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Assessment of intermediate phase post anesthesia quality of recovery and its affecting factors

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Abstract

Background Recovery after surgery and anesthesia is dependent on patient, surgical, and anesthetic characteristics, as well as the presence of any of numerous adverse sequelae. Postoperative recovery is a complex and multidimensional process that requires a holistic view of the recovery of capacities and homeostasis after anesthesia and surgery.

Objective To assess the quality of recovery after anesthesia and its affecting factors at Wachamo University Nigist Eleni Mohamed Memorial Comprehensive Hospital.

Method a prospective observational study was conducted at Wachamo University Nigist Eleni Mohamed Memorial Comprehensive Hospital among 384 surgical patients who undergone under anesthesia. Quality of recovery was assessed by using Quality of Recovery 40. Student t-test and one-way ANOVA were utilized to compare the mean of Quality of recovery in different groups. Binary regression was used to find out the factors affecting Quality of recovery quality of recovery. SPSS 27 was used for analysis. A *p*-value of < 0.05 was considered statistically significant.

Result Sex and smoking history were the factors that we failed to find an association with poor quality of recovery. Preoperative antiemetic administration; premedication with benzodiazepines and emergency procedures were the factors that show potential relation with poor quality of recovery after anesthesia and surgery. Procedures performed under general anesthesia; Patients who had coexisting diseases; post-anesthesia incidence of nausea and vomiting; Visual Analog Scale score >/= 7 during discharge and prolonged duration of surgery were the factors that had a significant association with poor quality of recovery.

Conclusion The magnitude of good quality of recovery was 65.6% whereas 34.4% scored poor quality of recovery. The predictors for the prevalence of poor quality of recovery were found to be orthopedic procedures; procedures undergone under general anesthesia; incidence of post-anesthesia nausea and vomiting; prolonged length of the procedure and severity of pain.

Keywords Post Anesthesia, Quality of recovery, Patient satisfaction

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Introduction

Quality of recovery (QoR) is a patient-reported measurement that is a broad concept that aims to evaluate recovery from the patient's perspective [1]. The restoration of the patient's preoperative functional abilities combined with the cessation of debilitating symptoms is known as recovery [2]. For various stakeholders at various times, recovery can mean different things [3]. As a result, recovery can be assessed continuously to monitor a patient's recovery trajectory or at a single point in time that the patient, the clinician, or the institution deems significant [4]. It is anticipated that the patient's recovery trajectory will undergo an abrupt decrease from baseline after surgery, followed by a gradual return to preoperative function [3].

Assessing a patient's quality of recovery following anesthesia is a crucial step in determining their postoperative health status [5]. Postoperative recovery is a multidimensional and intricate process that requires a detailed understanding of the restoration of abilities and homeostasis after anesthesia and surgery [6].

The primary focus of postoperative patient recovery assessments has historically been on morbidity, mortality, physiological changes, and re-hospitalization rates [7]. Most studies evaluating recovery after anesthesia and surgery have primarily focused on physiological endpoints, recovery times, and the frequency of adverse events [8].

The patient, surgical, and anesthetic characteristics, along with the existence of any of the many unfavorable sequelae, all influence recovery following surgery and anesthesia. The main markers of poor recovery are pain, nausea, emotional and psychological distress, and surgical complications [9]. While these metrics are highly valuable to physicians, they fail to take into account the patients' sense of recovery, which encompasses not just the elimination of symptoms but also the restoration of their pre-surgery performance level in activities. In recent times, there has been a change in focus towards defining recovery from the perspective of the patient, as self-reported recovery measures encompass various postoperative domains [9, 10].

The quality of recovery can be defined as a multifaceted process of returning to normal in comparison with pre-surgery standards across a variety of domains, such as physical, physiological, psychological, social, and economic aspects [1, 10, 11],

There are three phases of recovery. Phase 1 refers to the time before a patient is released to the ward from the post-anesthesia care unit (PACU), and phase 2 refers to the time before a patient is discharged to their home from the surgical ward. The final stage consists of the patient's discharge from the hospital and their ability to resume their regular activities [6, 9, 12, 13].

different rating scales have been developed to assess the quality of recovery after surgery and anesthesia; however, the most widely used is the QoR-40, a 40-item survey that offers a total score as well as subscores in the following five areas: pain, physical independence, patient support, comfort, and emotions [3].

