both 30 and 90 days(51).

The lack of an international standard definition of frailty is one of the most significant current challenges in the field of frailty research (52). Despite extensive research on frailty, the variability in frailty definitions used in existing studies influences evidence interpretation, comparison with other studies, generalization of findings, and implementation in health care policy(53).

Preventive strategies and targeted services for frail elderly people necessitate the identification of this risk group, preferably before adverse outcomes such as disability and health care utilization occur (hospitalization and institutionalization) (54). Frailty must be detected early so that (preventive) interventions can be used to delay the onset of frailty or prevent its progression. Interventions can even help with the transition to a non-frail state (55).

The health care provider makes programs and applies the prevention and management of frailty through frailty screening, frailty assessment, exercise intervention, nutritional intervention, multidisciplinary intervention, drug administration, social support, and health education to improve the clinical outcome and quality of life of elderly patients (56).

1.3 Justification

Preoperative frailty has serious clinical consequences and risks for perioperative outcomes, such as an increased risk of desaturation, a greater need for vasopressors, in-hospital mortality, and postoperative complications.

Adequate, careful frailty assessment in elderly patients during the preoperative period has been one of the greatest challenges for surgical patients, and the majority of those admitted to hospitals are still not properly evaluated for frailty before surgery.

This study will aid in the early detection of frailty problems among elderly patients prior to surgery, which may help to stratify risks and inform healthcare professionals, patients, and their families about the risks associated with surgery. It is also important to actively identify and improve controlled factors before surgery, which will increase the patient's chances of a better outcome.

According to our search and knowledge, no studies have been conducted on the prevalence and risk factors of preoperative frailty in elderly patients undergoing elective surgery in Ethiopia. This requires study in Ethiopia. As a result, the study identifies the prevalence and risk factors for preoperative frailty in older patients undergoing surgery. The results of this study are useful for improving prognosis and optimizing therapies before surgery, as well as for perioperative care practitioners (especially anesthetists) and future researchers.

Preoperative evaluation of elderly patients' frailty may enhance strategies for therapy and contribute to prognosis

CHAPTER TWO: LITERATURE REVIEW

Frailty is a complicated age-related clinical syndrome marked by a decrease of physiological abilities throughout multiple organ systems. It has been set as an independent predictor of undesirable postoperative and process-related outcomes in studies that cover surgical subspecialties to elective settings (57–60).

2.1 Prevalence of preoperative frailty

Frailty affects 15% of Americans over the age of 65, according to the nationally representative data presented here. Frailty prevalence increased dramatically with age, rising from 9% in those aged 65 to 69 to 38% in those aged 90 or older were frailty was assessed by the physical frailty phenotype (PFP) that is classified in five criteria: exhaustion, low physical activity, weakness, slowness, and shrinking (61). Liang-Ju Chen et al. (2014) discovered an 8.3% prevalence of frailty in a cross-sectional study of 495 elderly patients in Taiwan using Clinical Frailty Scale (CFS) containing five criteria; weight loss, self-described exhaustion, weakness, slowness, and low physical activity (62). Another observational study conducted in the United States by Woods et al. (2005) discovered a 16.3% prevalence of frailty in 40,657 women aged 65 to 79. (63).

Gong W. et al. observational cross-sectional study with 300 Chinese hemodialysis (HD) patients in 2022 were discovered that 75% of participants were in the frailty group, and the Tilburg indicator of frailty (TFI) score of HD patients was 6.89±2.87, with 8.15±2.06 in the frailty group and 2.87±1.31 in the non-frailty group among those were nearly three-quarters of those with HD participated were frail using the Tilburg indicator of frailty (TFI) questionnaire (64). Simon J. G. et al. conducted an observational study with 420 adult inpatients at tertiary hospitals in New Zealand in 2019. Frailty was found in 48.8% of patients, indicating that it is extremely common in a tertiary inpatient hospital were frailty assessment was performed using the Reported Edmonton Frail Scale(REFS) ranged from 1 to 12. A score of 8 or more was considered frail (65).

Another study done in medical settings has shown that frailty is present in 20–50% of the middle and older aged population, depending on the exact disease and the method of frailty measurement used (66). The age-stratified prevalence of frailty in surgical populations is higher than in community-based samples. Using a clinically validated multidimensional frailty instrument in the elective setting (where

the average age is around 70 years), it is reasonable to expect frailty in approximately 30% of non-oncologic surgery patients and approaching 50% of cancer surgery patients (35,67). A cross-sectional study of older adults aged 65 years and above by Kashikar Y et al, in India reported frailty was prevalent in 26% of individuals, the prevalence of frailty was measured by using Fried's frailty phenotype(FP) through five criteria: unintentional weight loss; weakness or poor handgrip strength; self-reported exhaustion; slow walking speed; and low physical activity (68).

According to a 2015 review, the prevalence of frailty is higher in developing countries than in developed countries, where it ranges from 5.4% to 44% in community-dwelling elderly, and J. S. L. Partridge et al. (2012) discovered that it ranges from 4.1% to 50.3% in patients of all ages presenting for surgical procedures were this reviews was done using different Models of frailty (5,69)

2.2 Factors associated with preoperative frailty

A single-centered cross-sectional study was conducted at a tertiary hospital in China from March to November 2020. The frail group was older and had a higher proportion of females than the non-frail group (P 0.05). The frail group had significantly lower MUAC, CC, 4-m gait speed (24.1% vs. 8.7%), handgrip strength (31.9% vs. 5.4%), and MNA-SF score (91.4% vs. 47.7%) than the non-frail group (P 0.05). The frail group exercised less frequently (79.3% vs. 92.6%) and required more blood transfusions before or after surgery (23.3% vs. 12.1%). (P 0.05). There were no significant differences in BMI, education, marital status, smoking or drinking history, the Charlson comorbidity index (CCI), or preoperative chemo-radiotherapy between the two groups of subjects (70).

A cross-sectional study with 654 participants was conducted to investigate the relationship between frailty and dementia, with 93 (14% of the participants) classified as frail. There were 171 people with cognitive impairment (26%) and 134 people with clinically diagnosed dementia (21%). Frail people were at risk of cognitive impairment, dementia, vascular dementia, and Alzheimer's disease as robust people (71). Frailty was associated with age, gender, income, education, the number of chronic diseases, ADL disability, and IADL disability in a cross-sectional study of 740 community-dwelling frailties and socio-demographic variables, morbidity, and disability in Canada (2010). The frail had 29.1% ADL disabilities, 92.7% IADL disabilities, and 81.8% comorbidity (72).

In a retrospective review of data from the ACS-NSQIP in the United States for all patients who underwent hysterectomy for endometrial cancer from 2011 to 2012, Pelumi Adedayo et al. (2018)

discovered that frailty is an independent risk factor for non-home discharge in patients undergoing endometrial cancer surgery. Advanced age, an increasing BMI, and cancer spread were also risk factors for non-home discharge (73)

The gender differences in the relationship between smoking and frailty status were investigated in a study of 3257 Chinese community dwellers aged 55. Men and women were subjected to separate studies. Current and former male smokers were significantly frailer than men who had never smoked, whereas women were not ($p = 0.529$) (74).

A prospective study of 2544 community-dwelling people aged 60 and older was conducted. After controlling for socio-demographic confounders, incident frailty risk was significantly higher among nondrinkers compared to the low consumption group (>0 and 7 units per week). Heavy drinkers (>21 units per week) had a lower incident frailty risk, significant when socio-demographic factors were considered (75).

A cross-sectional study of 179 inpatients aged 65 years looked at the relationship between nutrition status and frailty. Comprehensive nutritional assessment, whether categorical or continuous, was found to be significantly related to frailty ($P< 0.05$). The risk of frailty in malnourished patients was found to be 3.381 times higher than in well-nourished patients ($P = 0.036$) (76).

