



ARSI UNIVERSITY

COLLEGE OF HEALTH SCIENCE

DEPARTMENT OF ANESTHESIA

**ASSESSMENT OF KNOWLEDGE, ATTITUDE, PRACTICE, AND
ASSOCIATED FACTORS TOWARD ENHANCED RECOVERY
AFTER SURGERY PROTOCOL AMONG HEALTH CARE
PROFESSIONALS: MULTICENTER CROSS-SECTIONAL STUDY**

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Title of the Research	Assessment of Knowledge, Attitude, Practice, and Associated Factors Toward Enhanced Recovery After Surgery Protocol Among Health Care Professionals: Multicenter Cross-Sectional Study
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Abstract

Background:

Enhanced Recovery After Surgery (ERAS) is an evidence-based multidisciplinary approach designed to decrease surgical stress, enhance recovery, and improve postoperative outcomes. Despite global adoption, its implementation remains limited in our settings. Assessing healthcare professionals' knowledge, attitudes, practices, and associated factors regarding ERAS is crucial for effective integration and better perioperative care.

Objective: To assess the Knowledge, Attitudes, Practice, and associated factors of ERAS among healthcare professionals across three selected hospitals from June to October, 2025.

Methods: A multicenter, institutional-based, cross-sectional study was conducted across three hospitals, involving 423 participants. Data were analysed after cleaning in Excel and exported to SPSS version 26 for descriptive and inferential analysis. Chi-square and logistic regression analysis revealed factors related to Knowledge, Attitude, and Practice regarding ERAS protocols, with a significance level of $p < 0.05$.

Result: Of the expected 423 participants, 382 healthcare professionals completed the questionnaire, which yielded a 90% response rate. The prevalence of good knowledge, positive attitude, and good practice toward ERAS was 73.3% (95% CI: 68.9%, 77.8%), 82.2% (95% CI: 78.4%, 86.0%), and 35.6% (95% CI: 30.8%, 40.4%), respectively. Factors significantly associated with outcome variables were: good knowledge included being from AHMC (AOR=2.07, 95% CI 1.07-3.98) & from GRTH (AOR=1.63, 95% CI 1.67-2.96), having work experience >10 years (AOR=0.19, 95% CI 0.06-0.59) and unfamiliarity with ERAS (AOR=2.58, 95% CI 1.33-4.99), with positive attitude being nurse (AOR=3.12, 95% CI 1.97-10.05) and not familiar with ERAS (AOR=3.20, 95% CI 1.51-6.81), and with good practice being nurse (AOR=0.281, 95% CI 0.13-0.60), prior training of ERAS (AOR=0.43, 95% CI 0.20-0.95) and familiarity with ERAS (AOR=4.12, 95% CI 2.08-8.47).

Conclusion & Recommendations: Overall, healthcare professionals (HCPs) had good knowledge and a favourable attitude toward ERAS; however, their actual level of practice remains optimal. Integrate ERAS protocols into institutional perioperative care guidelines and provide ongoing education and training for all HCPs.

Key Words: Knowledge, Attitude, Practice, ERAS, ERAS Protocol

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List of Acronyms and Abbreviations

AHMC	Adama Hospital Medical College
AOR	Adjusted odds ratio
ANOVA	Analysis of variance
ARTH	Asella referral and teaching hospital
BSc	Bachelor of Science
ERAS	Enhanced Recovery After Surgery
COR	Crude odds ratio
GA	General Anesthesia
GC	Gregorian Calendar
GRTH	Goba referral and teaching hospital
HCP	Health Care Professional
IV	Intravenous
KAP	Knowledge, Attitude, and Practice
KM	Kilometre
LOS	Length of Stay
MIS	Minimally Invasive Surgery
MSc	Master of Science
NPO	Nil per os
OR	Operating Room
PONV	Postoperative Nausea and Vomiting
SD	Standard Deviation
TIVA	Total intravenous anaesthesia
VIF	Variance Inflation Factor

1. Introduction

1.1. Background

Enhanced Recovery After Surgery (ERAS) is an integrated evidence-based perioperative care pathway to facilitate the return to normal function of a surgically treated patient as early as possible in the best possible manner. These ideas were first developed in the early 2000s by a group of European surgeons who later established the ERAS study group. Their central aim was not only to accelerate discharge but also to enhance the quality of overall recovery by minimizing the physiological disturbances associated with the surgeries. (1,2)

ERAS involves a unique constellation of integrated research-based interventions that collectively reduce the metabolic and inflammatory responses to surgical stress. It emphasizes evidence-based practices that minimize surgical stress, reduce complications, shorten hospital stays, and promote early return to normal function. Even though the ERAS model originated with colorectal surgery, it has since been adopted for use in other types of surgery throughout the world. (2,3)

The framework assumes that patient outcomes can be improved with perioperative care aiming at minimizing surgical stress, optimizing organ function, controlling pain using multimodal strategies, maintaining adequate nutrition, and promoting early mobilization. ERAS pathways thus highlight engaging and optimizing the patient before surgery, preventing physiological derangements through intraoperative techniques, and providing for early functional recovery postoperatively. Each of these disciplines has developed unique ERAS protocols, yet ultimately works toward the overall goal of reducing physiological stress and ensuring recovery. (1–3)

ERAS protocols frequently classify the phases of intervention as preoperative, intraoperative, and postoperative phases. (1,4)

In the preoperative phase: patient education, comorbidities are identified and optimized, there will be lifestyle changes including quitting tobacco smoking or alcohol use, nutritional assessment, correction of anemia and carbohydrate loading strategies, pre-emptive analgesia (e.g., gabapentin/ pregabalin, acetaminophen), anemia treatment, nutrition and fasting optimization, PONV and thromboprophylaxis, mechanical bowel preparation, antibiotics and skin preparation, and preoperative fluids.

In the intraoperative phase, anesthetic application, along with surgical techniques for maintaining physiological balance. This is generally achieved through the selection of correct anesthetic agents for induction and maintenance (total intravenous anaesthesia (TIVA) vs. inhaled anaesthetics), multimodal non-opioid analgesic regimens, maintaining normothermia, slightly positive fluid balance, and minimally invasive surgery.

The post-operative phase: early provision of oral intake, early mobilization, pain control, and wound care. The focus is to encourage the patient's recovery at the right time. (1,4,5)

In essence, the primary goal of ERAS programs will be to achieve and sustain proper physiological conditions during the perioperative period and to enable adequate recovery by reducing the length of hospital stay and speeding patients' return to normal activities. All of which helps to recover gastrointestinal activity, maintain physiologic function, and prevent postoperative complications. (6–8) The ERAS programs' interventions with proven effects on reducing surgical morbidity and on maintaining homeostasis are repeatedly observed to be beneficial for the reduction of complications, readmissions, healthcare costs, and the overall quality of care for the patient. (9,10)

The success of ERAS implementation heavily relies on healthcare professionals' adherence to protocol elements. Knowledge, attitude, and practice (KAP) among these professionals, especially those involved in perioperative care, are critical for consistent and effective delivery of ERAS interventions. However, limited data are available in low-income countries such as Ethiopia regarding the readiness and capacity of healthcare professionals to implement ERAS. Understanding their current KAP and identifying associated factors are essential to improving surgical care outcomes and institutional adoption of ERAS guidelines.

1.2. Statement of Problem

The ERAS protocols are a multimodal evidence-based approach that helps surgical patients by reducing complications, recovery time, and hospital stay after major surgery. (3,11). ERAS guidelines were initially developed for colorectal surgery but have since been applied across most surgical disciplines, including gynecology, orthopedics, hepatobiliary, and cardiothoracic surgery. Their use has consistently shown advantages including shorter hospital stays, lower complication and readmission rates, earlier return of bowel function, and decreased costs. (7,12,13) However, despite these benefits and widespread global adoption, ERAS has been inconsistently and poorly implemented in developing countries, including in Ethiopia.