The objective of this study was to assess the quality of recovery after surgery and anesthesia in the intermediate phase of recovery among patients who underwent surgery under anesthesia. We also assessed the preoperative, intraoperative, and postoperative factors that had affected the quality of recovery. Finally, we try to investigate the relationship between patient satisfaction with anesthesia service and quality of recovery.

Methodology

Study area

This study was conducted at Wachamo University Nigist Eleni Mohamed Comprehensive Hospital. The hospitals act as referral centers for the surrounding primary hospitals allocated in remote areas. Emergency and elective caesarian section, gynecological procedures, urological procedures, and general procedures including neurosurgery and pediatric surgery performed at the Hospital operation theater.

Study design and period

Hospital-based prospective observational studies were conducted from September 2023 to January 2024.

Population

Source population

All adult surgical patients aged between 18 and 65 years at W/U/N/M/M/C/R/Hospital.

Study population

All elective and emergency patients who were operated under anesthesia during the study period.

Inclusion and exclusion criteria

Inclusion

Adult patients aged between 18 and 65 who underwent surgery under general and spinal anesthesia.

Exclusion criteria

- Age < 18 years old and Geriatric(age > 65 years old) populations.
- patients with altered consciousness as a result of a head injury, medications, alcohol, drugs, dehydration, or illnesses including diabetes,
- patients with Mental health disorders,
- Patients who were transferred to the intensive care unit following surgery.

Sample size determination

As this study is new to Ethiopia, we take the *p*-value as 0.5.

$$n = (z\alpha/2)\,2\,pq/d\,2$$

Where: n = number of sample size.
Z = desired 95% confidence,
Z = 1.96.
d = is the margin of sampling error tolerated (5%).

So sample size is equal to 384 and by adding 5% contingency total sample size became 403.

A situational analysis of the previous four months was evaluated using a systemic random sampling technique, which yielded data showing that 2800 adults between the ages of 18 and 65 had surgery within the allotted time frame. Given that 403 was the estimated sample size, we divided 2800 by 403 to obtain K = 6, so every sixth patient was chosen for the study after the first case was selected using the lottery method. (Fig. 1)

Data source, data collection tool, procedure, and personnel

Data were collected following approval by Wachamo University's ethical review board committee. Written forms of informed consent were taken from each study participant. During the Preoperative period sociodemographic characteristics (age, sex, weight, height, Body Mass Index, and educational status) ASA physical status, smoking history, premedication with benzodiazepines, antiemetic premedication with aldosterone; type of surgery, type of anesthesia and urgency of the procedure were assessed. For patients who underwent general anesthesia one or a combination of intravenous agents (ketamine, Propofol, and Suxmethonium) were used for induction, and corresponding inhaled agents (halothane or isoflurane) were used for maintenance of anesthesia. Morphine was a drug used for analgesia. For surgery underwent under spinal anesthesia after rigorous aseptic technique, 10 mg (for cesarean section) and 15 mg (for all other cases) of 0.5% bupivacaine were injected into the subarachnoid space. Every ten minutes, the patient's intraoperative vital signs (blood pressure, pulse, and spo2) were assessed, and this monitoring continued throughout their stay in the post anesthesia care unit (PACU). During the period of Intraoperative and post anesthesia care unit(PACU) stay assessments were made regarding the length of procedure, length of stay at PACU, and incidence of postoperative nausea and vomiting.

