

Incidence and Associated Factors of Postoperative Undesirable Anesthetic Outcomes Among Surgical Patients at Referral Hospitals in Amhara Region, Ethiopia: A Multi-Center Study

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Background: Patients undergoing surgery frequently experience unfavorable anesthetic outcomes. They may have an impact on body systems and result in more serious postoperative morbidities. This study was conducted to determine the incidence of postoperative undesirable anesthetic outcomes among surgical patients at referral hospitals in Amhara region, Ethiopia.

Methods: A total of 412 patients, who underwent surgical procedures between August 1 and October 30 of 2022, were included in this study. The Leiden Perioperative Care Patient Satisfaction Questionnaire's (LPPSq) dimension "discomfort and needs" was used to collect data on the first postoperative day. Data entry and analysis were performed using SPSS version 20. To assess how risk factors affected the outcome variable, logistic regression analysis was utilized. In multivariable logistic regression analysis, a variable with a P-value of less than 0.05 was statistically considered as significant.

Results: The proportion of those who had "at least a little bit" of unfavorable outcomes was calculated to estimate their overall prevalence, and the prevalence of those who had "more than moderate" levels of unfavorable outcomes was determined to appreciate how severe these outcomes were. The percentages of postoperative pain, the most common undesired result, for "at least a little bit" and "more than moderate" were 87.7% and 32.3%, respectively. In this study, postoperative cold was the least prevalent (51.4%) undesirable anesthetic outcome. The remaining undesirable postoperative outcomes were reported less frequently.

Conclusion and Recommendation: Undesirable postoperative anesthetic outcomes were still common. The most frequent unfavorable result was postoperative pain. Adequate postoperative patient follow-up and quality service are paramount.

Keywords: undesired anesthetic outcome, postoperative complication, postoperative outcome, surgery, anesthesia

Introduction

Undesirable postoperative anesthetic outcomes are common after surgery. Unfavorable anesthetic outcomes are adverse events that can affect all of the patient's body systems.^{1,2}

Most postoperative complications occur at a post anesthesia care unit (PACU). These may arise from the squeal of operations, anesthetic and analgesic agents, worsening co-morbidities.¹

Postoperative pain is a regular occurrence and is a major issue that anesthesia professionals face on a daily basis.^{3,4} One of the reasons for various medical difficulties is inadequate care of immediate postoperative pain. This results in longer hospital stays and slower recovery times, which raises the postoperative morbidity rate.^{5,6}

Postoperative nausea, vomiting, sore throat, thirst, hunger, and cold were frequently reported unwanted anesthetic outcomes.¹ In most cases, postoperative complications that are more severe and persistent are linked to failure to prevent these unwanted outcomes.⁷ These have also been delineated as avoidable causes of patient's dissatisfaction.⁸ Through accurate and prompt identification of the symptoms and use of the right medication, these unwanted events can be

managed as effectively as possible.⁹ The provision of high-quality care depends on the diagnosis and treatment of these unwanted post-anesthetic outcomes.^{7,9}

Patients in our facility have been seen to experience these issues during their recovery periods. Although most studies had reported a high prevalence of postoperatively undesirable anesthesia outcomes, no studies were conducted in Ethiopia. As a result, determining the magnitude of unfavorable postoperative anesthesia outcomes and the factors is critical for taking early and appropriate intervention.

Methods and Materials

Study Design and Period

A multicentre institution-based cross-sectional study was performed on 412 surgical patients at referral hospitals in Amhara regional state in Ethiopia from April 1, 2022, to October 30, 2022, to determine the magnitude and contributing factors of undesirable anesthetic outcomes after surgery. The study was conducted in University of Gondar comprehensive specialized referral hospital, Tibebe Gihon referral hospital, Debre Tabore referral hospital, and Debre Markos referral hospital. Following approval of the ethical concern, the ethical review committee of the college of medicine and health sciences provided ethical clearance. Letter of permission was obtained from each hospital's medical director.

All patients age 18 and older who were able to express their condition and operated under anesthesia were included. Patients who were uncooperative, had decreased cognitive function, were unconscious after surgery, were released before 24 hours of the postoperative period, and had upper respiratory tract infections prior to surgery were excluded from the study.

Sample Size Determination

Single population proportion formula was applied to estimate the sample size. The number of study participants was calculated with a 95% level of confidence and a 5% margin of error. In Ethiopia, no similar study was conducted to determine the magnitude of postoperatively undesirable outcomes. As a result, the 0.5 proportion assumption was applied. The ultimate sample size was 424, with a 10% non-response rate. Patients who met the inclusion criteria were consecutively selected in the study until the required sample is reached.