The KAP of healthcare professionals is a key determinant for the successful implementation of ERAS. In the literature, multidisciplinary collaboration, especially including surgeons, anesthesiologists, nurses, and allied health personnel, is found to be critical for compliance with ERAS protocols. However, significant discrepancies between ERAS knowledge and practice among health professionals have been documented in several studies conducted in various contexts. For instance, some health professionals have knowledge of ERAS principles but do not fully implement the protocols in clinical practice. Reasons for this implementation gap include poor training, lack of institutional support, and difficulty in letting go of old practices. (3,12)

Additionally, KAP has been found to vary across professional sectors. Anesthesiologists generally scored higher in knowledge than nurses and interns, while nurses who play a key role in post-operative recovery often report the lowest exposure to ERAS. (14) Evidence from a study in 2025, Anesthesiologists demonstrated a moderate knowledge level, positive attitude, but poor practice toward ERAS, showing KAP gaps. (15) Education, experience, hospital type, and ERAS training all significantly influence healthcare workers' KAP scores. For example, although HP in Ethiopia, Vietnam, Pakistan, and China accept the concepts of ERAS, it is not widely implemented in their clinical routines, especially regarding early feeding, multimodal analgesia, and patient counselling. (13–16)

In Ethiopia, existing studies also show that among the few nurses and anesthesiologists, although knowledge and attitude toward the subject are reported to be good, ERAS practice in real life is not commonly applied. While more than half of the nurses surveyed had adequate knowledge, one multicenter study found that only 30.1% practiced well. Reasons included

the absence of official ERAS training, insufficient institutional policies, and poor multidisciplinary collaboration. (16) In other studies, Anesthesia professionals demonstrated good knowledge and positive attitude, followed by the surgical team and nurses, and all demonstrated low practice. (14,17) These results suggest that there is a systemic gap in being able to successfully incorporate ERAS into the standard of surgical practice in Ethiopia.

Based on these observations, it is crucial to evaluate the knowledge, attitudes, and practices toward ERAS among healthcare professionals at tertiary and referral hospitals in Ethiopia. Identifying where gaps exist and their associated factors will help support efforts such as implementing more formal ERAS training programs, developing local guidelines, and increasing multidisciplinary collaboration. Ultimately, these efforts will improve the quality of surgical care and patient recovery outcomes in healthcare settings.

Therefore, this study aimed to assess knowledge, attitudes, practices, and associated factors toward the ERAS protocol among healthcare professionals across three hospitals to identify KAP gaps and obstacles to effective implementation. This helps develop strategies to improve ERAS utilization and enhance patient outcomes within institutions.

1.3. Significance of the study

When appropriately applied, ERAS programs represent an important evolution in the way we approach perioperative care, improving clinical outcomes and resource utilization. They will only be successful if they are supported not only by institutions and policies, but also importantly by the knowledge, attitudes, and practices of the people on the ground caring for surgical patients. In high-income settings, ERAS programs have significantly reduced length of stay (LOS), complication rates, and health care costs. However, the adoption of the ERAS protocol is at an early stage in Ethiopia, a low-resource setting, and there is limited literature on the readiness and ability of local HCPs to implement and sustain the protocol.

This study is significant in many areas: First, it addresses an important gap in the literature by evaluating KAP among health workers at various health centers in Ethiopia. Focusing on three hospitals, Asella Teaching and Referral Hospital, Adama Hospital Medical College, and Goba Referral and Teaching Hospital, this study provides a general overview of the status of ERAS implementation within the Ethiopian health system. This multicentre design also increases the practical implications and generalizability of the results.

Second, it contributes to improving surgical outcomes by identifying key barriers and facilitators for the use of ERAS protocols. Gaining insight into these aspects of healthcare workers will help governments and hospital administrators develop focused interventions, including debating and designing the type and amount of training that is needed and important. Some could be continuing education programs, the development of ERAS protocols that are adapted to the specific hospitals, or the integration of multidisciplinary teamwork that can help follow ERAS protocols.

Thirdly, this study will provide a baseline for future studies and quality improvement initiatives within the field of perioperative care. The study, by establishing a snapshot of existing practices and perceptions, will be able to provide a base for future longitudinal studies assessing the uptake and impact of ERAS in Ethiopia.

Finally, from a public health perspective, serving as input to improve ERAS adherence through knowledge and practice optimization among HCPs has the potential to reduce postoperative complications, minimize cost, enhance patient satisfaction, and ultimately improve the efficiency of the healthcare system. Therefore, the findings of this study will be crucial not only for academic and clinical stakeholders but also for national health authorities

seeking to promote cost-effective, evidence-based surgical care in resource-constrained settings.

1.4. Scope of the Study

This study is limited to healthcare professionals working in three tertiary hospitals: Asella Teaching and Referral Hospital, Adama Hospital Medical College, and Goba Referral and Teaching Hospital. It assesses their knowledge, attitude, and practice regarding ERAS protocols and the factors associated with these outcomes.

2. Literature Review

2.1. Introduction to ERAS

“Enhanced Recovery After Surgery” is a multimodal, multidisciplinary approach to the surgical patient. The team that puts ERAS into practice is composed of “surgeons, anesthesiologists/ anesthetists, an ERAS coordinator (usually a nurse or physician’s assistant)”, and members of the units involved in the surgical patient care.(1,2) According study by Smith et al. in 2020, ERAS frameworks are centred a patient patient-focused multidisciplinary care involving preoperative clinic contributions, operating room teams, inpatient recovery units, outpatient clinical staff incorporation, recovery staff postoperatively, nutritionists, physiotherapists, and social workers. (2,3)

In 2001 the ERAS Study Group was established, initially centred on colorectal surgery and postoperative outcomes. Since then, ERAS protocols have been expanded to multiple surgical specialties, such as bariatric, breast, cardiac, colorectal, gynecologic, hepatic, neurosurgical, orthopedic, pancreatic, thoracic, urologic, plastic, esophageal, and head and neck surgeries. The broad applicability of ERAS underscores its value as a standard approach to surgical care. (2,4)

ERAS emphasizes evidence-based practices that deviate from traditional surgical care norms. For example, modern ERAS guidelines recommend shortening preoperative fasting by encouraging carbohydrate drinks up to 2 hours before surgery, using minimally invasive surgical techniques, optimizing fluid management to avoid overload, and minimizing or removing tubes and drains early. Additionally, early oral intake and ambulation on the day of surgery are strongly encouraged. (3)

ERAS guidelines have achieved approximately 30-50% reductions in length of stay along with comparable reductions in postoperative complications, rate of readmissions, and hospital costs. (3) The components of the protocols minimize the surgical stress to maintain metabolic stability. Consistently, the most frequent advantage of ERAS implementation has been shorter LOS, while readmission and complication rates have decreased most consistently in colorectal surgery by Senturk et al.(3,12)

Standardized care according to the ERAS guidelines is related to better short-term outcomes, including shorter LOS (6 vs 7 days, $p=0.025$), fewer readmission rates (3.6% vs 4.8%, $p=0.042$), fewer complications, and faster return of GI function. A second meta-analysis also

confirmed that ERAS protocols improve quality of care by standardizing procedures, reducing LOS by 2.5 days, and 30-day morbidity 50% (RR=0.52) without increasing readmission rates. (7,13)

One study found that among 315 patients, fewer than 30% achieved 70% or more compliance with ERAS guidelines. Higher adherents had significantly fewer LOS (6 vs. 7 days, $p=0.025$), fewer re-admissions (3.6% vs. 4.8%, $p=0.042$), complications (15.4% vs. 22%), and faster return of GI function. (13)

2.2. Components of ERAS protocols

Bachelor et al. suggest that the following components should be included in a prehabilitation program: structured preadmission information, counselling and education, guidance on perioperative nutrition, interventions aimed at smoking cessation, treatment of alcohol addiction, treatment of anemia, pulmonary rehab and prehab, ensuring preoperative fasting with appropriate carbohydrate loading, pre-emptive analgesia, prophylaxis of venous thromboembolism, giving antibiotic prophylaxis, and carrying out appropriate skin preparation. (5,18,19).