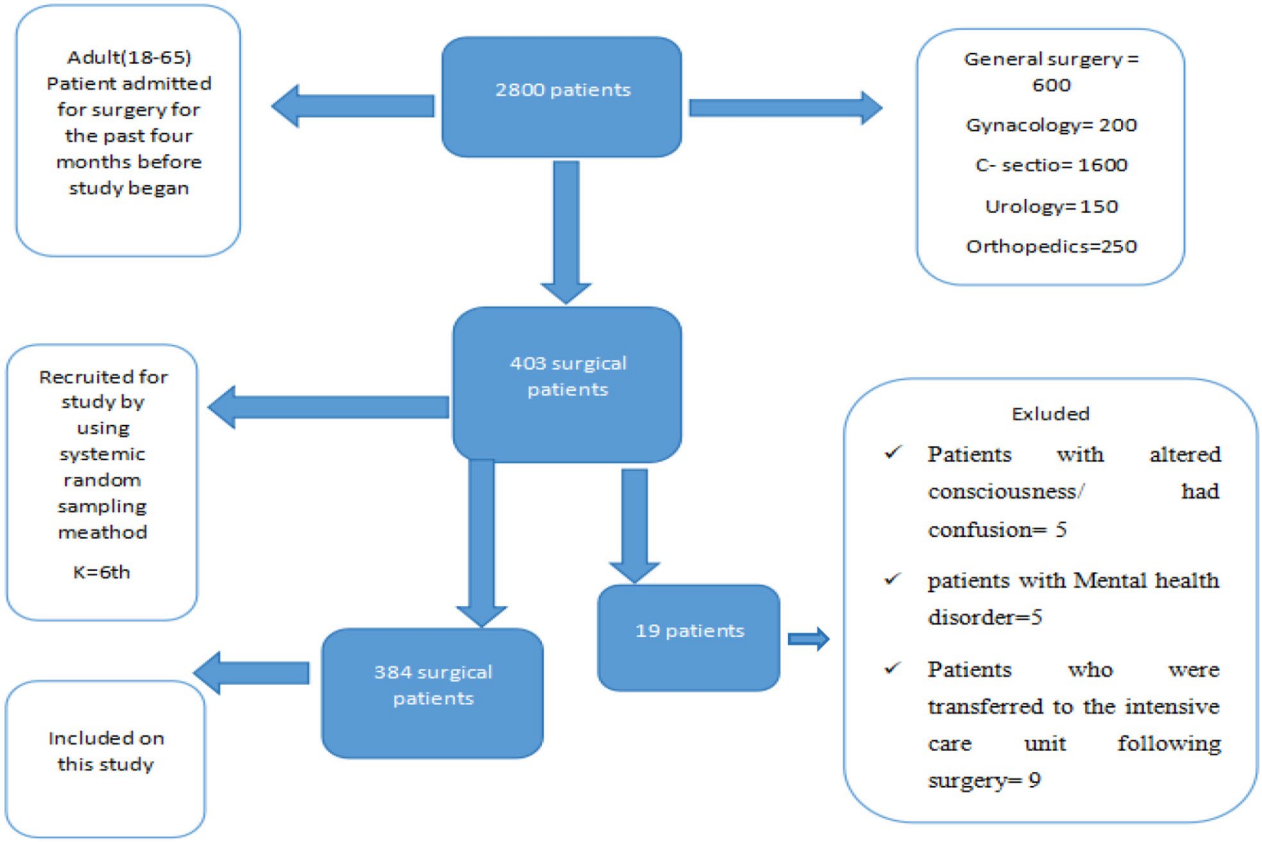

Fig. 1 Sample determination and situation analysis

Quality of recovery is the overall outcome measure and the QoR-40 has emerged as the most frequently used indicator of patients' perceived quality of recovery following surgery.it possesses consistently strong validity, reliability, responsiveness, and clinical utility parameters are indicative of a very good recovery scale. The quality of recovery was assessed by using the QOR40 questionnaire tool. QOR40 has five main components with 40 items of the questionnaire and each of the items scored five. The scale includes 18 positive statements and 22 negative statements. The lowest score is 40(very poor) and the maximum is 200(excellent) QOR. To classify quality of recovery in poor and good quality of recovery; the mean of the total score for all patients was calculated. The highest score or equal to the mean indicates a positive good quality of recovery from surgery, while the lowest score indicates a poor quality of recovery.

A questionnaire modified from the Leiden Perioperative Care Patient Satisfaction Questionnaire (LPPSq) was also used to gauge the degree of satisfaction among the patients. This scale's satisfaction and dissatisfaction were divided into two categories using the demarcation threshold formula. Patients who scored more than or equal to 79.5 were deemed satisfied by the formula, while those who scored less than 79.5 were deemed unsatisfied.

All the questionnaires for QOR40 and Leiden perioperative care patient satisfaction questionnaire (LPPSq) were first prepared in English language and translated into Amharic by language experts.

Table 1 Sociodemographic characteristics of the participants ($N=384$)

Variable		Number (%)
Sex	Male	234(60.9%)
	Female	150 (39.1%)
Age	18–26	130(33.85%)
	27–52	189(49.2%)
	>52	65(16.95%)
Age		34.8073 + 12.95662
Weight		61.9193 + 5.27680
Haight		1.6456 + 0.7263
BMI		22.7523 + 2.49741
Educational status	Illiterate	100(26%)
	Read and write	126(32.8%)
	High school	90(23.4%)
	More than and equal to a diploma	68 (17.7%)
Physical status	ASA I	247(64.3)
	ASA II	90(23.4)
	ASA III	47(12.2)
Smoking	No	297(77.3%)
	Yes	87(22.7%)

ASA = American society of anesthesia

BMI = body mass index

The data were collected by two BSc nurses and 1 BSc anesthetist. Data collectors received one day of training covering all aspects of the study tools, the goal, the relevance of the study, respondents' rights, and the confidentiality of the information collected. Throughout the data collection process, there was routine oversight and follow-up. Every day, the principal investigator's data was examined for consistency and completeness.