Data Collection Procedure

Prior to their operation, patients were recruited. Patients provided written consent after receiving a clear description of the study's objective and assurances of confidentiality and anonymity. After confirming them that they felt at ease to provide information, the study was conducted in their respective postoperative wards. A chart review and a structured questionnaire-based patient interview were used to collect data. The components of the patients' socio-demographic and medical characteristics were recorded in the data collecting form. From the chart, patient-related, surgical-related, and anesthesia-related factors were recorded.

Patients were interviewed 24 hours following the procedure to identify if they had any unfavorable anesthetic outcomes, using the dimension "discomfort and needs" of the Leiden Perioperative Care Patient Satisfaction Questionnaire (LPPSq). Translation of the dimension of Leiden perioperative care patient satisfaction questionnaire from English language to Amharic, the local spoken language, was performed. Questions in the dimension were standardized and measured using a five-point likert scale from "not at all" to "extremely". An expert opinion from the anesthesiology department was used to assess the content validity of the items in the dimension, as well as the internal consistency of the dimension (Cronbach = 0.66).¹

Data Quality Control

A pre-test was conducted on 10% of participants. The data have been checked for completeness, accuracy, and clarity by the lead investigator. Training was provided to data collectors on how to use the data collection tools and how to collect data. Finally, data had been cleaned up and cross-checked prior to analysis.

Data Analysis

Data were coded, entered, and checked for errors using SPSS software (version 20). SPSS version 20 was used to analyze data. The Shapiro–Wilk normality test was applied to check the data distribution. Bivariate logistic regression was used to assess predictor factors that influence the result, and variables with a p-value less than 0.2 in bivariate logistic regression were fitted for multivariate logistic regression. Normally distributed data were displayed as mean and standard deviation, whereas categorical data were presented as frequency and percentage. In multivariable logistic regression, p-values less than 0.05 are considered statistically significant.

Operational Definition

Undesired anesthesia outcomes are complications that commonly affect all body systems and occur after surgery.¹

Ethical Consideration

The ethical consideration was approved by the ethical committee of college of medicine and health sciences at University of Gondar. Referral hospitals, where the study was conducted, in the Amhara region provided a letter of permission. The study's objectives and significance were described, and each participant provided written consent. During all stages of the investigation, confidentiality was maintained. The study was conducted in compliance with the declaration of Helsinki.

Results

Socio-Demographic and Clinical Characteristics

Four hundred and twenty-four patients with a 97.2% response rate participated. Four hundred and twelve patients were included in the data analysis. Age of the patients was in between 18 and 70 years with mean and standard deviation of (Mean±SD) 33.8±11.8. The majority of the participants, 238 (57.8%), were men, with 256 (62.1%) having a normal BMI. About 211 (51.2%) were ASA I physical status, 187 (45.4%) underwent general surgery, and most of the remaining 240 (58.3%) received general anesthesia (Table 1 and Table 2).

Prevalence of Undesirable Postoperative Anesthetic Outcomes

The frequency distribution of undesirable anesthetic outcomes and the prevalence with “at least a little bit” and “more than moderate” were reported (Table 3 and Table 4). The most prevalent undesirable postoperative anesthetic outcome was pain, followed by nausea, thirst, headache, back pain, sore throat, vomiting, hunger, and a cold. The proportion of “at least a little bit” and “more than moderate” for the most observed undesirable anesthetic outcome, pain, was 362 (87.7%) and 133 (32.35%), respectively. The percentage of “at least a little bit” and “more than moderate” for the least prevalent variable, cold, was 212 (51.4%) and 138 (34.4%), respectively (Table 4).

Undesirable Postoperative Anesthetic Outcomes Among Surgical Patients and Associated Factors

The associations of undesirable postoperative anesthesia outcomes with the independent variables were computed. Postoperative pain was three times [AOR: 2.96, 95% CI: 0.01, 3] higher in patients who underwent orthopedic surgery compared to other types of surgery. When compared to patients who received general anesthesia, patients who underwent

Table 1 Demographic and Medical Characteristics of the Patients with Continuous Variables (N = 412)

Variables	Minimum	Maximum	Mean ±SD
Age	18	70	33.8±11.8
Duration of surgery	30min	240min	97.9±51.7
Duration of anesthesia	35min	280min	114.5±56.3
Intraoperative blood loss	50mL	1500mL	365.5±234.2