Preoperative components include: Preadmission counselling, cessation of cigarettes smoking, management of comorbid conditions with appropriate medication adjustments, bowel preparation selectively, maintaining NPO at least for 2 hours before surgery, administer carbohydrate-rich drinks, apply antiemetic prophylaxis, appropriate prophylactic antibiotics and skin preparation, standardized anesthesia protocol and multimodal analgesia, avoid hypothermia and maintaining euvoemia, use of minimally invasive surgery (MIS) & reduce uses of urine catheters and wound drains. (5,19)

It's recommended that patients undergo structured preadmission counselling as a routine component. Ideally, both the patient and accompanying caregiver or family member should receive information in various formats in oral, written, and or pictorial, to enhance understanding. Comprehensive preoperative counselling has several important goals. anaesthesia- and surgery-related anxiety and subsequent pain. Secondly, the patient's preparedness, satisfaction, and overall surgical experience may be improved considerably by detailed, procedure-specific, and patient-centred information-giving sessions. As a consequence of this psychological support, preoperative information has a positive impact on LOS and postoperative outcomes. (17–19)

Preoperative optimization extends beyond routine cardiorespiratory assessment and involves a range of targeted activities. Patients should be evaluated for tobacco use, alcohol consumption, undiagnosed hypertension, diabetes, anemia, assessment of nutritional status, HIV testing routinely in countries with high prevalence, and cognitive assessment. (18) Management of systemic comorbidities is a key component in preoperative optimization. This majorly involves stabilizing conditions like cardiac diseases, pulmonary diseases, renal diseases, hypertension, and diabetes, correcting derangements such as malnutrition and anemia, and cessation of excessive alcohol use and smoking. (17)

Mechanical bowel preparation has long been practiced under the assumption that it would lower anastomotic leaks and surgical site infections. However, its utilization is routinely related to undesirable effects such as dehydration, electrolyte imbalances, patient dissatisfaction, interrupted sleep the night before surgery, and increased patient anxiety. The current evidence is against the routine use of mechanical bowel preparation for patients undergoing elective colonic or gynecologic surgery. Selective use of mechanical bowel preparation is recommended. (18,20)

Intraoperative, ERAS promotes the use of minimally invasive techniques whenever possible, reduces the use of nasogastric tubes and minimizes surgical drains, incorporating regional anesthetic methods, such as epidural analgesia, peripheral nerve blocks, and local anesthetic infiltration to reduce reliance on opioids. Moreover, ERAS promotes the use of standardized anesthetic protocols that focus on maintaining normothermia and ensuring appropriate fluid balance. (9,19)

According to recent ERAS guidelines of perioperative colorectal surgery, intraoperative items include: - Anesthesia protocols with agents that are short-acting, neuro-monitoring, anti-inflammatory, and anti-adrenergic strategies to reduce surgical stress & improve recovery. Utilization of protective ventilation, abolish hypotension, and ensure full reversal of neuromuscular block with monitoring. Maintaining normothermia by using various active body warming methods. Shift to slightly positive fluid balance from almost zero fluid balance on the day of surgery. MIS should be the standard of care. Avoiding rectal drain is weakly recommended. (5)

In the postoperative period, ERAS protocols emphasize early removal of devices such as surgical drains and urinary catheters, along with minimizing IV fluids and opioids, encouraging multimodal non-narcotic analgesics, early initiation of oral feeding and

mobilization, and structured post-discharge follow-up. (12) Effective postoperative care further includes adequate analgesia, active management of postoperative nausea and vomiting, early ambulation, and feeding. Timely removal of urinary catheters, appropriate laxatives, and strategies to minimize postoperative ileus. (19)

Similarly, postoperative care items include: - early oral intake typically progresses to solid food within four hours after surgery, followed by regular feeding every six hours based on the patient's tolerance. Postoperative pain control relies on a multimodal opioid sparing approach, most commonly using oral paracetamol and NSAIDs as first-line agents, with additional use of non-opioid medications introduced when necessary. Opioids are reserved for only breakthrough pain and should be used in low doses. The urinary catheters are generally removed within the first 24 hours after surgery, with individualized timing for patients who are at high risk of retention. Ongoing monitoring and auditing of care processes to support adherence to recommended practices and improve patient outcomes. (20,21)

2.3. Importance of Health Professionals' KAP in ERAS Implementation

The anesthesiologists hold a central position in the effective application of the ERAS pathway. Their responsibilities extend across multiple phases of care. Firstly, in the preanesthetic contribute through appropriate premedication, adherence to updated fasting guidelines, carbohydrate loading, and optimization of patients' risk factors. Second, in the selection of suitable anesthetic techniques and agents, applying multimodal analgesia, managing perioperative fluid, maintaining normothermia, and reducing PONV. Finally, also in the postoperative period, in early nutritional intake and ambulation. (22)

In a survey of 95 colorectal surgeons (31.7% response rate), eight ERAS interventions were identified as most effective, including pre-operative supplementation of iron, minimally invasive surgical approach, prompt catheter removal, smoking cessation, pre-op counselling, avoiding drains and nasogastric tubes, and early drain removal alongside early oral feeding and ambulation. These strategies were rated highest in improving ERAS implementation. (23)

A study involving 178 healthcare professionals (65.2% nurses, 20.2% surgeons, 14.6% anesthetists) found that 58.8% had experience with ERAS protocols. However, knowledge and participation varied significantly. Nurses reported lower levels of knowledge and less involvement in ERAS care compared to physicians. The main barrier was a lack of information (62.6%), and the preferred learning method was seminars or lectures by experts.

Most respondents (87.8%) supported expanding ERAS implementation. (24) Conversely, a Vietnamese study with 193 nurses and anesthesia technicians found that knowledge (mean 7.66 ± 1.46) and attitudes (mean 40.10 ± 5.24) were high, while practice scores (mean 6.51 ± 1.26) were significantly lower, reflecting a gap between awareness and practice. Age, work experience, and education level also played important roles across the three groups. Additionally, attitudes and practices were significantly positively correlated ($p < 0.001$), indicating that those with more positive attitudes also reported stronger adherence to ERAS.(25)

A review of ten studies identified common barriers to ERAS application, including resistance to change, lack of knowledge, insufficient teamwork, and poor management support. Facilitators included strong communication, leadership, and support for hospital policy. (26) Similarly, in another systematic review, the commonly mentioned barriers to ERAS implementation were resistance from healthcare professionals, resistance from patients, limited resources, rotating staff and residents, misconceptions about the difficulty of implementing ERAS, and a perceived lack of evidence. In South Korea, other reviews showed additional barriers included a lack of manpower and policy support, poor communication and collaboration among multidisciplinary teams, resistance to shifting away from outdated concepts, and patient-specific risk factors. (27,28)

In a 2021 survey of 223 participants, anesthesiology providers demonstrated greater knowledge of ERAS/PSH than surgical providers ($P = .036$). Most agreed that ERAS/PSH improves patient care (73%), and postgraduate trainees were more involved in ERAS/PSH care (55%) than attendings (41%) or non-physician providers (42%) ($P = .050$), although this did not significantly affect their perceived knowledge levels ($P = .352$). (29)