Data processing and analysis

Data were coded, edited, entered, and cleaned on epi info version 7 and transported to the statistical package for social science (SPSS) 27. The continuous variables (Age, weight, height, and BMI) were presented as Mean ± SD. We investigated the relationship between the quality of recovery and its predictors using binary logistic regression and chi-square analysis as it help us to identify covariates associated with low recovery quality. Moreover, it differentiates between variables that exhibit a highly significant correlation. To determine whether the difference was statistically significant or not, the means of two groups and more than two groups were compared using the independent student t-test and one-way analysis of variance (ANOVA), respectively. The descriptive analysis was presented using texts, tables, and graphs. A *P*value of <0.05 was considered statistically significant with 95% CI.

Data quality assurance

Data collectors received brief orientations on the assessment tool and training on the goals and applicability of the study to ensure the quality of the data. To assess the questioner's compliance with the stated goal, a pretest was conducted. The investigator made revisions to each questionnaire during data collection to ensure it was accurate and comprehensive.

Result

Sociodemographic characteristics

From 403 selected participants 19 participants were not included in this study as they didn't meet the inclusion criteria. This study has a 95.2% response rate. Of the study participants, 205 of them were male whereas 179 were female with a mean age of 34.8073 ± 12.95662 year. The mean of weight, height, and BMI were; 61.9193 ± 5.27680 kg; 1.6456 ± 0.7263 m and 22.7523 ± 2.4974 kg/m2 respectively. The physical status of the participants shows that 247(64.3) were with ASA I whereas 90(23.4) were ASA II and the rest 47(12.2) were ASA III. The educational status of the participants was also included in this study and shows that 126(32.8%) of participants at least can Read and write. The distribution of socio-demographic characteristics of the participants is illustrated in Table 1.

This study was conducted on five different types of surgeries that were commonly performed in the hospital setting between the periods when this study was conducted. From these general surgery holds 162(42.2%) of study participants whereas gynecological procedures hold 36(9.4%) of them C-section, urologic procedures and orthopedic procedures holds 62(16.1%), 80(20.8%) and 44 (11.5%) respectively. Among them, around 61.2% of the procedures were elective whereas 38.8% were emergency procedures. From all participants, 35.9% of patients had associated coexisting diseases whereas the rest 64.1% had not had any associated systemic diseases. The smoking history of the participants was also assessed by this study and shows that 22.7% of the participants had such a history. All surgeries were performed under spinal and general anesthesia which accounts for 39.1% and 60.9% respectively. The minimum time taken to complete the procedure was 30 min while the maximum took 3 h and 15 min. The surgical and anesthetic characteristics of the participants are depicted in Table 2.

In our study, we also assess the pre and post-operative characteristics and our result shows that about 40.6% of participants were premeditated with benzodiazepines and 35.9% with antiemetics (ondansetron). Of the total participants, 46.1% of them had postoperative nausea and vomiting and about 44.3% had severe pain. The preoperative and post-operative patient characteristic is shown in Table 3.

The mean of quality of recovery is shown to be 164.1458. Those who scored 164 and above were considered to have a good quality of recovery and those who scored below were considered to have a poor quality of recovery. The distribution of quality of recovery shows that the mean of the five components of QOR I.e physical comfort; Emotional State; Physical independence; Psychological Support and Pain were assessed in our study. Post-anesthetic quality of recovery and its component distribution are elucidated in Table 4.

Our result shows that 252(65.6%) of the participants scored good quality of recovery whereas 132(34.4%) scored poor quality of recovery. The magnitude of poor and good-quality recovery is depicted in Fig. 2. The mean distribution of QOR and its component shows that those who score good quality of recovery score better in each of the quality of recovery components and it is illustrated in Fig. 3.