Table 2 Frequency Distribution of Socio-Demographic and Medical Characteristics of the Patients (N = 412)

Variable	Frequency (%)
Gender:	
Male	238 (57.8%)
Female	174 (42.2%)
BMI	
18.5–24.5	256 (62.1%)
24.6–29.5	156 (37.9%)
Religion	
Orthodox	267 (64.8%)
Muslim	104 (25.2%)
Catholic	6 (1.5%)
Protestant	35 (8.5%)
Residency	
Urban	230 (55.8%)
Rural	182 (44.2%)
Occupation	
Unemployed	228 (55.3%)
Employed	184 (44.7%)
Health coverage	
Paying	290 (70.4%)
Free	122 (29.6%)
Co-existing disease	
Yes	49 (11.9%)
No	363 (88.1%)
Type of Airway	
ETT	206 (50%)
LMA	26 (5.3%)
FM	8 (1.9%)
Maintenance	
IVAA	68 (16.5%)
IAA	164 (39.8%)
Smoking history	
Yes	62 (15%)
No	250 (85%)
Alcohol drinking	
Yes	85 (20.6%)
No	327 (79.4%)
ASA physical status:	
I	211 (51.2%)
II	199 (48.3%)
III	2 (0.5%)

(Continued)

Table 2 (Continued).

Variable	Frequency (%)
Type of surgery:	
General	187 (45.4%)
Orthopedics	102 (24.8%)
Gynecology	95 (23.1%)
ENT	28 (6.8%)
Type of anesthesia	
GA	240 (58.3%)
RA	172 (41.7%)
Induction agent (N=240):	
Ketofol	142 (34.5%)
Ketamine	98 (23.8%)
Type of muscle relaxant (N=219):	
Depolarizing	58 (14.1%)
Non-depolarizing	161 (39.1%)
Admission type	
Elective	114 (27.7%)
Emergency	298 (72.3%)

Abbreviations: ETT, Endotracheal tube; FM, Face mask; IAA, Inhalational anesthetic agent; IVAA, Intravenous anesthetic agent; LMA, laryngeal mask airway.

Table 3 Frequency Distribution of Undesirable Postoperative Anesthetic Outcomes (N = 412)

Variable	Frequency (%)				
	Not at All	A little Bit	Moderately	Quite a Bit	Extremely
Degree of postoperative pain	50 (12.14%)	229 (55.6%)	90 (21.84%)	33 (8%)	10 (2.42%)
Degree of sore throat	177 (43%)	93 (22.6%)	94 (22.8%)	22 (5.3%)	26 (6.3%)
Degree of back pain	128 (31.1%)	99 (24%)	35 (8.5%)	127 (30.8%)	23 (5.6%)
Degree of Nausea	83 (20.1%)	142 (34.5%)	137 (33.3%)	47 (11.4%)	3 (0.7%)
Degree of Vomiting	200 (48.5%)	72 (17.5%)	99 (24%)	36 (8.7%)	5 (1.2%)
Degree of cold	202 (49.0%)	74 (17.9%)	95 (23.1%)	34 (8.2%)	7 (1.7%)
Degree of hunger	191 (46.4%)	87 (21.1%)	106 (25.7%)	19 (4.6%)	9 (2.2%)
Degree of thirsty	109 (26.5%)	154 (37.4)	74 (18%)	71 (17.2%)	4 (1%)
Degree of headache	120 (29.1%)	120 (29.1%)	111 (26.9%)	31 (7.5%)	30 (7.3%)

Table 4 Prevalence of Undesirable Postoperative Anesthetic Outcomes (N = 412)

Variables	At Least a Little Bit	Moderately, Quite a Bit and Extremely
Degree of postoperative pain	362 (87.7%)	133 (32.3%)
Degree of sore throat	235 (57.0%)	142 (34.5%)
Degree of back pain	284 (68.9%)	185 (44.9%)
Degree of Nausea	329 (79.8%)	187 (45.4%)
Degree of Vomiting	212 (51.4%)	140 (33.9%)
Degree of cold	210 (50.9%)	136 (33.0%)
Degree of hunger	221 (53.6%)	134 (32.5%)
Degree of thirsty	303 (73.5%)	149 (36.2%)
Degree of headache	292 (70.8%)	172 (41.7%)

surgery under regional anesthesia were less likely [AOR: 0.26, 95% CI: 0.008, 0.8] to develop postoperative pain. Patients induced with ketofol were thirteen times [AOR: 13, 95% CI: 2.95, 60] high likely to develop postoperative pain compared to those induced with ketamine. Patients who received a depolarizing muscle relaxant were greater than four times [AOR: 4.4, 95% CI: 1.1, 18] more likely to develop postoperative pain (Table 5).