A nationwide online survey conducted from September 2020 to January 2021 assessed anesthesiologists' knowledge, attitudes, and application of ERAS procedures in India. 89.4% of respondents reported being familiar with ERAS, indicating strong awareness. Participants regularly practiced protocols such as pre-admission counselling, preoperative nutrition screening, PONV prophylaxis, oxygen titration, normothermia maintenance, depth-of-anesthesia monitoring, balanced crystalloids, epidurals, goal-directed fluid therapy, early feeding, and mobilization, although adoption levels varied considerably. Other evidence-based therapies, however, were less frequently used, including rigorous glycaemic control, nasogastric avoidance, opioid-sparing analgesia, TIVA, preoperative carbohydrate drinks

(17.9%), and neuromuscular monitoring. Major obstacles included administrative constraints and fears of the lack of local evidence. Despite a moderate 32% response rate, which may introduce nonresponse bias, this cross-sectional study highlights a strong knowledge of ERAS. (30)

The cross-sectional study evaluated the knowledge, attitudes, and practices toward thoracoscopic lobectomy among health professionals, with 289 valid responses (response rate: 96.33%) analysed. Most participants were physicians (82.4%) or anesthesia personnel (81.3%), 50.2% were female, and 55.4% held a bachelor's degree or lower. The mean scores ($\pm$ SD) for knowledge, attitude, and practice were 19.99 ± 5.89 , 36.71 ± 4.09 , and 49.84 ± 5.40 , respectively. Knowledge varied significantly across all demographic parameters, while attitude differed by age and publication status; practice varied with department, surgical volume, and publication status. Notably, over half (51.9%) scored better in knowledge and practice, while 51.2% exceeded the attitude threshold. A multivariate analysis showed higher knowledge among physicians, employees of public tertiary hospitals, and those involved in more thoracoscopic lobectomy cases. A positive attitude was linked to higher knowledge, female gender, and age between 31 and 40. A proactive practice was associated with higher knowledge and attitude scores. There was a clear positive correlation among all the KAP dimensions. (31)

A cross-sectional study done at a university hospital in Turkey in 2023 evaluated knowledge and attitudes regarding the ERAS protocol among cardiac surgery nurses. Fifty nurses participated in the study; 78% of whom were women, while 76% were bachelor's degree holders. The knowledge scores were 18.70 ± 5.29 out of a maximum of 28, indicating a moderate understanding of the ERAS components. However, attitude scores were reasonably high, with a mean of 30.00 ± 3.86 out of 33, indicating positive sentiments toward the implementation of ERAS. A medium positive correlation was observed between knowledge and attitude scores ($r = 0.396$, $p = .005$), further emphasizing the association between greater knowledge and positive attitudes. However, the small sample size, a single-centre setting, and the exclusion of behavioural practice assessment all reduce its generalizability and completeness. (32)

A total of 153 French healthcare providers (76% female; median age 35 years; mainly physiotherapists, nurses, and dietitians) completed an online assessment of ERAS implementation and perceived barriers in a prospective, cross-sectional survey. Only 20.3%

(n=31; 95% CI: 13.9-26.6) reported applying ERAS standards to major surgery. Barriers were identified using the Theoretical Domains Framework (TDF), with the most common being: Environmental context and resources (57.6%; e.g., staffing, logistics, funding, and coordination) and Knowledge gaps (52.8%; e.g., awareness of or training on ERAS). The study concluded that ERAS remains underutilized in France, mainly due to limited resources and low providers' awareness. (33)

A study in Pakistan of 49 surgeons found that 42 (85%) participants reported awareness of the ERAS guidelines, with only 30 (61%) strongly agreeing or agreeing that they successfully implemented ERAS into practice. The largest discrepancies in implementation were observed when discussing specific elements of the ERAS guidelines, such as preoperative carbohydrate loading, prolonged preoperative fasting, performing mechanical bowel preparation, performing active patient warming, and early postoperative removal of a Foley's catheter. In contrast, a large-scale survey from China assessing nurses' involvement in ERAS found that 91.8% (2230/2430) had participated in ERAS-related activities. Among abdominal surgical nurses, the mean knowledge score was 12.10 (SD = 3.79). ERAS knowledge varies significantly based on gender, age, educational level, job title, years of overall working experiences, specialised working years, prior ERAS training, clinical department, and the type of hospital ($p < 0.05$). (34,35)

A study assessing pediatric surgical nurses in China showed low knowledge, particularly regarding postoperative recovery and preoperative preparation. The influencing factors of KAP were educational level, geographical region (South, Central, North, Northwest), years of work experience, hospital category (general hospital, women and children's hospital), and familiarity with ERAS. (36) Another study in 2025 revealed that Anesthesiologists lacked adequate knowledge and showed weak practical application of ERAS despite positive attitudes, with factors like ERAS training exposure, hospital level, and workload influencing KAP levels. (15)

A study in 2024 reported an overall moderate level of knowledge, attitudes, and practices toward ERAS protocols among nursing interns, and educational level, training exposure, and voluntary choice of profession were some factors that affected KAP scores. (37) The study, which included 214 perioperative clinicians, predominantly surgeons and anesthesiology residents, revealed substantial knowledge gaps, which nearly 87% of respondents reported knowing nothing or some about ERAS. While attitudes toward ERAS protocols were

generally favourable and overall the study underscored the need for targeted training, better institutional support, and multidisciplinary collaboration, though its findings were limited in representation of anesthesiologists, one of the key leaders in ERAS implementation. (38)

A study in Rwanda found limited awareness of ERAS protocols, including international NPO guidelines, with only 45.7% of participants familiar with them and 48% unknowingly applying some ERAS elements. Early postoperative feeding was supported by 45.7%, and 92.5% agreed that preventing nausea and vomiting enhances recovery. Regarding opioid use, 88.4% supported selective use, while 81.5% disagreed with eliminating opioids. Almost all respondents (97.7%) believed ERAS improved perioperative care, and 79.2% felt it reduced hospital expenses. (39)

Another more recent study conducted in Rwanda also emphasizes the importance of KAP-oriented training and protocol adaptation to ensure optimal implementation of ERAS. A 2024 controlled trial demonstrated more than 90% of ERAS compliance and shorter hospital stays in laparoscopic cholecystectomy, further supporting the implementation of ERAS protocols in low-resource settings without compromising patients' safety. Also, another scoping review of ERAS data from Africa, published in 2024, found only 15 studies on the continent meeting inclusion criteria, reporting lower morbidity with ERAS but variable adherence to ERAS protocols, which was frequently attributed to lack of staff training and to factors inherent to the specific hospital. (40,41)

A descriptive cross-sectional study conducted at Kenyatta National Hospital in Kenya evaluated knowledge, adherence, and perceived challenges to the practice of ERAS by general surgeons and surgical residents. While awareness of ERAS was high at 98%, mean knowledge was low at 57.7%, particularly low knowledge on preoperative components such as bowel preparation (24.5%), nutritional optimization (35.9%), and fasting (39.6%). Compliance was poor overall, averaging 50.2%, and also declined with seniority; junior residents were more compliant than senior residents and consultants. They felt that knowledge and institutional factors were of utmost relevance to compliance and suggested that structured systems of coordination and training at the institutional and disciplinary levels would improve ERAS utilization and ultimately yield better surgical outcomes. (42)

A study conducted in Ethiopia involving 462 nurses found that most participants (64.1%) had a strong understanding of ERAS protocols. Among participants, 51.9% showed positive attitudes towards the ERAS protocol. However, when it came to actually applying the

protocols, only 30.1% engaged in good practices. Level of education (AOR = 32.748, AOR = 5.023, AOR = 4.070), work experience (AOR = 6.408, AOR = 8.086), hospital type (AOR = 16.545, AOR = 2.121, AOR = 2.637), and on the-job training (AOR = 6.525, 2.474, 1.974) were found to be highly associated with surgical nurses' knowledge, attitudes and practice of ERAS protocols with respective AOR. Another study in Gondar included 140 health workers; 112 participated, yielding a response rate of 80%. Anesthetists had a mean score of correct answer of 88.8% the questions followed by surgeons 66.8%, interns 60%, and nurses 55%; and also 84.6% (22) Anesthetists were able to score above the mean score of 41 out of 50 attitude scores followed by Surgeons (68.4%), Interns (46.2%) and Nurses (14.3%). (14,16)