Statistically significant mean deference was observed in ASA physical status ($P=0.001$), BMI difference ($P<0.001$) and type of surgery ($P=0.001$). Those patients with BMI > 24 had the lowest mean score which was 156.1031. The patient with ASA physical status III records the lowest QOR score, 154.3830, and those with ASA physical status II scores 159.5556. This was also true in orthopedic Procedures which had the lowest score among all other types of surgeries the mean score was 138.3182. Sex, age difference, and educational status show comparable mean distribution of QOR and no association with the prevalence of poor QOR. The relation between QOR and different variables is illustrated in Table 5.

In this study, the minimum length of stay at PACU was 120 min whereas the maximum was 360 min. The relation between the lengths of stay in PACU was comparable in both poor QOR and good QOR and shows no association. The finding was also the same for the length of hospital stay. The minimum hospital stay was 3 days and the maximum was 7 days (Table 6).

Table 2 Anesthetic and surgical characteristics ($N=384$)

Variable		*N*(%)
Coexisting	No	253(65.9%)
	Yes	131(34.1%)
Type of surgery	General surgery	162(42.2%)
	Gynecology	36(9.4%)
	Cesarean section	62(16.1%)
	Urology	80(20.8%)
	Orthopedics	44 (11.5%)
Type of anesthesia	Spinal Anesthesia	150(39.1%)
	General Anesthesia	234(60.9%)
Urgency of Procedure	Elective	235(61.2%)
	Emergency	149(38.8%)
Duration of surgery	< 60 min	140(36.5%)
	>/=60 min	244(63.5%)

Table 3 Pre and post-operative patient characteristics ($N=384$)

Variables		Number
Benzodiazepine premedication	Yes	151(39.3%)
	Not	233(60.7%)
Preoperative Antiemetic's	Yes	153(39.8%)
	Not	231(60.2%)
Post op N/V	No	213(55.5%)
	Yes	171(44.5%)
VAS post op	< 7	208(54.2%)
	>/= 7	176(45.8%)

VAS = Visual analog scale

Post op N/V = Post op nausea and vomiting

Table 4 Post Anesthetic quality of recovery distribution within the intermediate phase of recovery at W/U/N/E/M/M/H/C/R/Hospital

	QOR	Physical Comfort	Emotional State	Physical independence	Psychological Support	Pain
Mean	164.1458	52.1510	34.6745	20.3854	29.3177	30.6458
Std. Deviation	26.84759	15.47096	7.80679	3.59248	5.35264	3.72201

QOR = quality of recovery

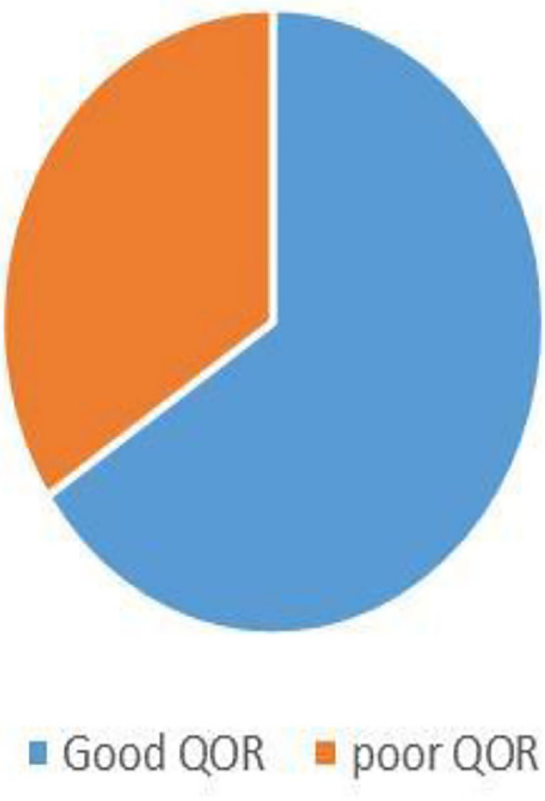

Fig. 2 distribution of good and poor quality of recovery at W/U/N/E/M/M/C/R/H; central Ethiopia

The association between preoperative and postoperative predictors and quality of recovery were the considerations for assessment in this study. Binary regression was utilized for analysis and those with *p*-value < 0.25 on univariate logistic regression were directly included

Table 5 Relation between QOR and different variables

Variable		Mean	*P* value
Sex	M	164.9658	0.108
	F	162.8667	
Age	</=26	163.7519	0.859
	27–52	164.8519	
	> 52	162.8387	
BMI	< 18	181.4444	< 0.001
	18–24	166.3921	
	> 24	156.1031	
Educational Status	Illiterate	158.9700	0.132
	Read and write	165.8070	
	secondary	167.3529	
	> high school	164.1618	
ASA	ASA I	167.6761	0.001
	ASA II	159.5556	
	ASA III	154.3830	
Type of surgery	C/S	172.7097	< 0.001
	GNY	168.6389	
	GENERAL SURGERY	165.5679	
	URO	166.8125	
	Orthopedics	138.3182	