Table 5 Multivariate Logistic Regression Analysis of Undesirable Postoperative Anesthesia Outcomes with Independent Variables

Variables	Undesirable Postoperative Pain			
	Not at All and a Little Bit	More than Moderate	AOR[95% CI]	P-value
Gender				
Male	74	163	3.3[0.523, 21.37]	0.2*
Female	26	148		
Co-existing				
Yes	4	45	0.8[0.2, 3.83]	0.8*
No	96	267		
Type of surgery				
General	53	134	2.96[0.01, 3]	0.001**
Orthopedics	27	75		
Gynecology	12	83		
ENT	8	20		
Type of anesthesia				
GA	61	179	0.26[0.08, 0.8]	0.02**
RA	39	133		
Induction agent				
Ketofol	22	120	13[2.95, 60]	0.001**
Ketamine	39	59		
Relaxant				
Depolarizing	15	43	4.4[1.1, 18]	0.06**
Non-depolarizing	44	177		
Maintenance				
IVAA	23	45	1.3[0.06, 1.1]	0.62*
IAA	36	128		
Variable	Undesirable postoperative sore throat			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
BMI:				
18.5–24.5	165	91	1.5[0.67, 3.44]	0.31*
24.6–29.5	113	43		
Co-existing				
Yes	38	11	0.34[0.05, 2.1]	0.12*
No	240	123		
Smoking				
Yes	31	31	11.4[2.2, 58.9]	0.004**
No	247	123		

(Continued)

Table 5 (Continued).

Variables	Undesirable Postoperative Pain			
	Not at All and a Little Bit	More than Moderate	AOR[95% CI]	P-value
Type of surgery				
General	104	83	2[0.2, 19.2]	0.04**
Orthopedics	83	19		
Gynecology	85	10		
ENT	6	22		
Type of anesthesia				
GA	113	127	1.5[0.67, 3.44]	0.02**
RA	165	7		
Induction agent				
Ketofol	70	72	0.5[0.26, 1.2]	0.14*
Ketamine	43	55		
Relaxant				
Depolarizing	35	23	0.8[0.4, 1.7]	0.58*
Non-depolarizing	70	91		
Airway type				
ETT	102	104	0.4[0.77, 1.7]	0.003**
LMA	3	23		
FM	8	0		
Variable	Undesirable postoperative back pain			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Age				
Below mean	189	43	0.4[0.23, 0.76]	0.004**
Above mean	238	42		
BMI				
18.5–24.5	202	125	0.3[0.8, 1.8]	0.125*
24.6–29.5	54	23		
Co-existing				
Yes	44	5	0.1[0.29, 0.44]	0.12*
No	283	80		
Type of surgery				
General	155	32	0.2[0.03, 0.7]	0.08*
Orthopedics	85	17		
Gynecology	67	28		
ENT	20	8		
Type of anesthesia				
GA	201	39	1.5[0.88, 2.8]	0.019*
RA	126	46		
Occupation				
Farmer	213	52	2.3[1.2, 4.5]	0.013**
Employed	114	33		

(Continued)

Table 5 (Continued).

Variables	Undesirable Postoperative Pain			
	Not at All and a Little Bit	More than Moderate	AOR[95% CI]	P-value
Variable	Undesirable postoperative Nausea			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Gender				
Male	96	141	0.2[0.09, 0.3]	0.001**
Female	129	45		
Smoking				
Yes	15	47	1.3[0.2, 8.13]	0.001**
No	210	140		
Type of surgery				
General	103	84	2.8[0.74, 10.7]	0.12*
Orthopedics	39	63		
Gynecology	69	26		
ENT	14	14		
Type of anesthesia				
GA	114	126	0.2[0.07, 0.64]	0.006**
RA	111	61		
Induction agent				
Ketofof	61	81	17[1.89, 59.8]	0.000**
Ketamine	53	45		
Maintenance				
IVAA	27	41	1.83[0.65, 5]	0.024*
IAA	81	83		
Variable	Undesirable postoperative vomiting			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Gender				
Male	143	94	2.8[1.12, 7.33]	0.027**
Female	129	45		
Smoking				
Yes	25	37	0.14[0.037, 0.55]	0.014*
No	247	103		
Type of surgery				
General	126	61	1.6[0.47, 5.9]	0.42*
Orthopedics	53	49		
Gynecology	79	16		
ENT	14	14		
Type of anesthesia				
GA	138	102	10[3.1, 35]	0.000**
RA	134	38		

(Continued)

Table 5 (Continued).