A thesis done in 2021 in Addis Ababa at Tikur Anbessa Specialized Hospital revealed knowledge, attitude and practices disparity among health professionals towards ERAS, anesthetist and surgeon had a good knowledge (85-90%), and good attitude (>90%) meanwhile nurses had an inadequate knowledge level of 21% 15 had a good attitude towards the implementation of ERAS protocols, while only 36% were currently practicing ERAS protocols. Among interesting findings, a higher proportion of good attitudes and practices was observed among health care workers who had been working for 1-5 years. This likely reflects a significant KAP gap, particularly among nurses, which can be addressed through education and capacity building across all provider types. (17)

The findings indicate important gaps in healthcare professionals' knowledge, attitudes, and practices regarding ERAS pathways. In most cases, particularly in developing countries like Ethiopia, healthcare providers are poorly informed, indecisive, and exhibit low levels of ERAS implementation. This identifies a need for organized, ongoing training, institutional policies that encourage this type of work, and working collaboratively within multidisciplinary teams. Filling these KAP gaps is necessary to ensure proper and sustainable implementation of ERAS to enhance surgical outcomes and patient recovery.(14,16,26)

2.4. Conceptual Framework (14,16,24,34,36)

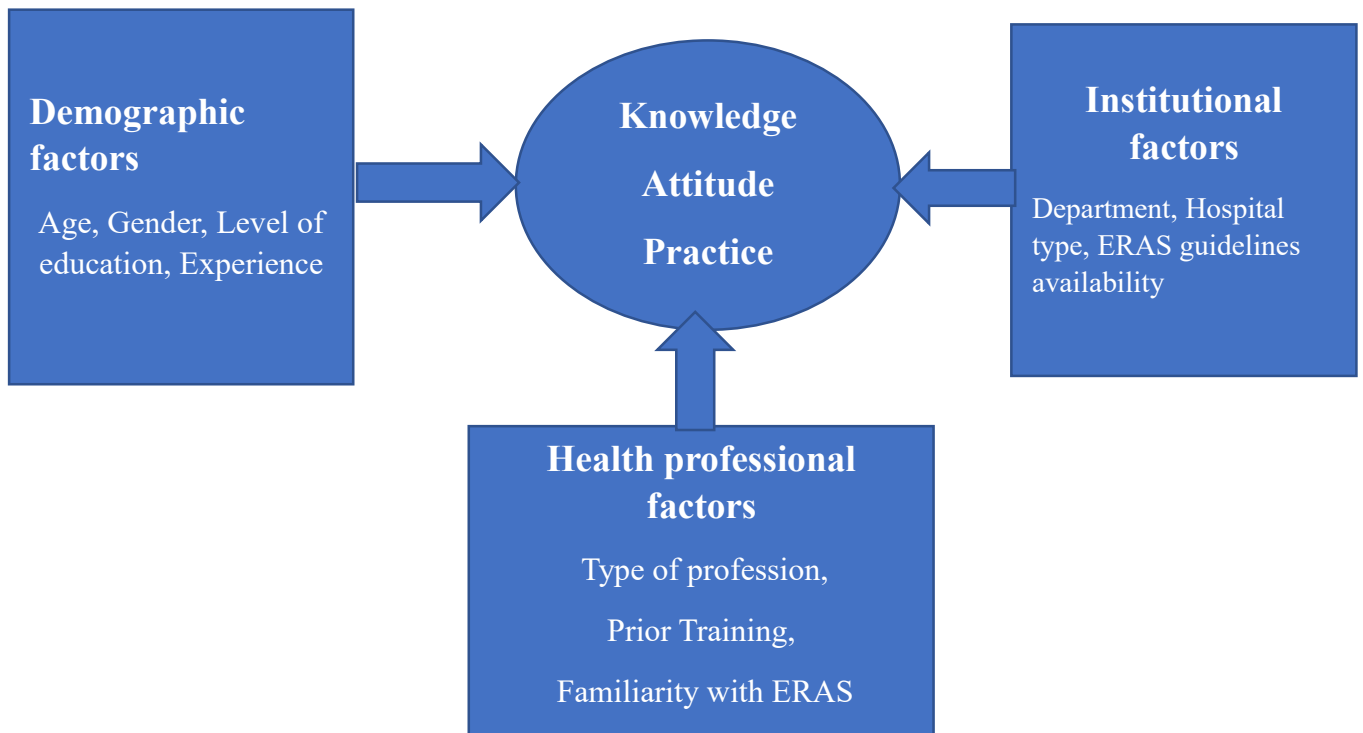


Figure 1; Conceptual framework

2.5. Research Questions

What are the levels of knowledge among healthcare professionals regarding ERAS protocol across selected hospitals?

What are the prevailing attitudes of healthcare professionals toward ERAS protocol across selected hospitals?

To what extent do healthcare professionals practice ERAS protocol across selected hospitals?

What factors are associated with the levels of Knowledge, Attitude, and Practice of the ERAS protocol among healthcare professionals across selected hospitals?

2.6. Research Hypothesis

Null Hypothesis (H_0): There is no significant association between healthcare professionals' levels of knowledge, attitudes, and practice regarding the ERAS protocol and selected independent factors.

Alternative Hypothesis (H_1): There is a significant association between healthcare professionals' levels of knowledge, attitudes, and practice regarding the ERAS protocol and selected independent factors.

3. Objectives

3.1. General Objectives

To assess the knowledge, attitude, practice, and associated factors of the Enhanced Recovery After Surgery (ERAS) protocol among healthcare professionals across three selected hospitals from July to October, 2025 G.C.

3.2. Specific Objectives

To assess the level of knowledge about ERAS among healthcare professionals across three hospitals from July to October, 2025 G.C.

To determine the attitude level of healthcare professionals towards the ERAS protocol across three hospitals from July to October, 2025 G.C.

To assess the practice of the ERAS protocol among healthcare professionals across three hospitals from July to October, 2025 G.C.

To identify the factors associated with levels of knowledge, attitude, and practice of the ERAS protocol among healthcare professionals across three hospitals from July to October, 2025 G.C.

4. Method

4.1. Study area

A multicenter study was conducted at three selected hospitals in Southeast Oromia Regional State, Ethiopia: Asella Teaching and Referral Hospital (ATRH), Adama Hospital Medical College (AHMC), and Goba Referral and Teaching Hospital (GRTH).

Asella Teaching and Referral Hospital (ATRH) is located in Asella city and serves as the primary teaching hospital for Arsi University. ATRH serves a population of over 3 million found in the Arsi zone and receives referrals from neighbouring zones. It is found in the Southeast of Addis Ababa the capital of Ethiopia, at a distance of 175km. It provides a broad range of surgical services, including general surgery, obstetrics and gynaecology, orthopaedics, paediatrics, internal medicine, radiology, plastic, maxillofacial, emergency and critical care, and anesthesia. They have 5 functional operating rooms and have more than 14 MSc academic staff, 3 Anesthesiologists, and 15 postgraduate students.

Adama Hospital Medical College (AHMC): Adama Hospital Medical College, found in Adama city, is located 99 km southeast of Addis Ababa in the Great Rift Valley of East Africa, covering an immense area of 13,666.5 hectares (133.6 square km). Adama Hospital Medical College was founded in 1938. Nowadays, offering services such as General surgery, Gynecology and Obstetrics, Pediatrics and Child Health, Neurosurgery, Ophthalmology, Dermatology, Psychiatry, Dentistry, Orthopedics, as well as medical services with 10 OR tables. Have more than 30 Anesthesia staff, including MSc Anesthesia professionals, and 3 Anesthesiologists.