2.3 Conceptual Framework

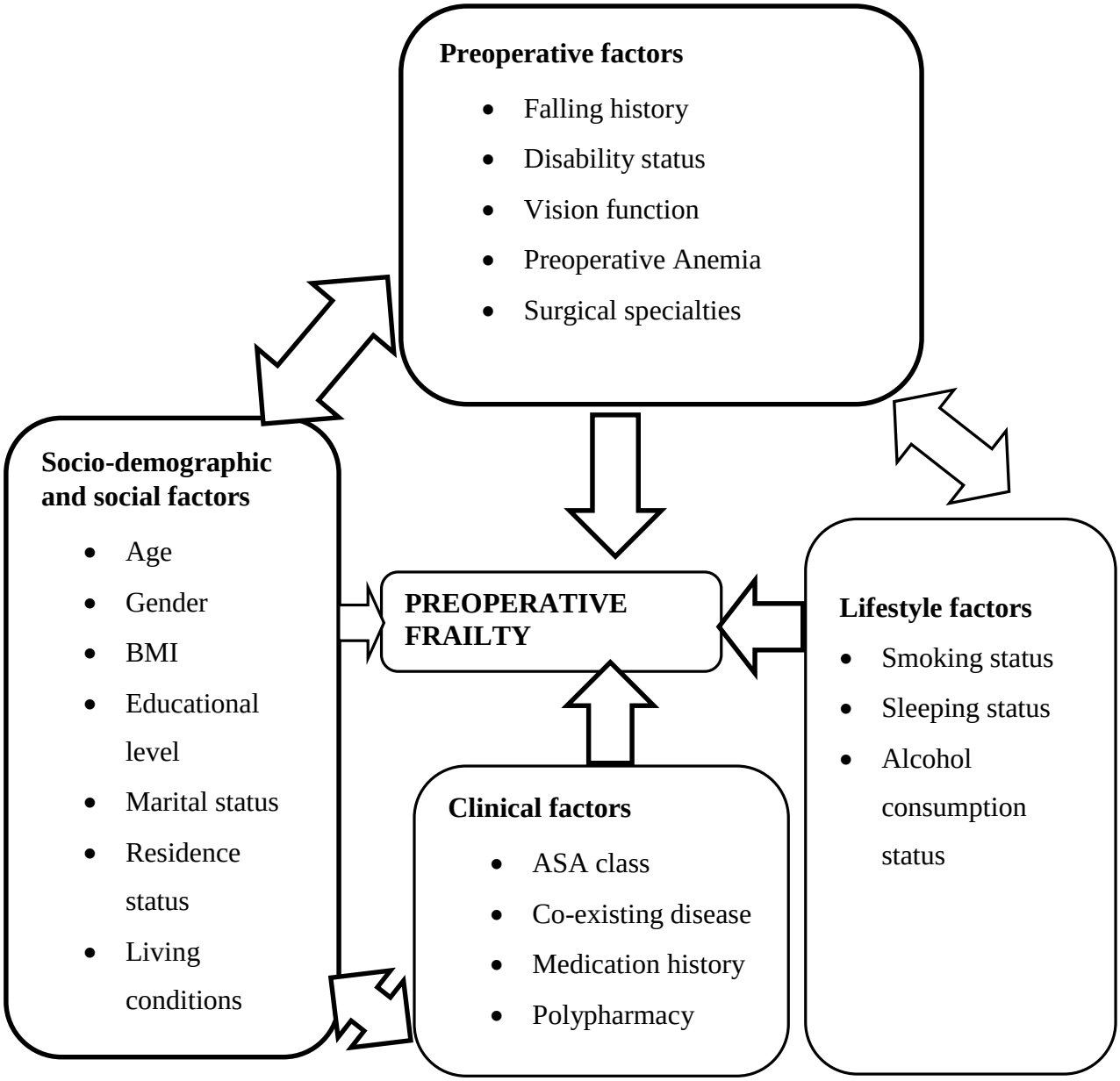

Figure 1: Conceptual Framework (77)**.**

CHAPTER THREE: OBJECTIVE

3.1 General Objective

To assess the prevalence and associated factors of preoperative frailty among elderly patients underwent elective surgery in teaching hospitals of southern Ethiopia, from February 8 to June 7, 2023 G.C.

3.2 Specific Objective

1. To determine the prevalence of preoperative frailty among elderly patients underwent elective surgery in teaching hospitals of southern Ethiopia, February 8 to June 7, 2023, G.C.

2. To identify factors associated with preoperative frailty among elderly patients underwent elective surgery in teaching hospitals of southern Ethiopia, February 8 to June 7, 2023 G.C.

CHAPTER FOUR: METHODS AND MATERIALS

4.1 Study Area and Period

The study is conducted in southern Ethiopia's randomly selected (with lottery method) six teaching hospitals from February 8 to June 7, 2023, G.C (yekatit 1 to gimbot 30 2015 E.C). Hawassa University Comprehensive Specialized Hospital (HUCSH), Wolaita Sodo University Teaching Referral Hospital (WSUTRH), Dilla University Teaching Hospital (DUTH), Wachemo University Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital (WUNEH), Worabe Comprehensive Specialized Hospital, and Bule Hora University Teaching Hospital (BHUTH) were the selected sites.

HUCSH is located in Hawassa, southern Ethiopia, 280 kilometers from Addis Ababa. It is one of the major health facilities, serving as a teaching, research, and regional referral hospital since 2005. It serves about 20 million people locally and in surrounding areas. The hospital has over 400 beds, including eight ICU beds and 12 operating tables, and offers services in gynecology, obstetrics, orthopedics, neurology, cardiothoracic, maxillofacial, pediatric, urology, ENT, plastic surgery, internal medicine, and pediatrics, as well as OPD and major diagnoses for 90,200 outpatients, 18,100 hospitalized patients, and 1100 emergency cases each year (78).

DUTH is located in Dilla town, Gedio zone, Southern Nation Nationality Peoples Regional State, 365 kilometers south of Addis Abeba, Ethiopia. The hospital began as a university facility and was promoted to a referral hospital in 2005. Currently, it offers instructional services to new advanced medical education program students in emergency surgery and obstetrics, health officers, midwives, psychiatry, and anesthesia, as well as clinical services to the public. The hospital serves around 5 million people in the southern section of the Southern Nation Nationalities and People, as well as the southern regions of Oromia and Somalia (79). The hospital now has four operating tables, three PACU tables, and eight ICU tables.

WSUTRH is located in Sodo Town, Ethiopia, 317 kilometers from the capital, Addis Ababa. It serves a population of around 10 million. It has clinical services and offers a comprehensive range of medical treatments to both in and outpatients of all ages in several areas such as internal medicine, surgery, gynecology and obstetrics, and pediatrics (80,81).

WUNEH is located in the Hadiya zone, Hosanna town, Ethiopia, 232km south of Addis Ababa. The hospital serves about 3.2 million people annually. The hospital has medical, obstetrics and gynecology, surgical, orthopedic, and pediatric wards and approximately 350 beds and provides services such as outpatient treatment, emergency treatment, surgery, delivery, laboratory, pharmacy, and mental health care (82).