ASA = American society of anesthesia

BMI = body mass index

C/S = cesarean section

Table 6 Relation between QOR and length of PACU stay and Hosptal stay

		Mean	Std. Deviation	*P* value
length of PACU stay in minute	Good QOR	167.0238	64.23214	0.247
	Poor QOR	162.9924	58.01704	
length of hospital stay in days	Good QOR	4.6032	1.11904	0.683
	Poor QOR	4.8106	1.09915	

QOR = quality of recovery

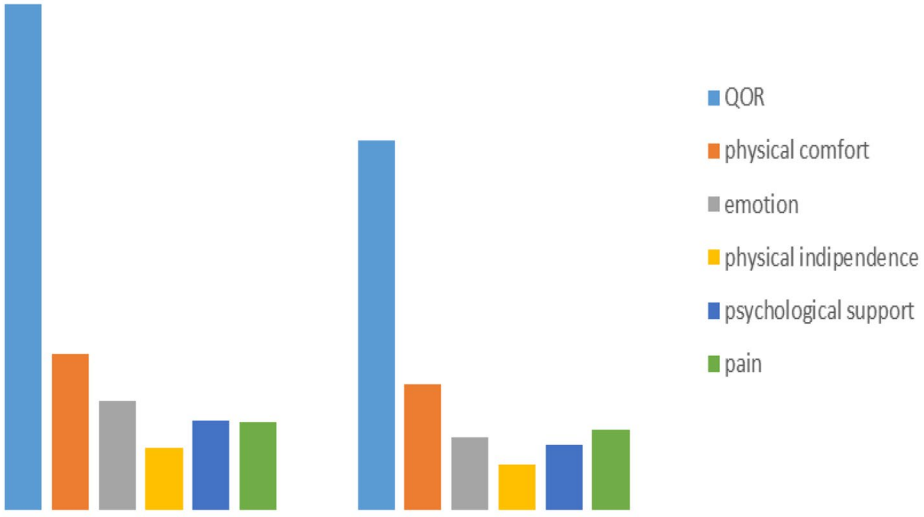

Fig. 3 the distribution of QOR between good QOR and poor QOR gro

in multivariate logistic regression and stepwise forward selection was used to create the final model. A *P*value of <0.05 was considered statistically significant with 95% CI.

Sex (COR 1.125(0.732−1.730 CI 95% *P*=0.591) and smoking (COR 1.173 (0.712–1.933 CI 95% *P*=0.530) history were the factors that we failed to find association with poor quality of recovery. Preoperative antiemetic administration (COR 1.666(1.087–2.553 CI 95% *P*=0.019); premedication with benzodiazepines (COR 1.620(1.048–2.504) CI 95% *P*=0.03 and emergency procedures (COR 1.667(1.083–2.565) CI 95% *P*=0.02 were the factors that show potential relation with poor QOR after anesthesia and surgery.

Procedures that were performed under general anesthesia (AOR 2.690(1.624–4.458 CI 95% *P*<0.001); Patients who had coexisting diseases (AOR 2.149(1.322–3.493 CI 95% *P*=0.004) ; post-anesthesia incidence of nausea and vomiting (AOR 2.515(1.545–4.095 CI 95% *P*<0.001); VAS score >/= 7 during discharge (AOR 3.339 (1.940–5.747 CI 95% *P*<0.001) and prolonged duration of surgery (AOR 2.502(1.564-4.000 95% *P*<0.001) were the factors that had a significant association with poor QOR. The univariate and multivariate association of predictors and poor QOR is described in Table 7.

The study participants were also subjected to an assessment of their satisfaction with preoperative anesthetic services. The result shows that 280 (72.9%) of them were satisfied with the paranesthesia service and the rest 104 (27.1%) were not satisfied. The correlation between patient satisfaction and quality of recovery was assessed and shows a moderate correlation(*r*=0.571). Table 8 shows the correlation between patient satisfaction and quality of recovery.