Goba Referral and Teaching Hospital (GRTH) is among the University hospitals found in the southeast part of the country, 444km from the capital, Addis Ababa. The hospital has the catchment communities of Bale, East Bale, West Arsi, Guji Zone, and part of the Somali region, with a population of more than four million.

These three hospitals offer a diverse range of clinical and academic environments, enabling the study to hear from different perspectives based on levels of resources available and models of health care delivery.

4.2. Study design and period

The study was a multicentre cross-sectional study of the KAP among healthcare professionals toward the ERAS protocol from July to October 2025.

4.3. Source and study population

4.3.1. Source population

All HCPs, Surgeons, Anesthetists, Anesthesiologists, Nurses, and Surgical residents working in, or assigned to the surgical or perioperative departments at the three hospitals selected.

4.3.2. Study population

All eligible healthcare professionals who agreed to participate during the data collection period were enrolled.

Inclusion criteria: – All Anesthetists, Anesthesiologists, Surgeons, Surgical Residents, Nurses working in ARTH, in AHMC, and in GRTH in the surgical ward and ORs within the timeframe of the study were included.

Exclusion criteria: - HCPs who are unwilling to be part of the study.

The HCPs with less than 6 months of work experience.

4.4. Sample size determination and Sampling technique /Sampling procedures

A study conducted in Gondar by Alemneh Y. 2017 found that the proportion of positive attitudes among health professionals was 0.509 overall, which yields a larger sample size than good knowledge, with a proportion of 0.664. (14)

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Where:

n = sample size needed

Z = Z-score of the confidence level you wish to use (e.g., 1.96 for 95% CI)

p = expected proportion (e.g., 0.509)

d = desired precision (margin of error) .05

$$n = \frac{1.96^2 \cdot 0.509 \cdot (1-0.509)}{0.05^2} = \frac{3.8416 \cdot 0.509 \cdot 0.491}{0.0025} \approx \frac{0.960088}{0.0025} \approx 384$$

Adding a 10% non-response rate:

$$n_{adj} = 384 + (0.10 \cdot 384) = 422.4 \approx 423$$

The study used the survey method to recruit participants, as the calculated sample size was extremely close to the actual population size. The study is a multicentre study, so three hospitals were purposively selected, located in the Oromia region, in southeast and central Ethiopia. Total 426 (AHMC 187, ARTH 148, & GRTH 91), which was based on each hospital's human resource review.

Proportionate allocation was employed to allocate the calculated total sample size to each centre's population.

By using this formula

$$n_h = n \times \frac{N_h}{\sum N_i}$$

Where n_h - number of eligible health professionals in each center

n - Total sample size

N_h - Total no. of health professionals in each center

N_i - Sum of total health professionals in all center

$$n_{AHMC} = 423 \cdot \frac{187}{426} = 185.67 \approx 186$$

$$n_{ARTH} = 423 \cdot \frac{148}{426} = 146.96 \approx 147$$

426

$$n_{\text{GRTH}} = 423. \underline{91} = 90.35 \approx 90$$

426

4.4.1. Sampling method

All healthcare professional categories of interest (Surgeons, anesthetists, Anesthesiologist, nurses, residents) were included in the study by census method in each hospital proportionally.

First, each hospital's human resource office was consulted to obtain the list of all healthcare providers working in perioperative care units.

The overall sample size was distributed among hospitals based on the proportion of eligible personnel within each facility.

Across professional categories, the proportional allocation was also respected within each hospital.

4.5. Study variables

4.5.1. Dependent variables

Knowledge, attitude, and practice of ERAS protocols

4.5.2. Independent variables

Demographic characteristics: Gender, Age of the respondents, educational level, work experience

Healthcare professional-related: Profession, belief, ERAS-related training exposure,

Institutional factors: Department, hospital protocols, Availability Guidelines

4.6. Operational definitions

Good knowledge: Participants whose knowledge scores are $\geq 70\%$ of the total attainable Knowledge score.

Poor knowledge: Participants who achieved less than 70% of the total attainable Knowledge score.(15)

Positive attitude: Participants who obtained at least 70% of the total attainable Attitude score.

Negative attitude: Participants whose attitude score was below 70% of the total attainable Attitude score.(15)

Good practice: Participants' practice score $\geq 70\%$ of the total attainable Practice score.

Poor practice: Participants' practice score $< 70\%$ of the total attainable Practice score.(15)

Healthcare professionals – including surgeons, Anaesthesiologists, general surgery residents, anesthetists, and nurses at ARTH, AHMC, and GTRH those who are involved in perioperative patient care.

Anesthesia Professionals- Anesthesia care providers during perioperative care, including anesthetists and anesthesiologists

4.7. Data collection procedures

Socio-demographic data as well as information about their working department, professional status/qualification, years of experience, and knowledge, attitudes, and practices on ERAS were obtained through a structured self-administered questionnaire by using digital data collection tools (KoboToolbox). The principal investigator personally distributed and retrieved the questionnaires to ensure completeness and data quality.

The questionnaire was comprised of the following four parts:

Socio-demographic information

Knowledge-related questions about the ERAS protocol

Attitude-related questions using a 5-point Likert scale

Practice-related questions to assess implementation of ERAS elements.

4.8. Data quality control

The principal investigator trained three anesthetists in a single day on the study tools, data collection, the study's purpose, and how to ensure accuracy in data collection. Pretesting was conducted at Shashemene Comprehensive Hospital on a similar population to identify unclear or ambiguous questions. Data was checked for completeness and consistency daily by the principal investigator and supervisors. Necessary modifications were made based on feedback from the pre-test. The reliability was established by using Cronbach's α , which was

computed on SPSS version 26, to identify the reliability of the items of the tools used in this study. Since a coefficient of 0.7 to 1 is considered good, this indicates fine internal consistency. The Cronbach's α of 17 knowledge items was 0.83, 0.86 for attitude (11 items), which was obtained after removing one item that affected the coefficient of the final 10 items, and for practice, 11 items were 0.91. Thus, all were within an acceptable range of reliability.

4.9. Data analysis procedures

After data collection, the questionnaires were reviewed for completion and consistency. Data were coded and cleaned in Excel, then exported to SPSS version 26 for analysis.

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize participants' socio-demographic characteristics, ERAS knowledge, attitudes, and practices.

Prior to inferential analysis, several statistical assumptions and preliminary tests were conducted.

Reliability test: Internal consistency of the knowledge, attitude, and practice items was assessed using Cronbach's alpha, where a value of ≥ 0.7 was considered acceptable.

Normality test: The distribution of continuous variables was examined using the Shapiro–Wilk test, histograms, and Q–Q plots to determine whether parametric or non-parametric tests were appropriate.

Levene's test for equality of variances was conducted to verify the homogeneity of variance assumption for t-tests and ANOVA analyses.

Multicollinearity test: For independent variables in the regression analysis, the Variance Inflation Factor (VIF) and Tolerance were used to detect multicollinearity, with $VIF < 10$ and $Tolerance > 0.1$ indicating acceptable levels.

Hosmer–Lemeshow goodness-of-fit test: Used to evaluate how the logistic regression model fit with the observed data. A p-value greater than 0.05 was interpreted as evidence of adequate model fit.

For inferential analysis, associations between categorical variables such as knowledge, attitude, and practice levels with sociodemographic and professional characteristics were examined using the Chi-square (χ^2) test of independence. Candidate variables showing p-value < 0.25 in the bivariate analysis were subsequently included in the multivariable logistic

regression model to determine independent predictors of good knowledge, positive attitude, and good practice toward the ERAS protocol. The magnitude of association in the final model was presented using the Adjusted Odds Ratio (AOR) with corresponding 95% Confidence Interval (CI). Statistical significance was declared at a p-value less than 0.05.