WCSH is located in Worabe town. It is the administrative capital of the Siltie zone and 172 km to the south of the capital city of Addis Ababa. It is a tertiary-level hospital established in 2014 E.C., which was expected to serve 3.5-5 million populations and has 800 beds including eight adult and four pediatric ICUs, and eight operation tables. Now it provides services in, gynecology and obstetrics, internal medicine, pediatrics, outpatient department, diagnostic facilities, psychiatry, and intensive care as a secondary and tertiary level of care, used as a referral center for district, and neighboring (83)

BHUTH is located in Bule Hora town, situated in the southern part of Ethiopia. The town is part of the West Guji Zone in the Oromia regional state and is approximately 467 km south of Addis Ababa. The town has a total population of 141,579 and offers a wide range of medical care services, including surgical services and obstetrics/gynecology services. It serves as a referral center for health centers and nearby hospitals (84).

4.2 Study Design

A multi-centered cross-sectional study was conducted in teaching hospitals of Southern Ethiopia.

4.3 Population

4.3.1 Source population

All elderly patients who undergo elective surgery in the selected teaching hospitals of southern Ethiopia were used as the source population.

4.3.2 Study population

All elderly patients who underwent elective surgery in selected teaching hospitals in southern Ethiopia during the study period and fulfilled the inclusion criteria were used as a study population.

4.4 Eligibility Criteria

4.4.1 Inclusion Criteria

Age 50 and above (85). Elective surgery and ASA physical status (I-III)

4.4.2 Exclusion Criteria

Psychotic patients, Unconscious patients, pregnant women

4.5 Study Variable

4.5.1 Dependent Variables

Preoperative Frailty (Yes/No)

4.5.2 Independent Variables

Age, gender, BMI, medication history, number of medications used, preoperative anemia, comorbidity (Heart failure, Diabetes mellitus, hypertension, metastatic cancer, COPD/asthma), type of surgery, falling history**,** educational level, marital status, smoking status, sleeping status, vision status. Drinking status, residence status, ASA physical status, and living conditions.

4.6 Sample size determination and sampling Procedure

4.6.1 Sample size

A single population proportion formula with a 5% margin of error and 95% confidence intervals (CI) was used to determine the sample size. There has been no specific study on the prevalence and associated factors of preoperative frailty among the elderly undergwent elective surgery in Ethiopia or Africa; hence, p-values of 50% was used to identify the acceptable sample size.

$n = \frac{(z^{\alpha}/_{2})^{2}\rho(1-\rho)}{\varepsilon^{2}}$ Where p= 50% from q= 50% rule, z= 1.96, and ε= 0.05

n = $\frac{(1.96)^{2}0.5(1-0.5)}{0.05^{2}}$= 384 and 10% of the additional sample is included by assuming nonresponse rate =380*10%= 38 = 384+38 = 422

A situational analysis was done from a recorded logbook of adult elective surgery for the consecutive same three months of last year in each teaching hospital. There were 250 elderly patients operated on in HUCSH, 121in DUTH, 152 in WSUTRH, 50 in BHUTH, 78 in WUNEH, and 192 in WCSH,. These hospitals have operated on an average of 843 elderly patients.

Finally, the sample size was assigned to each hospital proportionally based on their average three-month report. As a result, 843 elderly patients underwent surgery. Given a sample size of 422, 843 divided by 422 equals 2: HUCSH = 250/2 = 125, DUTH = 121/2 = 61, WSUTRH = 152/2 = 76, BHTH=50/2=25, WUNEH=78/2=39 and WCSH=192/2=96.

4.6.2 Sampling Procedure

Six study areas were randomly selected with a lottery method from nine teaching hospitals in Southern Ethiopia. The selection of participants was carried out with a systematic random sampling technique. By using systematic random sampling the k value (k=N/n, 843/422 =1.997 ≈2), where N = number of elderly patients underwent elective surgery in the last three months, n = sample size, k = interval. Of the first two elderly, one was selected through a lottery method to be the study participant.

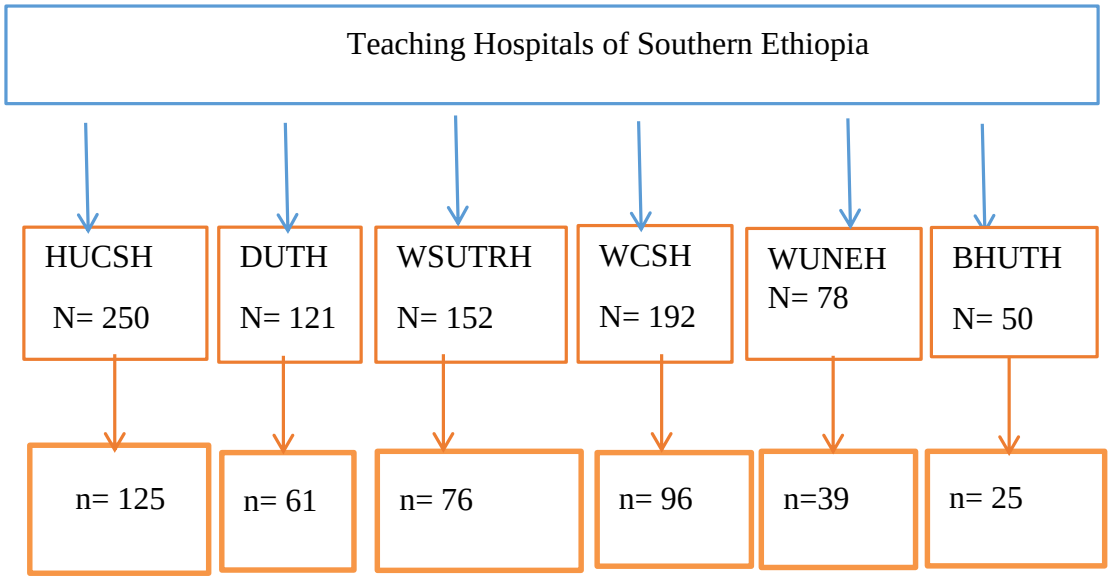

Figure 2: Proportional allocation for sample size

4.7. Data collection procedure

A pretested and semi-structured questionnaire and patient chart was used to gather data. The study's advantages, harms, and objectives were drafted in English, translated into Amharic, and explained to the study participants prior to surgery, and questionnaire items were derived from existing literature (29,86,87). Twelve trained (12) data collectors and one supervisor per selected hospital were involved in the data collection process. Written informed consent was obtained and data collection was done at pre-anesthetic evaluation time a day before surgery.

Data were collected on patients' characteristics (sex, age, weight, residence status, educational status, marital status, living condition), smoking status, drinking status ASA physical status, preoperative full blood count result, date of sample collection, patient ID, baseline hemodynamic status, comorbidity, fall history, vision status, sleeping status, surgical specialties, history of medication intake, number of medication used and preoperative frailty(Yes/No). Preoperative frailty was assessed based on the FRAIL scale. FRAIL scale (frailty≥3): Fatigue, Resistance, Ambulation, Illnesses, and loss of weight within a year.

4.8 Data Quality Management

To assure the quality of data, one-day training on the objectives and relevance of the study and a brief orientation on the assessment tools were provided for data collectors before data collection was begun. To ensure the quality of the data, a pretest was done at Araba Minch Teaching Hospital and the data collection tool (questionnaire) was tested on 5% of the total sample size. The Cronbach's alpha value was 0.832 (83.2%).

Based on the pre-test findings, syntax, sequencing, and timing were adjusted before the real data collecting started. Each questionnaire was revised by the investigators to be complete and appropriate for all study participants. The data collectors were instructed to write card numbers on the questionnaire during the data collection if further crosschecking is needed. The complete data was encoded and entered into Epi-Data version 4.6 and exported to SPSS version 26 for analysis.