Variables	Undesirable Postoperative Pain			
	Not at All and a Little Bit	More than Moderate	AOR[95% CI]	P-value
Induction agent				
Ketamine	77	65	11.9[3.9, 36.3]	0.000**
Ketofol	61	37		
Relaxant:				
Depolarizing	41	17	0.69[0.37, 3.5]	0.66*
Non-depolarizing	86	75		
Variable	Undesirable postoperative cold			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Age				
Below mean	61	171	0.8[0.43, 1.8]	0.76*
Above mean	73	107		
Gender				
Male	87	150	2.8[1.12, 7.33]	0.027**
Female	47	127		
Type of surgery				
General	75	112	0.7[0.18, 3]	0.7*
Orthopedics	31	71		
Gynecology	28	67		
ENT	0	28		
Type of anesthesia				
GA	95	145	1.5[0.88, 2.8]	0.019*
RA	39	133		
Maintenance				
IVAA	34	34	0.6[0.28, 1.3]	0.6*
IAA	39	105		
Induction				
Ketofol	52	90	1.5[0.6, 3.7]	0.2*
Ketamine	43	55		
IAA	94	70		
Variable	Undesirable postoperative hunger			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Age				
Below mean	145	87	0.2[0.05, 0.45]	0.2*
Above mean	83	97		
Gender				
Male	143	94	0.6[0.28, 1.3]	0.6*
Female	84	90		

(Continued)

Table 5 (Continued).

Variables	Undesirable Postoperative Pain			
	Not at All and a Little Bit	More than Moderate	AOR[95% CI]	P-value
Co-existing				
Yes	41	8	0.9[0.34, 2.4]	0.84*
No	187	176		
Type of surgery				
General	107	80	0.2[0.04, 1.1]	0.06*
Orthopedics	44	58		
Gynecology	55	40		
ENT	22	6		
Alcohol drinking				
Yes	45	40	0.6[0.49, 3]	0.34*
No	183	144		
Maintenance:				
IVAA	34	34	2.8[1.12, 7.33]	0.02**
IAA	39	105		
Variable	Undesirable postoperative thirst			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Age				
Below mean	87	28	0.2[0.05, 0.45]	0.001**
Above mean	145	152		
Gender				
Male	55	182	0.16[0.04, 0.6]	0.0007**
Female	60	144		
Co-existing				
Yes	12	37	0.1[0.009, 0.36]	0.003**
No	103	260		
Type of surgery				
General	40	147	25[5.92, 108]	
Orthopedics	39	63		
Gynecology	22	73		
ENT	14	14		
Type of anesthesia				
GA	46	199	3[1.17, 12.7]	0.02**
RA	69	103		
Induction agent				
Ketofol	82	80	0.6[0.19, 2.3]	0.54*
Ketamine	47	51		
Alcohol drinking				
Yes	25	60	0.3[0.76, 1]	0.04**
No	90	237		

(Continued)

Table 5 (Continued).

Variables	Undesirable Postoperative Pain			
	Not at All and a Little Bit	More than Moderate	AOR[95% CI]	P-value
Variable	Undesirable postoperative headache			
	Not at all and a little bit	More than Moderate	AOR[95% CI]	P-value
Gender				
Male	79	159	2.8[6.4, 92.8]	0.003**
Female	72	102		
Type of surgery				
General	78	109	8.3[2.2, 31.5]	0.002**
Orthopedics	31	71		
Gynecology	36	59		
ENT	6	22		
Type of anesthesia				
GA	85	155	3[1.17, 12.7]	0.02**
RA	66	106		
Maintenance				
IVAA	15	53	2[0.99, 8.4]	0.05**
IAA	70	94		
Smoking				
Yes	34	108	3.9[0.8, 17.8]	0.0001**
No	57	47		
Co-existing				
Yes	21	28	0.2[0.06, 0.55]	0.07*
No	130	233		
Alcohol drinking				
Yes	13	72	0.7[0.2, 2.5]	0.69*
No	138	189		

Notes: *Significant in bivariable analysis, **Significant in multivariable analysis.

Abbreviations: ETT, endotracheal tube; LMA, laryngeal mask airway; FM, Facemask; GA, general anesthesia; RA, regional anesthesia; IVAA, intravenous anesthetic agent; IAA, Inhalational anesthetic agent.