4.10. Ethical consideration

Ethical clearance of this study was obtained from Research and Ethics Review Committee of the Arsi University College of Health Sciences. Permission letter were subsequently issued to AHMC and GRTH before data collection. All participants provided informed consent before participating, and the anonymous questionnaire was kept confidential.

4.11. Dissemination plan

The findings of this research will be communicated to the Arsi University Anesthesia Department and presented to relevant academic and professional bodies. The result will be shared with institutional stakeholders, including hospital quality improvement teams, and used to promote ERAS related training activities. The results will be published in a peer-reviewed scientific journal.

5. Result

5.1. Participant's demographic and Other Characteristics

Of the n=423 participants expected to respond to the survey, 382 Health professionals completed the questionnaire, giving a 90% response rate. The majority of respondents were male (250, 65.4%), and the remaining were female (132, 34.6%), Figure 3. The participants' mean age was 34.20 ± 5.67 years (Range 20-55). The professional composition was: nurse 139 (36.4%), anaesthetist 75 (19.6%), anaesthesiologist 6 (1.6%), surgeon 61 (16%), and residents 101(26.4%). The participants' educational levels were: diploma 3.4%, MD/BSc 66.8%, and Speciality/MSc 29.8%. 31.4% of professionals had experience of 1-5 years, 39% of 6 to 10 years, and 29.6% of greater than 10 years. The respondents from each hospital were AHMC 172(45%), ARTH 134(35%) and GRTH 76(20%), Figure 4. Only 34(9%) had reported prior training regarding ERAS. Of the respondents, 128(33.5%) answered that they were not familiar with the ERAS protocol, and the remaining 254(66.5%) reported familiarity, see Table 1.

5.2. Knowledge, Attitude, and Practice Scores

The majority of the participants had good knowledge (n= 280, 73.3% [95 % CI: 68.9%, 77.8%]), and a positive attitude (n= 314, 82.2% [95% CI: 78.4%, 86.0%]), but in the case of practice, the majority had poor practice (n= 246, 64.4%) see Figure 2.

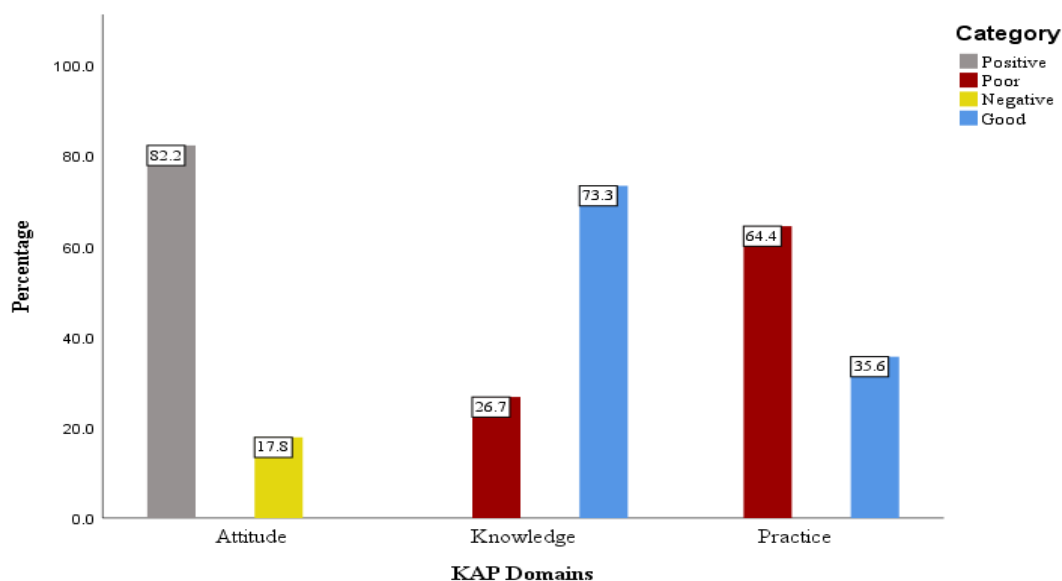


Figure 2: Bar chart of KAP score of HCPs across three tertiary hospitals, Ethiopia, 2025(N=382)

Table 1: Demographic characteristics of health care professionals across three tertiary hospitals, Ethiopia, 2025, (N=382)

Demographic characteristics	N=382	%
Gender		
Female	132	34.6
Male	250	65.4
Age (In years)		
20-30	109	28.5
31-40	222	58.1
>40	51	13.4
Profession		
Nurse	139	36.4
Anaesthetist	75	19.6
Anaesthesiologist	6	1.6
Surgeon	61	16.0
Resident	101	26.4
Educational level		
Diploma	13	3.4
MD/BSc	255	66.8
Specialty/MSc	114	29.8
Years of Experience (years)		
1-5	120	31.4
6-10	149	39.0
>10	113	29.6
Hospital		
AHMC	172	45.0
ARTH	134	35.1
GRTH	76	19.9
Prior training		
Yes	34	8.9
No	348	91.1
How much familiar		
Not familiar	128	33.5
Familiar	254	66.5
Resident (Year)		
R-1	18	17.8
R-2	26	25.7
R-3	29	28.7
R-4	28	27.7
Nurse (unit working)		
Surgical Ward	72	51.8
OR	56	40.3
PACU	11	7.9

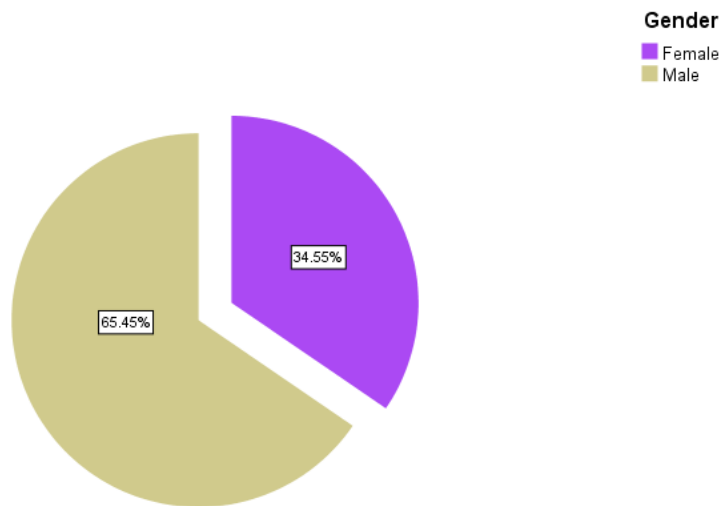


Figure 3 Pie chart of HCPs by gender across three tertiary hospitals, Ethiopia, 2025(N=382)

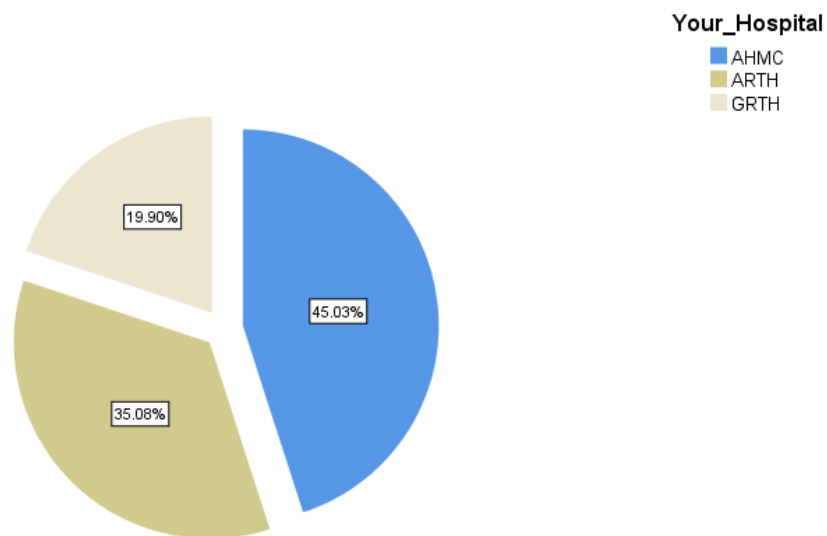


Figure 4 Pie chart of HCPs by hospital affiliation across three tertiary hospitals, Ethiopia, 2025(N=382)

The proportion of healthcare professionals demonstrating good knowledge of the ERAS protocol was 59.0% among nurses, 89.3% among anesthetists, 100% among anesthesiologists, 80.3% among surgeons, and 75.2% among residents. The reported positive attitude levels were 68.3% among nurses, 86.7% among anesthetists, 66.7% among anesthesiologists, 90.2% among surgeons, and 94.1% among residents. While good practice levels were observed in 31% of nurses, 39.8% of anesthetists, 83% of anesthesiologists, 38.1% of surgeons, and 35.7% of residents.