4.9 Data Processing and Analysis

Statistical analysis was performed with IBM SPSS statistical package version 26. The data were tested for normality using histogram, Shapiro–Wilk normality test (p-value >0.05 taken as normally distributed) and chi-square for continues and categorical data respectively. Multi-collinearity was checked for independent variables with VIF; the value of VIF was <10. Cross-tabulation was used to describe the relationship between categorical variables. In the logistic regression analysis, odds ratios (OR) with 95% confidence intervals were calculated. The outcome was described using descriptive statistics, such as frequency tables, and graphs. The dependent variable was dichotomous (present or absence of frailty). Which obeys the assumptions of binomial (binary) logistic regression. As a result, we used it to ascertain the association between the dependent and independent variables. Hosmer and Lemeshow's goodness of fit test for logistic regression was used to test for the model fitness for the outcome variable. A P-value less than 0.05 was taken as statistically significant, and variables with a P-value of < 0.25 in the bivariable binary logistic regression analysis were transferred to the multivariable binary logistic regression analysis.

4.11 Ethical Consideration

Support letter and ethical clearance were received from the institutional review board (IRB) of Hawassa University College of Medicine and Health Science before the start of the study. The advantages and risks of the study were explained and written informed consent was obtained from each study participant by the data collectors. Confidentiality was kept during the study by avoiding identifiers and using codes to identify patients. Participants' involvement in the study was voluntary.

4.12 Result Dissemination Plan

The final result of this research will presented and submitted after defense to Hawassa University College of Medicine and Health Science as part of the M.Sc. in advanced clinical anesthesia finally, the result will presented at the regional conferences and it will be sent to local and international journals for publication.

4.10 Operational definition

Frailty: a state of increased vulnerability, resulting from age-associated declines in reserve and function across multiple physiologic systems (88).

FRAIL Scale: is a short five-question assessment that can screen for frailty,(Score between 0 and 5; score >3 defined as frailty) (89).

Elderly: The group of population ≥50 years (85)

Age category: 50-64 years and 65 and above (28,90).

Sleeping status: Normal sleep duration defined as 7 hours or more hours per night on a regular

basis to promote optimal health, were Sleeping less than 7 hours or more than 9 hours per night defined as sleeping dysfunction (91)

Vision status: Normal /Good vision: defined as where patients reporting excellent, very good or good eyesight, and dysfunction/ poor vision defined as were patients blind or could not see across the street and/or read newspaper print, even with glasses (92)

Preoperative hemoglobin(Hb): defined as the last Hb value measured before surgery, with all Hb measurements obtained within 28 days before surgery (93)

Anemia: defined according to world health organization (WHO) criteria (women<12.0 g/dl and men <13.0g/dl) (94)

CHAPTER FIVE: RESULT

5.1. Characteristics of respondents

5.1.1. Socio-demographic and Preoperative Characteristics of the Elderly Patients

A total of 422 elderly patients who were 50 years of age or older who underwent elective surgery were included in this study without a non-response rate. The majority of participants 256 (60.7%) were males and 166(39.3%) were females. The mean age of all respondents was 60.2 ±9.2years and ranged from 50 to 110, from those respondents 317(75.1%) were between the ages of 50 to 64, and 105(24.9%) were 65 years or older. Most of the patients were illiterate 214 (50.7%), primary school 109(25.8%), middle school 58(13.7%), and were diploma and above 41(9.7%). Among the marital status, most of the patients were married 338(80.1%), Single 7(1.7%), divorced 64(15.2%), and widowed 13 (3.1%). More than half of the patients were BMI normal 248(58.8), underweight 148(35.1) and were the rest overweight13 (3.1) and obesity13 (3.1). Most of the participants live in bungalows 288(68.2%) and half of the participants have rural residences 211(50%).

Table 1: Socio-demographic characteristics of elderly patients underwent elective surgery in selected teaching hospitals of southern Ethiopia, February 8 to June 7, 2023(n=422).

Variable	**Category**	**Frequency (%) (n=422)**	**Preoperative Frailty**	
			Yes	**No**
Age n (%)	50-64	317 (75.1)	113(35.6)	204(64.4)
	≥65	105 (24.9)	97 (92.4)	8 (7.6)
Sex n (%)	Male	256(60.7)	94(36.7)	162(63.3)
	Female	166 (39.3)	131(78.9)	35(21.1)
Marital status n (%)	Single	7(1.7)	4(57.1)	3(42.9)
	Married	338(80.1)	165(48.8)	173(51.2)
	Divorced	64(15.2)	34 (53.1)	30(46.9)
	Windowed	13(3.1)	8(61.5)	5(38.5)
BMI n (%)	<18.5	148 (35)	123 (83.1)	25 (16.9)
	18.5-24.9	248 (58.8)	69 (27.8)	179 (72.2)

	25-29.9 ≥30	13 (3.1) 13 (3.1)	6 (46.2) 9(69.2)	7(53.8) 4(30.8)
Residence n (%)	Urban Rural	211 (50) 211 (50)	108(51.2) 102(48.3)	103(48.8) 109(51.7)
Educational status n (%)	Illiterate Primary school Middle school Diploma and above	214 (50.7) 109(25.8) 58(13.7) 41(9.7)	150 (70) 61(56) 28 (48.3) 21(51.2)	64(30) 48(44) 30 (51.7) 20(48.8)
Living condition n (%)	Bungalow Building with elevators Building without elevators	288(68.2) 15(3.6) 119(28.2)	137 (47.7) 8 (53.3) 39(33)	151(52.3) 7(46.7) 80 (67)

In the present study, the majority of the elderly patients were ASAI/ II 398 (94.3%) and III 24(5.7%). Depending on preoperative hemoglobin status done before 28 days patients were categorized as anemic and not anemic, according to this were anemic patients 132(31.2%) and normal hemoglobin patients 290(68.7%). All of the patients were take less than five medication.

More than half of the patients were nondrinkers 276(65.4%) and non-smokers 142(33.6%); 136(32.2%) of the patients had a history of falls within the last 12 months. A small portion of the respondents had vision dysfunctions 63(14.9%), and sleeping dysfunction 66(15.6%). In terms of preoperative health status, 190(45%) of the study participants had a history of comorbid conditions, of which hypertension takes the highest rank 97(51%) followed by diabetes mellitus 35(18.4%), Asthma/COPD 23(12.1%), HIV/AIDS 22(11.6), metastatic cancer 6(3.2%) and heart disease 7(3.7%).

Table 2: Preoperative baseline characteristics of elderly patients underwent elective surgery in selected teaching hospitals of southern Ethiopia, February 7 to June 8, 2023(n=422).

Variable	Category	Frequency (%) (n=422)	Preoperative Frailty	
			Yes	No
ASA PS n (%)	I/ II III	398 (94.3) 24 (5.7)	192 (48.2) 18 (75)	206 (51.8) 6 (25)
Fall history in last 12 months n (%)	Yes No	136(32.2) 286(67.8)	77(56.6) 133(46.5)	59(43.4) 153(53.5)
Smoking status n (%)	Non-smoker Former smoker Current smoker	142(33.6) 137(32.5) 143(33.9)	2(1.4) 90(65.7) 118(82.5)	140(98.6) 47(34.3) 25(17.5)
Drinking status n (%)	Current drinker Former drinker Nondrinker	40(9.5) 106(25.1) 276(65.4)	17(42.5) 59(55.7) 134(48.6)	23(57.5) 47(44.3) 142(51.4)
Vision status n (%)	Normal Dysfunction	359(85.1) 63(14.9)	173(48.2) 37(58.7)	186(51.8) 26(41.3)
Sleeping status	Normal Dysfunction	356(84.4) 66(15.6)	172(48.3) 38(57.6)	184(51.7) 28(42.4)
Medication intake	Yes No	185(43.8) 237(56.2)	138(74.6) 72(30.4)	47(25.4) 165(69.6)
Hemoglobin (g/dl) status	Normal Anemia	290(68.7) 132(31.3)	68(28) 142(78.9)	174(72) 38(21.1)
Co-exiting diseases	Yes No	190(45) 232(55)	142(74.7) 68(29.3)	48(25.3) 164(70.7)