The odds of having post operative sore throat were more than eleven folds [AOR: 11.4, 95% CI: 2.2, 58.9] higher among smoker patients compared to non smoker. Patients who underwent general surgery were two times [AOR: 2, 95% CI: 0.2, 19.9] more likely to develop a postoperative sore throat. Patients who underwent surgery under general anesthesia were more likely [AOR: 1.5, 95% CI: 0.67, 3.44] to develop a postoperative sore throat compared to those who underwent RA. Compared to other types of airway maintenance, using a face mask decreased the risk of post-operative sore throat by 0.4 times [AOR: 0.4, 95% CI: 0.3, 1.7] (Table 5).

The odds of having postoperative back pain were more than twice [AOR: 2.3, 95% CI: 1.2, 4.5] higher among farmers compared to non-farmers. Those patients who had an age below the mean were 0.4 times [AOR: 0.4, 95% CI: 0.23, 0.76] less likely to develop postoperative back pain, and patients who received regional anesthesia were 1.5 times [AOR: 1.5, 95% CI: 0.88, 2.8] more likely to develop postoperative back pain compared to those who received GA (Table 5).

Males were 0.2 times [AOR: 0.2, 95% CI: 0.09, 0.3] less likely than females to develop postoperative nausea. Non-smokers have 1.3 times [AOR: 1.3, 95% CI: 0.2, 8.13] higher odds of postoperative nausea than smokers. Patients who received RA 0.2 times [AOR: 0.2, 95% CI: 0.07, 0.64] had a lower risk of developing postoperative nausea than those who received GA. Postoperative nausea occurs 17 times [AOR: 17, 95% CI: 1.89, 59.8] and 1.83 times [AOR: 1.83, 95% CI: 0.65, 5] when ketamine is used as an induction agent and IAA is used as a maintenance agent (Table 5).

The odds of having postoperative vomiting 0.14 times [AOR: 0.14, 95% CI: 0.03, 0.55] were less likely to occur in non-smokers compared to smokers. Patients who received GA had a 10-fold [AOR: 10, 95% CI: 3.1, 35] higher risk of postoperative vomiting than those who received RA. Using ketamine as an induction agent 1.9 times [AOR: 1.9, 95% CI: 3.9, 6.3] more likely develops postoperative vomiting, and being female 2.8 times [AOR: 2.8, 95% CI: 1.12, 7.33] more likely develops postoperative vomiting (Table 5).

The risk of developing a postoperative cold was about three times [AOR: 2.8, 95% CI: 1.12, 7.33] higher in females compared to males. When IAA was used as anesthesia maintenance, the odds of having postoperative hunger were about three times [AOR: 2.8, 95% CI: 1.12, 7.33] higher than when IVAA was used as maintenance (Table 5).

Postoperative thirst was 0.2 times [AOR: 0.2, 95% CI: 0.05, 0.45], 0.16 times [AOR: 0.16, 95% CI: 0.04, 0.6], 0.1 times [AOR: 0.1, 95% CI: 0.009, 0.36], and 0.3 times [AOR: 0.3, 95% CI: 0.7, 1] less likely in patients who were younger, male, and had no coexisting conditions. Having general anesthesia increased the risk of postoperative thirst by three times [AOR: 3, 95% CI: 1.17, 12.7] (Table 5).

Postoperative headache among females was 2.8 times [AOR: 2.8, 95% CI: 6.4, 92.8] more likely to develop compared to males. Postoperative headache occurred more than eight times [AOR: 8.3, 95% CI: 2.2, 31.5], 3 times [AOR: 3, 95% CI: 1.17, 12.7], and two times [AOR: 2, 95% CI: 0.99, 8.4] more likely in ENT surgery; the patient received GA and IAA as maintenance anesthesia, respectively (Table 5).