Table 7 Univariate and multivariate association of predictors and poor QOR

		Quality of recovery			
		COR		AOR	
		CI 95%	*P* value	CI 95%	*P* value
Sex	M F	1.125(0.732 − 1.730	0.591		
Coexisting diseases	No[a] Yes	2.234(1.440–3.466)	< 0.001	2.149(1.322–3.493	0.002
Preoprative antiemetic	Yes[a] No	1.666(1.087–2.553	0.019		
Premedication with benzodiazipam	Yes[a] No	1.620(1.048–2.504)	0.030		
Type of anesthesia	Spinal[a] General	2.752(1.722–4.397)	< 0.001	2.690(1.624–4.458)	< 0.001
Urgency	Elective emergency	1.667(1.083–2.565)	0.020		
Post op N/V	No[a] Yes	1.931(1.261–2.959)	0.002	2.515(1.545–4.095)	< 0.001
Duration of surgery	< 60 min[a] >/= 60 min	2.483(1.547–3.987	< 0.001	3.339(1.940–5.747	< 0.001
PACU temp	< 36c[a] >/= 36c	1.733(1.131–2.653)	0.011		
VAS	< 7[a] >/= 7	2.500(1.623–3.850	< 0.001	2.502(1.564-4.000)	< 0.001
Smoking	No[a] Yes	1.173(0.7121.933)	0.530		

COR = crude odd ratio

AOR = Adjusted odd ratio

Post op N/V = post anesthesia care unit nausea and vomiting

PACU temp = post anesthesia care unit temperature

VAS = visual analog scale

a = constant

Table 8 Correlation between patient satisfaction and quality of recovery

		Patient Satisfaction		*r*	*P*-Value
		satisfied	Not satisfied		
QOR	Good QOR	230	22	0.571	< 0.001
	Poor QOR	50	82		

QOR = quality of recovery

Discussion

Quality of recovery and patient satisfaction are intimately related. This is not surprising, as most factors that lead to a poor recovery following surgery will also result in decreased patient satisfaction. Efforts should be taken to minimize surgical discomfort and complications, optimize early feeding and ambulation, and promote early hospital leave to enhance the quality of recovery and raise patient satisfaction. These are the primary goals of any competent perioperative medical care [3].

In this study prevalence of good quality recovery was about 252(65.6%) of the participants scored good quality of recovery whereas 132(34.4%). the result is highly consistent with the result found by L. Guimarães-Pereira et al. and S.M. Ferraz et al. shows the prevalence of poor QOR is less frequent than good QOR [12, 13].

Even though men showed a small increase over women in our study, gender had no noticeable impact on the quality of recovery. The finding has a similarity to Gornall et al. who described men had a slight increment of QoR-40 scores than women [3]. Our findings also concurred with multiple reports indicating that a patient's sex does not independently influence how they respond to

anesthesia or how quickly they recover from surgery. Regarding some other research findings after correcting and balancing certain confounding factors, such as age and the type of surgery, a distinct difference between the sexes was seen and women showed generally lower quality of recovery [13–15].

As our study concerns the adult age group between18 to 65 the age difference shows no relation with the quality of recovery. The mean distribution of QOR in all three age groups is comparable even though the age group between 27 and 52 shows a slight increase. Our result is in line with Carolina et al., (2015) [14] who mentioned that there was no relation between poor QOR after 24 h of anesthesia and the patient's age. Some studies illustrate it is possible that the younger patients experienced a more rapid recovery process and were back to their ordinary lives [16].

Regarding body mass index, our study result showed that there was a statistically significant correlation between the postoperative total quality of recovery and patients' body mass index. This finding is in line with Berg et al., (2010) who describes BMI as a factor affecting postoperative recovery negatively [17]. this finding is contradicted by Moro et al [18].

In our study, prolonged duration of surgery had a significant relation with the prevalence of poor QOR. This finding is supported by several research [1, 9] But the study done by Ferraz et al. shows there was no positive correlation between QOR and duration of surgery [12]. This deference may be secondary to the difference in the definition of poor QOR as there is a lack of consensus on the description of this variable.

Concerning the relation between postoperative total quality of recovery and type of surgery, the present study revealed that patients who were undergoing general surgery, urologic surgery gynecologic, and obstetric surgery had comparable quality of recovery. However, those who had orthopedic surgery achieved a lower postoperative QOR score. This result is in line with the result found by Berg et al. (2012) [19] who described that orthopedic patients had a significantly lower postoperative recovery score. When mean changes in scores were compared between the surgical groups, a significant difference was shown in Orthopedic procedures [20–23]. This may be due to orthopedic surgery being painful and frequently affecting mobility, which often results in an extended recovery period [12].