Table 3:Preoperative co-morbidities and surgical Specialties baseline characteristics of elderly patients underwent elective surgery in selected teaching hospitals of southern Ethiopia, February 7 to June 8, 2023(n=422)

Variable	Category	Frequency (%) (n=422)	Preoperative Frailty	
			Yes	No
Preoperative blood pressure status	Normal	325(77)	60(18.5)	265(81.5)
	Hypertension	97(23)	80(82.5)	17(17.5)
Diabetes mellitus	No	387(91.7)	110(38.4)	277(71.6)
	Yes	35(8.3)	25(71.4)	10(28.6)
Asthma/ COPD	No	399(94.5)	125(31.3)	274(68.7)
	Yes	23(5.5)	14(61)	9(39)
HIV/AIDS	No	400(94.8)	130(32.5)	270(67.5)
	Yes	22(5.2)	17(77.3)	5(22.7)
Heart disease	No	415(98.3)	120(29)	295(71)
	Yes	7(1.7)	6(85.7)	1(14.3)
Metastatic Cancer	No	416(98.6)	126(30.3)	290(69.7)
	Yes	6(1.4)	5(83.3)	1(16.7)
Surgical Specialties	General surgery	122(28.9)	52(42.6)	70(57.4)
	Gynecologic surgery	41(9.7)	17(41.5)	24(58.5)
	Orthopedic surgery	58(13.7)	29(50)	29(50)
	Urologic surgery	165(39.1)	97(58.8)	68(41.2)
	Cardiothoracic surgery	8(1.9)	4(50)	4(50)
	Neurosurgery	10(2.4)	6(60)	4(40)
	Plastics surgery	10(2.4)	2(20)	8(80)
	Otolaryngology	8(1.9)	3(37.5)	5(62.5)

The patients mostly were undergone urology surgery 165(39.1%) followed by general surgery 122(28.9%), Orthopedic surgery 58 (13.7%), Gynecologic surgery 41 (9.7%), and other 36(8.6%).

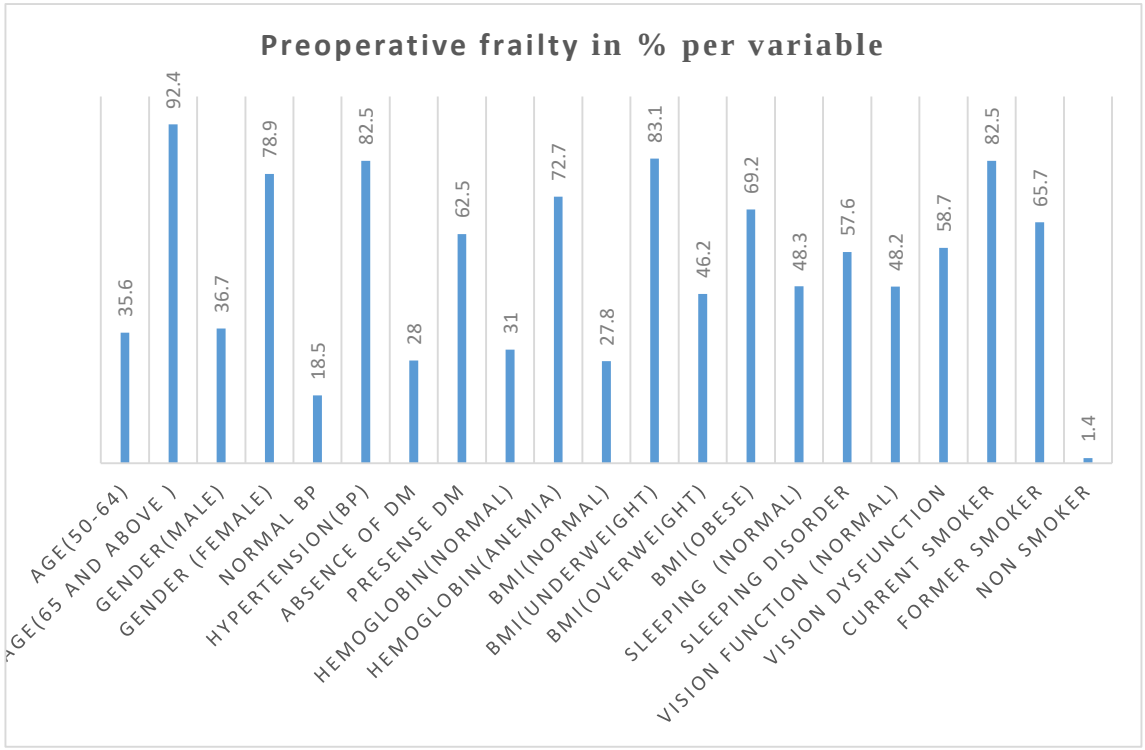

Figure 3: Bar graph showing the preoperative factors and their association with preoperative frailty.

5.1.2 Prevalence of preoperative frailty

In the present study, the prevalence of preoperative frailty among elderly elective surgical patients is 49.8% (CI 44.2–55.6) (figure 4). Preoperative frailty highest among the age 65 or older 97(92.4%), were compared to 50-64 age patients 113(35.6%). The elderly females exhibited preoperative frailty 131 (78.9%) when compared to male patients 94(36.7%). Among educational status showed, were illiterate 150(70%), primary school 61(56%), and middle school 28 (48.3%), when compared to patients having diploma and above 21(51.2%).

Among the marital status, were the prevalence of frailty having widowed highest 8 (61.5%), divorced 34 (53.1%), single 4 (57.1%), compared to married 165 (48.8%). Preoperative frailty occurred in urban 108 (51.2%) in contrast to rural residences 102(48.34%).

In this study, the prevalence of preoperative frailty in living conditions was showed in buildings with elevators 8(53.3%), bungalows 137(47.7%), in comparison to buildings without elevators 39(33%). According to the BMI of the participants, being underweight 123 (83.1%), obese 9 (69.2%), and overweight 6(46.2%) were higher preoperative frailty than normal body mass index 69(27.8). The preoperative frailty was assessed among those ASA III /above 18(75%) as opposed to ASA I/II 192(48.2%). Fall history in the last 12 months was indicated 77(56.6%) having frailty when compared to patients doesn't have a history of falls in the last 12 months 133(46.5%).

The prevalence of preoperative frailty was checked on smoking status among patients with current smokers showed a higher prevalence of 118 (82.5%), former smokers 90(65.7%) contrary to nonsmokers 2(1.4%). According to drinking status, the prevalence of frailty showed that nondrinkers 134(48.6%), former drinkers 59(55.7%), when compared to current drinkers 17(42.5%).

The prevalence of preoperative frailty vision was done according to those vision dysfunction [poor vision; were blind or could not see across the street and/or read newspaper print, even with glasses] 37(58.7%) in comparison to normal vision 173(48.2%). Additionally, the prevalence of preoperative frailty was done on the sleeping so according to those sleeping dysfunction [short sleep duration < 7 h or long sleep duration > 9 h] 38(57.6%) when compared to normal sleeping duration [normal sleep duration] 172(48.3%).

The prevalence of preoperative frailty in patients with a co-existing disease was 142(74.7%) against does not have a co-existing disease 68(29.3%). In the study done on the patients who can take medication and not take medication the prevalence of preoperative frailty on used medication was 138(74.6%) as compared to not used medication 72(30.4%).