Discussion

This study focuses on common undesirable postoperative anesthetic outcomes reported by patients. Similar to previous studies done in Eritrea,¹ and Singapore⁴ the most frequent unwanted postoperative anesthetic outcome was pain (87.7%). Despite the fact that postoperative optimal pain control is a crucial part of providing high-quality postoperative patient care,¹⁰ our findings indicate that postoperative pain prevalence was still high. This is supported by a study conducted in Kilimanjaro, Africa, which reported that a high prevalence of postoperative pain (73%).¹¹ This could be because the anesthetist's work does not extend beyond the operating room, and the management of these events is left to either the surgeon or the ward nurses. It has been suggested that nurses' lack of knowledge and attitude toward pain management were variables influencing effective pain management.¹²

Similar to a study done in Tanzania¹⁰ patients underwent orthopedics surgery had significant association with postoperative pain. This might be due to the generally known fact that bone surgeries are associated with more severe pain and poor postoperative pain control.^{13,14}

In this study, using ketamine significantly decreased the occurrence of postoperative pain. This might be explained by the use of N-methyl-D-aspartate (NMDA) receptor antagonists effective for the control of postoperative pain and, therefore, ketamine exerts its main analgesic effect by antagonizing NMDA receptors.¹⁵ In addition, depolarizing muscle relaxants have a high likelihood of postoperative pain that might be related to suxamethonium-induced myalgia.

In this study, the proportion of undesirable postoperative thirst was 73.5%. It is higher compared to previous study done in University of Gondar comprehensive and specialized hospital (59.4%),¹⁶ Eritrea (27.7%),¹ China (58.7%)¹⁷ and Taiwan University Hospital (55.8%).¹⁸ This disparity could be attributable to an underestimation of the condition, since the quality of postoperative care varies by nation. Also, most professionals do not want to examine their patients' thirst. Patients in the postoperative period face the most merciless part of their thirst after fasting for overly long durations, sometimes due to the surgical staff's lack of expertise about managing thirst safely in the perioperative phase.¹⁹

This study revealed that the type of anesthesia used was significantly related to the proportion of thirst after surgery. Patients who received general anesthesia have a higher probability of developing postoperative thirst than those who had regional anesthesia. This result is in line with studies conducted in Ethiopia, Taiwan, and Brazil.^{16,19,20} This association

could be due to the fact that we used different drugs and airway equipment during general anesthesia. The effects of the different anesthetic agents, endotracheal intubation, and a prolonged NPO time may increase the risk of postoperative thirst.

Postoperative nausea and vomiting are unpleasant and commonly occurring phenomena after surgical procedures. The magnitude of nausea and vomiting in this study was 79.8% and 51.4%, respectively. It was higher compared to previous studies in Ethiopia (35.2% and 20%),²¹ Eritrea (40.6% and 37.7%)¹ and Iran (31.4% and 16.8%).²² This could be explained by the current practice of nausea and vomiting prophylaxis in this clinical setting was suboptimal.²³ This large disparity in prevalence may be related to changes in surgery and anesthetic practices, study designs, and tools used to assess nausea.

The finding of this study revealed that being female and a nonsmoker increased the likelihood of postoperative nausea and vomiting. Even though the risk of postoperative nausea and vomiting is a multidimensional phenomenon, female gender, nonsmoker, and increased age were the main predictors of postoperative nausea and vomiting (PONV).²⁴⁻²⁶

In our study, patients receiving general anesthesia with ketofol as an induction agent and IAA for maintenance anesthesia had a higher likelihood of postoperative nausea and vomiting. This is supported by a study conducted in Uganda, in which the incidence of PONV was low due to propofol's antiemetic effect.²⁷ Another possibility is that because most inhalation anesthetics are circulatory depressants and vasodilators, they create hypotension, which leads to intestinal hypoperfusion. Intestinal hypoperfusion can produce serotonin release, which can lead to PONV via vagal afferent activation in the GI tract.

Postoperative sore throat was the most reported patients' most undesirable outcome.²⁸ The percentage of postoperative sore throat was 57.0%. This was higher than previous studies in China (16%)²⁹ and Eritrea (18.5%).¹ This discrepancy might be due to differences in airway equipment and assessment tools, and there may also be clinical setting differences. On the contrary, the proportion of postoperative sore throat was lower than a study in Gondar (80%).²⁸ This difference could be attributed to a variation in the description of the problem and the techniques utilized to assess the prevalence of sore throats.

One of the most common negative postoperative anesthesia outcomes in patients who had surgery under general anesthesia versus regional anesthesia was a postoperative sore throat. This might be explained by the fact that during general anesthesia technique, the insertion of airway equipment is an inherent risk factor of a postoperative sore throat.³⁰

The occurrence of sore throat was higher in patients who underwent surgery under ETT anesthesia versus LMA and FM anesthesia, according to our findings. This report was in agreement with a previous study showing that the incidence of postoperative sore throat during LMA anesthesia is lower compared with tracheal tube insertion.³¹ When inserting a tracheal tube, postoperative throat complications are, intuitively, more likely.³² This may be due to coughing or movement due to inadequate anesthesia or neuromuscular blockade; glottis exposure may be difficult; and airway trauma during insertion, tracheal lumen irritation, and ischemia due to cuff pressure are more common during ETT anesthesia. Furthermore, similar to previous study in Ethiopia,²⁸ patients underwent general surgery had high risk compared to other type of surgery. This could be because most general surgery performed under general anesthesia in our setting necessitates the insertion of airway equipment.