Regarding the relation between the postoperative total quality of recovery and type of anesthesia, the findings of this study showed that there is a statistically significant relation between postoperative total quality of recovery and type of anesthesia. The patients undergone under general anesthesia score a much lower quality of recovery after anesthesia than those who underwent spinal anesthesia. This result is supported by the study done by Berg et al., (2010) [17]. but the study done by Sa et al., (2015) stated that QOR scores were higher after general anesthesia [14]. This discrepancy might be secondary to the difference in the tool to assess the QOR after anesthesia. In our study, we use QOR 40 but they use QOR15.

The present study revealed that there was a statistically significant relation between postoperative total quality of recovery and the presence of other diseases and the ASA physical status of the patient. Patients who were free from any other diseases had higher mean scores of postoperative quality of recovery than those who had other diseases. This result is in agreement with Carolina et al., (2015) who described that patients who had diabetes mellitus and hypertension; who took antidepressant drugs more frequently and those with COPD developed poor QOR after surgery [14].

In our study, postoperative pain affects QOR greatly. Those who had severe pain had a greater than two times higher chance of scoring poor QOR than those who had moderate and mild pain at the ward. Moro et al. stated that for every increase of one unit on the VAS scale there would be a 19% increase risk of poor QOR [18]. According to Carolina et al., (2015), the VAS score shows no differences in patients with Poor QOR neither at admission nor at discharge and stated that pain alone is not the single factor affecting the quality of recovery after anesthesia. This difference could be a result of the difference in the sample size and the tool they used to assess Poor QOR [14].

The patients who had postoperative nausea and vomiting were 2.5 times higher at risk for a score below good quality of recovery. This finding is similar to the result found by Moro et al. which shows the poor quality of recovery among those who had nausea and vomiting postoperatively [18].

Conclusion

The magnitude of good quality of recovery was 65.6% whereas poor quality of recovery was 34.4%. The predictors for the prevalence of poor quality of recovery were found to be orthopedic procedures; procedures undergone under general anesthesia; incidence of post-anesthesia nausea and vomiting; prolonged length of the procedure and severity of pain. The Pearson correlation between patient satisfaction with anesthesia service and quality of recovery shows a moderate relationship. That means whenever the level of patient satisfaction rises the quality of recovery is improved.

Limitations of the study

This study does not include the QOR within 30 and 90 days of post-surgery. Reaching participants after leaving the hospital is challenging and almost impossible as most

have lived in rural areas. Because recovery is frequently not complete and is associated with long-term morbidity and mortality, quality of recovery assessment is crucial. After surgery, 60% of patients may experience delayed physical recovery for up to 90 days and 50% of patients for up to 180 days. Patients with an earlier readmission or a longer initial hospital stay have a lower rate of long-term functional recovery. Similarly, a lower quality of long-term nociceptive recovery is linked to significant acute postoperative pain. Any time during the postoperative period, cognitive dysfunction is linked to more long-term and short-term consequences. Postoperative cognitive dysfunction at discharge is highly associated with mortality at three months. Health institutions and health professionals are responsible for following and keeping our clients' well-being, so we suggest researching 30 days and 90 days post-surgery quality of recovery and associated factors of mortality and morbidity [10, 11, 24].

Abbreviations

QOR	Quality of recovery
PACU	Post-anesthesia care unit
LPPSq	Leiden perioperative care patient satisfaction questionnaire
W/U/N/E/M/M/C/S/H	Wachamo University Nigist Eleni Mohamed Memorial Comprehensive Specialized Hospital

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Author contributions
All authors are involved substantially to the conception, design, and acquisition of data analysis, interpretation of data, and preparation of manuscript for this study.

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Data availability
The data used in this study was collected by data collectors and submitted to authors. the data can be shared upon request from peer researchers by contacting the corresponding author.

Declarations

Ethics approval
we confirm that this study was reviewed and approved by an institutional review board (ethics committee) before the study began with reference number CHSM/ERC/20/23. The written form of consent from the patient was taken and the assessment was done accordingly, the confidentiality of participant records and the privacy of the health facility were maintained.

Clinical trial registry number
Name of the registry: Research Registration.
Unique identifying number or registration ID: researchregistry10488; https://researchregistry.knack.com/research-registry#home/registrationdetails/6694d41df0cb48001da59367/.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Guarantors
All authors.

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