This study also investigated the prevalence of preoperative frailty on patients' blood pressure(mmHg) status according to this were hypertension 80(82.5%) when compared to normal blood pressure of 60(18.5%). In addition, the study included the preoperative hemoglobin (g/dl) status obtained within either 28 days before surgery / the patients were anemic or not, so according to this the prevalence of preoperative frailty in patients with anemia was 96(72.7%) when compared to patients does not have anemia 90(31%).

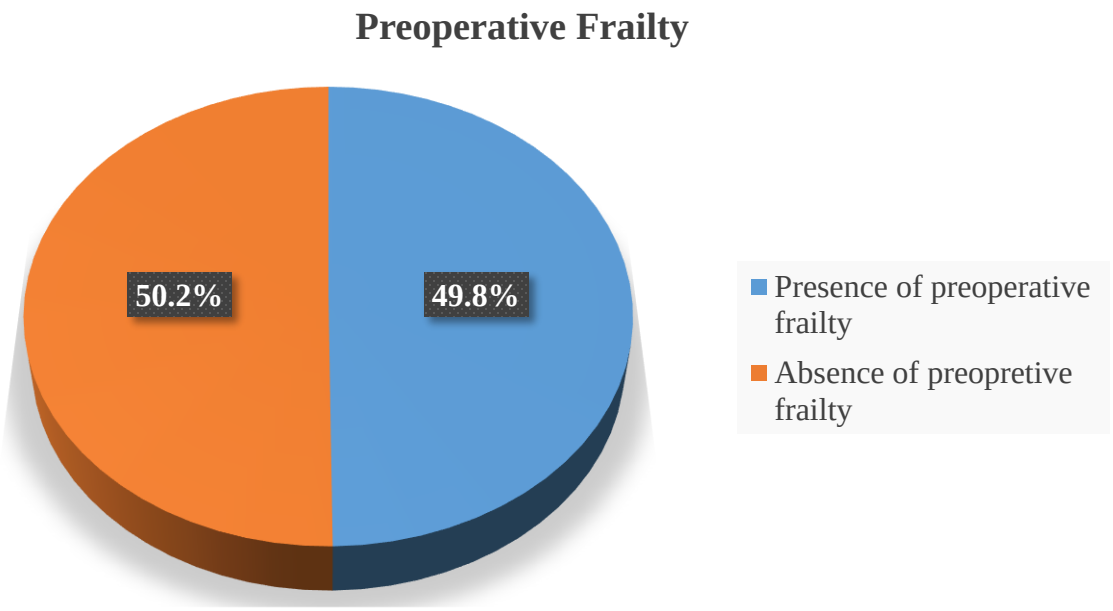

Figure 4: Pie chart showing the prevalence of preoperative frailty among elderly elective surgical patients in the selected teaching hospitals of southern Ethiopia, from February 8 to June 7, 2023 (n=422).

5.1.3 Factors associated with preoperative frailty

Preoperative frailty was thought to be influenced by the patient's age, gender, body mass index, smoking, and drinking habits, place of residence, marital status, level of education, and ASA status, as well as the patient's living situation, history of falls in the previous 12 months, vision and sleeping issues, and co-existing diseases.

By using SPSS version 26, binary logistic regression analyses were done & P-value < 0.25 was used as a cut point to select candidate variables for multivariable logistic regression. In binary logistic regression analysis the variables age, gender, ASA, BMI, smoking status, drinking status sleeping status, vision dysfunction, living condition, co-existing disease, preoperative blood pressure status, and preoperative hemoglobin status, are candidate variables for multivariable analysis with a p-value of, <0.25 (Table 3).

Table 4: Bivariate logistic regression of factors associated with Preoperative frailty among elderly patients underwent elective surgery in the selected teaching hospital of southern Ethiopia, from February 8 to June 7, 2023 (n=422).

Variable	Category	Outcome		COR (**95%CI**)	P-value
		Yes	No		
Age	50-64	113(35.6)	204(64.4)	0.045(0.022-0.091)	0.000
	65 and Above	97 (92.4)	8(7.6)	1	
Gender	Male	94(36.7)	162(63.3)	1	
	Female	131(78.9)	35(21.1)	6.450(2.987-14.191)	0.035
ASA	ASAI/II	192(48.2)	206(51.8)	1	
	ASA III	8(75.0)	6(25.0)	1.430(0.723-2.860)	0.2
BMI	Normal	69(27.8)	179(72.2)	1	
	Underweight	123(83.1)	25(16.9)	12.763(5.105 -28.717)	0.000
	Overweight	6(46.2)	7(53.8)	2.223(0.765-5.781)	0.251
	Obese	9(69.2)	4(30.8)	5.836(2.244-13.133)	0.606
Smoking	Non –smoker	2(1.4)	140(98.6)	0.003(0.002-0.006)	0.000
	Former smoker	90(65.7)	47(34.3)	0.405(0.162-1.217)	
	Current smoker	118(82.5)	25(17.5)	1	

Drinking	Current drinker	17(42.5)	23(57.5)	1	
	Former drinker	59(55.7)	47(44.3)	1.698(1.004-3.821)	0.021
	Nondrinker	134(48.6)	142(51.4)	1.276(0.638-2.553)	
Sleeping Status	Normal	172(48.3)	184(51.7)	1	
	Dysfunction	38(57.6)	28(42.4)	1.451(0.484-4.355)	0.224
Vision function	Normal	173(48.2)	186(51.8)	1	
	Dysfunction	37(58.7)	26(41.3)	1.530(0.512-4.568)	0.247
Living condition	Building without elevators	39(33)	80 (67)	1	
	Bungalow	137(47.7)	151(52.3)	1.861(0.744-5.583)	
	Building with elevators	8(53.3)	7(46.7)	2.344(1.019-6.798)	0.025
Co-existing disease	No	68(29.3	164(70.7)	1	
	Yes	142(74.7)	48(25.3	7.134(2.038-22.053)	0.232
Blood pressure status	Normal	60(18.5)	265(81.5)	0.048(0.024-0.192)	0.000
	Hypertension	80(82.5)	17(17.5)	1	
Hemoglobin (g/dl) status	Normal	90(31)	200(69)	1	
	Anemia	96(72.7)	36(27.3)	5.925 (2.043-18.962)	0.046

As shown in Table 3, residence status, educational status, marital status, fall history in the last 12 months, medication intake, number of medications, coexisting disease other than hypertension, and surgical specialties are not included because the p-values>0.25 so were not included in the multivariable analysis.

Table 5:A multivariable logistic regression analysis showing factors associated with preoperative frailty among elderly patients underwent elective surgery in the selected teaching hospitals of southern Ethiopia, February 8 to June 7, 2023 (n=422)

Variables	Category	Outcome		COR(95%CI)	AOR(95%CI)	p-value
		Yes	No			
Age	50-64	113	204	0.045(0.022-0.091)	0.038 (0.012- 0.128)	0.000**
	65 or Above	97	8	1	1	
Gender	Male	94	162	1	1	
	Female	131	35	6.450(2.987-14.191)	2.480(1.004-6.450)	0.035
BMI	Normal	25	123	1	1	
	Underweight	179	69	12.763(5.105 -28.717)	4.748(2.010-11.216)	0.000**
	Overweight	6	7	2.223(0.765-5.781)	0.533 (0.049-5.841)	0.251
	Obesity	9	4	5.836(2.244-13.133)	1.597 (0.398-4.790)	0.606
Preoperative anemia	Normal	90	200	1	1	
	Anemia	96	36	5.925(2.043-18.962)	2.386 (1.015-5.611)	0.046
Preoperative hypertension	Normal	60	265	0.048(0.024-0.192)	0.005 (0.001-0.024)	0.000**
	Hypertension	80	17	1	1	

Key: **: Highly significant in the Multivariate logistic regression (p-value < 0.001), AOR adjusted odds ratio, COR crude odds ratio, and CI confidence interval.