In this study, the prevalence of postoperative back pain was 68.9%. It was higher than studies done in Eritrea (26.6%)¹ and Gondar, Ethiopia.³³ This disparity may be due to differences in sample size, anesthesia type, and clinical setting. In adults, the incidence of back discomfort following neuraxial anesthesia is comparable to that following general anesthesia.³⁴ However, patients who got regional anaesthetic had a higher incidence of postoperative back pain than those who received general anesthesia, according to this study. Postoperative back pain is frequently reported after RA.³⁵ It could be related to soft tissue damage during lumbar puncture.³⁶

Hunger is a complex process involving neuronal and systemic components.¹⁷ Early initiation of postoperative feeding accelerates bowel function recovery and decreases paralytic illness.^{37,38} The prevalence of postoperative hunger was 50.9%. This result was higher than an Eritrean (18.3%)¹ and Chinese studies (47.47%).¹⁷ This disparity could be attributed to the technique used to assess postoperative hunger and the quality of postoperative patient care, which varies by setting. Another possible explanation may be a difference between clinical practice and feeding protocols.^{39,40}

In this study, using an inhalational anesthetic agent (IAA) as anesthesia maintenance had a significant relation with the occurrence of postoperative hunger compared to using an IVAA. This might be due to the fact that anesthetic drugs

alter feeding behavior. Unlike isoflurane, propofol induces feeding behavior in mice for at least six hours.^{37,41} Previous study done in France has shown that, compared with sevoflurane, propofol did not accelerate the recovery of appetite after outpatient minor surgery.⁴² Furthermore, propofol had no influence on other clinical or biological markers connected with food intake.

Postoperative headache is a minor postoperative morbidity. It significantly increases postoperative morbidity by necessitating higher pain medication doses, lowering overall patient satisfaction, and even delaying patients' discharge.⁴³ In this study, the prevalence of postoperative headache was 70.8%. This finding was higher compared to studies done in University of Athens, Greece (28.3%)⁴⁴ and Eritrea (25.1%).¹ This might be due to differences in the assessment tool and clinical setting.

Similar to a previous study done in Greece,⁴⁴ female gender, nonsmoker status, and patients who underwent ENT surgery, received GA, and used IAA as maintenance of anesthesia were found to be strongly linked with the occurrence of postoperative headache, whereas alcohol consumption and ketamine use were found to be unrelated. In contrast to our finding, patients have co-existing diseases, and the anesthetic and adjuvant drugs administered [*N*-methyl-d-aspartate (NMDA) receptors] contribute to the occurrence of postoperative headache.^{45,46}

Being female increases the risk of postoperative headache⁴³ and this could be hormonal or psychological differences in females. Smokers have a higher likelihood of experiencing postoperative headaches. The possible explanation might be that smoking is strongly related with vascular disease or withdrawal from tobacco. In our findings, alcohol consumption did not have any effect on the incidence of postoperative headache. In contrast to our finding in a previous study, which stated that alcohol consumption is an independent factor for perioperative headache occurrence.⁴⁷

Limitation of the Study

This study was conducted after 24 hr of completion of surgery. Patients may experience undesirable anesthetic outcomes immediately within 24 hours of end of surgical procedures. As a result, patients may be missed and not included in the study.

Conclusion and Recommendation

Undesirable postoperative anesthetic outcomes were still common. The most frequent unfavorable result was postoperative pain, whereas postoperative cold was the least frequent postoperative anesthetic outcome. Appropriate postoperative patient follow-up and quality service are paramount. Furthermore, reliable and valid monitoring of anesthetic outcomes is crucial for improving postoperative anesthetic care.

Data Sharing Statement

At reasonable request, the corresponding author will release the data sets used and analyzed during the study.

Ethical Approval

The study gained ethical clearance and approval from the College of Medicine and Health Sciences' ethical review committee at the University of Gondar. Letter of permission was obtained from each referral hospitals in Amhara region. Each study participant completed a written informed consent form after receiving a full explanation. Confidentiality was protected by preventing personal identification and locking the completed questionnaires.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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