CHAPTER SIX: DISCUSSION

To the best of our knowledge, no previous study has reported on preoperative frailty and its associated factors among Ethiopian elderly surgical patients. This study brings new evidence to focus on frailty in elderly surgical patients in our country. This is a multi-centered cross-section study among 422 elderly patients who were 50 years of age or older and who underwent elective surgery, reporting on the prevalence of preoperative frailty in Ethiopia. The FRAIL scale was the tool used in this study. Overall, our study found that the prevalence of pre-operative frailty was 48.9% (CI 44.2-55.6). Which is comparable with the previous findings done by Carneiro JA et al. in Brazil 47. 2% (95), Richards SJ et al. in New Zealand 48.8% (65), and RB Biritwum et al in Indians 55.5% (96) were frail.

Our research finding is higher than a study done in Belgium (40%) (Joosten et al, 2014) (40%) (97). Chinese (43.8%) (Zhang Q et al, 2022) (98) , (Jiao J et al, 2020) (18.02%) (42) Taiwan (4.9%) (Chen CY et al, 2010) (99), Japan (Takeuchi H et al, 2018) (26.1%) (100) , and central Rajasthan G. Meratwal et al. in Clinical Epidemiology and Global Health (32.3%) (101). This broad range is due to definitional and measurement problems, demography, sample size as well as the varying populations studied.

Other study in china by Binru Han et al,2019. reported that among elderly patients undergoing thoracic and abdominal surgery, the prevalence of frailty was 26.12% in a sample of 245, using a frailty phenotype (102). This study was less than the prevalence of our study, which may be attributed to two aspects. First, since our 422 subjects came from various surgical specialties of the study hospitals. Second, sample size and population difference.

The research finding in chines on orthopedic patients 67.8%(FANG Wen et al ,2020) (103) was higher than our results. This discrepancy may be due to the study was only done on specific surgical department (patients with knee osteoarthritis), while our result shows overall prevalence of all surgical patients.

In our study, a significant association between being over 65 years old and preoperative frailty was found. Patients aged 50-64 years were 96.2% times less likely to develop preoperative frailty than patients aged older than 65 years [AOR=0.038, 95%CL: (0.012–0.128)], p=0.000. This finding is consistent with the study done on a cross-sectional survey of older persons aged 63 to 92 that was done between 2014 and 2016 (104). A cross-sectional study on factors related to frailty, such as the rise in frailty prevalence with age 60(105). As a result, this study shows that old age was linked with frailty, which may relate to hormonal changes with an increment leading lead to a decline in muscle mass and a low quality of life.

According to this study, patients with normal blood pressure who were not diagnosed with hypertension were 99.5% times less likely to become frail than patients with hypertension [AOR=0.005, 95% CI: (0.001–0.024)], P<0.001. This result is similar to studies conducted in Brazil by Abrahamian et al. (106), and in Korea, by Kang et al,2017) (107). Hypertension is more prevalent and significantly associated with frailty in the elderly. This may be due to the adverse impact of hypertension and drugs on the cardiovascular system.

They found that association of preoperative frailty among older women in comparison to those who had male patients, those women had a 2.480-fold higher chance of having preoperative frailty than males [AOR= 95% CI: (1.004–6.450)], p=0.035. This is in line with the study done in Australia by Gordon EH et al, 2020 (108), in Canada by Hubbard RE et al, 2011 (109). This may be due to problems during pregnancy, childbirth, and adverse life events like divorce, this thing may affect the health of the female and make her more prone to frailty.

This study shows a significant association between patients with anemia and preoperative frailty, according to this patients with anemia are 2.386 times more likely to have frailty compared to those with not anemic[AOR=95% CI:(1.015–5.611)], p=0.046. Our result is similar to studies done in Brazil by Corona L Corona LP et al, 2015 (110), and in Spain by Esquinas Requena J et al, 2021 (111). This may be related systemic effect of anemia causing low physical activity; weakness and slowness in daily life make anemic patients more fragile.

In this study, we looked at additional BMI that was associated with preoperative frailty. Patients with a BMI of < 18.5 kg/m2 (underweight) are 4.748 times more likely to become fragile than those with a normal body mass index [AOR=95%Cl: (2.010–11.216)], p = 0.000. This is consistent with study Liang H et al (76), Yuan L et al (112), Reitman M et al (113) and Xu L et al (114). This may be due to lowered immunity, causing anemia secondary to malnutrition and decreased muscle strength making underweight patients more fragile.

Strength of the study

The first strength is our study takes place in six different teaching hospitals in southern Ethiopia, which increases its generalizability. Second, we used a systematic sampling method, which helps to minimize bias. Third, since no study has been done in Ethiopia before, it is a base for future researchers.

Limitations of the study

The first potential drawback of our study is the nature of our study being cross-sectional, which limited us from following the intraoperative and post-operative factors which might have given us follow-up time to assess further outcomes. Second, there are confounders like other medical problems and biological factors.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1 Conclusion

The prevalence of preoperative frailty was high among elderly patients underwent elective surgery, which indicates assessing preoperative frailty and its risk factors was important among elderly surgical patients for better perioperative quality.

7.2 Recommendations

For Clinicians: Our findings indicate that preoperative frailty is prevalent in older patients undergoing elective surgery and is associated with underweight status, preoperative anemia, and preoperative hypertension. As a result, hypertension, anemia, and loss of weight should be controlled and managed before surgery. To enhance patient care and raise satisfaction among patients and attendants, healthcare providers should be knowledgeable of preoperative frailty evaluation and related issues. In older patients, frailty should be routinely evaluated as part of their preoperative patient risk assessment.

Therefore, assessing frailty in older surgical patients is crucial for preoperative risk stratification, identifying controlled factors, patient education, prehabilitation and comorbidity management, which may enhance therapy strategies and improve prognosis.

For Policymakers: The key factors increasing the prevalence of preoperative frailty, according to our study, were underweight, getting older, female gender, preoperative anemia, and preoperative hypertension. Consequently, policymakers need to enhance a multidimensional, multidisciplinary approach that identifies medical, social, and functional needs. When elderly patients come for elective surgery with increased preoperative frailty, it should be taken into consideration.

For Researchers: There is a need for further similar studies in other areas since there is not enough information about the prevalence of frailty in Ethiopia. Researchers are also encouraged to investigate other studies in the general population that help to identify the incidence of frailty in elderly surgical patients by identifying gaps and addressing the limitations of this study.

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ANNEX 1: Data Collection Tool

Informed consent form

Identification

Name of the Institute _____Address of the Institute _____

Hello greeting, I am _____.

I am working with the research team with the title of "PREVALENCE AND ASSOCIATED FACTORS OF PREOPERATIVE FRAILTY AMONG ELDERLY PATIENTS UNDERGOING ELECTIVE SURGERY IN TEACHING HOSPITALS OF SOUTHERN ETHIOPIA" for the fulfilment of Master of Science in Department of Anaesthesia, College of Health Science and Medicine, Hawassa University. So I would like to ask you some questions relevant to the study which may take about 15 minutes at different times

The purpose of this questionnaire is to gather information about the study aimed to assess the prevalence and associated factors of preoperative frailty among elderly patients undergoing elective surgery in teaching hospitals in southern Ethiopia. Your response to the study items will greatly contribute to the success of the study. Data collectors will ask you. Your name, your responses, or anything describing you will not be mentioned to anyone. Everything will be confidential in a secure way, and you will have the full right to refuse to participate in the research. You will not be given any incentives, nor will you benefit or be harmed in any way. The information will be used for the intended purpose only. If you have any questions, please call +1251942623661. E-mail:gemmeansa@gmial.com

Do we have your permission to continue?

If yes, enter the participant's signature ___ and proceed to the next page. If not, skip to the next participant.

Informed consent certified by an interviewer

Interview date: _____Card Number: _____

Interviewer's name: _____Signature_____

Supervisor _____Signature _____Date of check-in _____

Amharic version consent form

<u>በመረጃ የተደገፈ የስምምነት ቅጽ</u>

የኢንስቲትዩቱ ስም _____የተቋሙ አድራሻ _____

ጤና ይስጥልኝ ሰላም፣ እኔ _____ ነኝ።

በ ሀዋሳ ዩኒቨርሲቲ የጤና ሳይንስ እና ህክምና ኮሌጅ የአንስቴዢያ ትምህርት ክፍል ማስተር ኦፍ ሳይንስን(MSc) ለማሟላት በምርምር ውስጥ እየሰራሁ ነው። ስለዚህ ከጥናቱ ጋር የተያያዙ አንዳንድ ጥያቄዎችን ልጠይቅዎት እፈልጋለሁ ይህም 15 ደቂቃ ሊወስድ ይችላል። የዚህ መጠይቅ ዓላማ ስለ ጥናቱ " ቀዶ ጥገና በሚደረግላቸው አረጋውያን ታካሚዎች መካከል የቅድመ ቀዶ ጥገና የደካማነት ስርጭት እና ተያያዥ ምክንያቶችን ለመገምገም." እና መረጃ ለመሰብሰብ ነው። ለጥናት የሚሰጡት ምላሽ ለጥናቱ ስኬት ከፍተኛ አስተዋፅኦ ይኖረዋል። በመረጃ ሰብሳቢዎች ይጠየቃሉ። ስምዎ ፣ ምላሾችዎ ወይም እርስዎን የሚገልጽ ማንኛውም ነገር ለማንም አይጠቀስም። ሁሉም ነገር በአስተማማኝ መንገድ ሚስጥራዊ ይሆናል; በጥናቱ ውስጥ ላለመሳተፍ ሙሉ መብት ይኖርዎታል። በምርምሩ ዉስጥ ባልመሳተፍዎ የሚያጡት ወይም የተለየ የሚያገኙት ምንም ነገር የለም ወይም እንዲሳተፉ ምንም አይነት ማበረታቻ አይሰጥዎትም። መረጃው ለታለመለት ዓላማ ብቻ ጥቅም ላይ ይውላል።

ለመቀጠል ፈቃድዎ አለን?

አዎ ከሆነ፣ የተሳታፊው ፊርማ _____ እና ወደሚቀጥለው ገጽ ይቀጥሉ።

አይደለም ከሆነ ወደ ቀጣዩ ተሳታፊ ይዝለሉ።

በመረጃ የተደገፈ ስምምነት በቃለ መጠይቁ የተረጋገጠ

የቃለ መጠይቁ ቀን _____

የመረጃ ሰብሳቢ ስም_____ፊርማ_____

የተቆጣጣሪ ስም _____ ፊርማ _____

Questionnaire form

Socio-demographic characteristics of the study participants in selected teaching hospitals in southern Ethiopia in 2023

S. No	Questions	Possible responses	Code
101	Age (in years)	_____	
102	Weight (in Kg)	_____	
103	Height(in meters)		
104	BMI (kg/m2)	_____	
105	Gender	Male Female	
106	Education status	Illiteracy Primary school Middle school Diploma and above	
107	Residence status	Rural Urban	
108	Marital status	Single Married Divorced Widowed	
109	Living conditions	Building with elevators Building without elevators Bungalow	
201	Smoking status	1. Non-smoker 2. Current smoker 3. Former smoker	
202	Drinking History	1. Non-drinker 2. Current drinker 3. Former drinker	

203	Fall history in the last 12 months	1. Yes 2. No	
204	Vision	1. Normal 2. Dysfunction	
205	Sleeping	1. Normal 2. Dysfunction	
206	Department	1. General surgery 2. Gynecology 3. Orthopedics 4. Urology Thoracic surgery 6. Neurologic surgery 7. Ear, nose, and throat (ENT) 8. Plastics 9. Maxillofacial 10. Others_____	

Preoperative risk factors among the participants in selected teaching hospitals in southern Ethiopia in 2023.

S. No	Questions		Possible responses	Code
207	Preoperative diagnosis		_____	
208	ASA physical status		_____	
209	Preoperative CBC status obtained within 28 days before surgery	HGB (g/dl)	_____	
		HCT (%)	_____	
		RBC	_____	
		WBC	_____	
		PLT	_____	
301	Does a patient have a co-existing disease?		1. Yes 2. No	

302	If yes, what type of co-existing?	1. Hypertension (yes/no) 2. Diabetes mellitus (yes/no) 3. HIV /AIDS (yes/no) 4. Heart disease(yes/no) 5. Asthma /COPD(yes/no) 6. Metastatic cancer(yes/no)	
303	Medications	Yes No	
304	If yes, how many medications used?	1 2 3 Other_____	
Preoperative hemodynamic baseline status	BP PR SPO2	_____mmHg _____/min _____%	

The FRAIL scale is used to assess frailty in the elderly (≥50 years old).

S. No	Question	Response
305	How much of the time during the past 4 weeks did you feel tired?	1 All of the time 2 Most of the time 3 Some of the time 4 A little of the time 5 None of the time
306	By yourself and not using aids, do you have any difficulty walking up 10 steps without resting?	1. Yes 2. No
307	By yourself and not using aids, do you have any difficulty walking a couple of blocks (e.g. several hundred Meters)?	Yes No

407	Did a doctor ever tell you that you have the illness?	Yes No
408	If yes, How many illnesses do you have?	_____
409	How much do you weigh? [current weight]	1._____
501	One year ago, how much did you weigh? [weight 1 year ago]	2._____
502	Percent weight change	3._____

ANNEX 2: Supplemental Table

Table 6-Frailty Assessment Tool (115,116)

FRAIL Scale	Definition
Fatigue	**Fatigue**: how much of the time during the past 4weeks did you feel tired? 1. All of the time , 2. Most of the time, 3. Some of the time, 4. A little of the time, 5.none of the time Responses of 1or 2 are scored as 1 and all others as 0.
Resistance	Resistance: By yourself and not using aids, do you have any difficulty walking up steps without resting? 1=Yes, 0=No
Ambulation	Ambulation: By yourself and not using aids, do you have any difficult walking several meters (a couple of blocks)? 1=Yes, 0=No
Illnesses	For illnesses, participants are asked; Did a doctor ever tell you that you have illness? 1=Yes, 0=No
Loss of weight	How much do you weigh? [current weight] One year ago, how much did you weigh? [weight 1 year ago] Percent weight change: (weight 1 year ago – current weight)/weight 1 year ago x 100 5% loss of weight is scored=1, < 5% as 0
Total illnesses (0-11) are recorded as 0-4=0 and 5-11=1. The illnesses include hypertension, diabetes, cancer (other than minor skin cancer), chronic lung disease, heart attack, congestive heart failure, angina, asthma, arthritis, stroke, and kidney disease	
Scoring: between 0 and 5, were $\geq$3 criteria defined as frailty	

DECLARATION

I hereby declare that this MSc thesis is my original work and has not been presented for a degree in this or any other university, and that all sources of materials used for the thesis have been duly acknowledged. I have produced it independently except for the guidance and suggestion of the advisors

Declared by: Fraol Husen

Signature: _____

Date of submission: _____