5.3. Association Between demographic and professional characteristics with KAP levels of ERAS protocol

The association between HCPs' knowledge of the ERAS protocol and several institutional and professional factors was examined using the Chi-square test. The test showed presence of significant statistical association between age group and Knowledge level ($\chi^2 = 33.29$, $p < 0.001$), Profession and knowledge level ($\chi^2 = 23.10$, $p < 0.001$), Hospital affiliation and knowledge level ($\chi^2 = 10.79$, $p = 0.001$), work experience and knowledge level ($\chi^2 = 31.01$, $p < 0.001$), Familiarity with ERAS protocol and knowledge level ($\chi^2 = 33.89$, $p < 0.001$), and prior training and knowledge level ($\chi^2 = 8.89$, $p = 0.001$). However, the analysis showed no significant statistical differences in HCPs' knowledge levels regarding the ERAS protocol and gender ($\chi^2 = 0.82$, $p = 0.248$), the availability of written guidelines ($\chi^2 = 3.12$, $p = 0.047$), residency year ($\chi^2 = 6.17$, $p = 0.156$), and nursing working unit ($\chi^2 = .482$, $p = 0.478$).

Chi-square test was performed for the ERAS protocol's HCPs' attitude level. The analysis revealed significant statistical association between attitude level and gender ($\chi^2 = 4.41$, $p = 0.035$), age group ($\chi^2 = 13.23$, $p = 0.002$), work experience ($\chi^2 = 16.37$, $p < 0.001$), Familiarity with ERAS protocol ($\chi^2 = 39.10$, $p < 0.001$), Profession ($\chi^2 = 30.54$, $p < 0.001$), Educational level ($\chi^2 = 6.58$, $p = 0.034$), and prior training ($\chi^2 = 7.66$, $p = 0.004$). However, no significant statistical association was observed between attitude level and hospital affiliation ($\chi^2 = 4.89$, $p = 0.108$), residency year ($\chi^2 = 4.84$, $p = 0.211$), and nursing working unit ($\chi^2 = 0.29$, $p = 0.889$).

There is statistically significant association between HCPs ERAS protocol practice level and age group ($\chi^2 = 11.88$, $p = 0.001$), profession ($\chi^2 = 14.44$, $p = 0.006$), work experience ($\chi^2 = 17.13$, $p < 0.001$), How familiar with ERAS ($\chi^2 = 11.75$, $p = 0.001$), hospital affiliation ($\chi^2 = 6.55$, $p = 0.010$), prior training ($\chi^2 = 9.75$, $p = 0.003$), and residency year ($\chi^2 = 7.85$, $p = 0.049$). Contrastingly, there is no significant statistical relation between practice level and gender

($\chi^2=1.21$, $p=0.177$), the availability of guidelines ($\chi^2=1.82$, $p=0.127$), and the nursing working unit ($\chi^2=4.33$, $p=0.108$), Table 2.

Table 2: Factors associated with health care professionals' knowledge, attitude, and practice on ERAS protocol across three tertiary hospitals, Ethiopia, 2025, (N=382)

Variable	Knowledge level			Attitude level			Practice level		
	Good n (%)	Poor n (%)	<i>P</i> - <i>value</i>	Positive n (%)	Negative n (%)	<i>p</i> - <i>value</i>	Good n (%)	Poor n (%)	<i>p</i> - <i>value</i>
Age			<.001*			.002*			.001*
20-30	84(30)	25(24.5)		90(28.7)	19(27.9)		46(33.8)	63(25.6)	
31-40	174(62.1)	48(47.1)		191(60.8)	31(45.6)		83(61)	139(56.5)	
>41	22(7.9)	29(28.4)		33(10.5)	18(26.5)		7(5.1)	44(17.9)	
Gender			.248			.035*			.177
Female	92(32.9)	40(39.2)		101(32.2)	31(45.6)		53(39)	79(32.1)	
Male	188(67.1)	62(60.8)		213(67.8)	37(54.4)		83(61)	167(68.9)	
Profession			<.001*			<.001*			.006*
Nurse	82(29.3)	57(55.9)		95(30.3)	44(64.7)		54(39.7)	85(34.6)	
Anesthetist	64(22.9)	7(7.5)		65(20.7)	10(14.7)		52(21.1)	23(16.9)	
Anesthesiologist	6(2.1)	0		4(1.3)	2(2.9)		6(4.4)	0	
Surgeon	49(17.5)	12(11.8)		55(17.5)	6(8.8)		42(17.1)	19(31.1)	
Resident	76(27.1)	25(24.5)		95(30.3)	6(8.8)		34(25)	67(27.2)	
Educational			.024*			.034*			.617
Diploma	7(2.5)	6(5.9)		9(2.9)	4(5.9)		3(2.2)	10(4.1)	
MD/BSc	180(64.3)	75(73.5)		203(64.6)	52(76.5)		91(66.9)	164(66.7)	
Specialty/MSc	93(33.2)	21(20.6)		102(32.5)	12(17.6)		42(30.9)	72(29.3)	
Experience			<.001*			<.001*			<.001*
1-5yrs	94(33.6)	26(25.5)		100(31.8)	20(29.4)		47(34.6)	73(29.7)	
6-10	125(44.6)	24(23.5)		134(42.7)	15(22)		67(49.3)	82(33.3)	
>10	61(21.8)	52(51)		80(25.8)	33(48.5)		22(16.2)	91(37)	
Hospital			.001*			.108			.010*
AHMC	114(40.7)	58(56.9)		141(44.9)	31(45.6)		50(36.8)	122(49.6)	
ARTH	113(40.4)	21(20.6)		116(36.9)	18(26.5)		61(44.9)	73(29.7)	
GRTH	53(18.9)	23(22.5)		57(18.2)	19(27.9)		25(18.4)	51(20.7)	

Familiarity			<.001*		<.001*		.001*
Not	68(24.3)	60(58.8)	83(26.4)	45(66.2)	29(21.3)	99(40.2)	
Familiar	212(75.7)	42(41.2)	231(73.6)	23(33.8)	107(78.7)	147(59.8)	
Training			.001*		.004*		.002*
No	247(88.2)	101(99)	280(89.2)	68(100)	116(85.3)	232(94.3)	
Yes	33(11.8)	1(1)	34(10.8)		20(14.7)	14(5.7)	
Guideline			.077		.189		.127
No	264(94.3)	101(99)	298(94.9)	67(98.5)	127(93.4)	238(96.7)	
Yes	16(5.7)	1(1)	16(5.1)	1(1.5)	9(6.6)	8(3.3)	
Nurse (Unit)			.948		.889		.108
Surgical ward	43(52.4)	29(50.9)	48(50.5)	24(54.5)	30(55.6)	42(49.4)	
OR	33(40.2)	23(40.4)	39(41.1)	17(38.6)	23(42.6)	33(38.8)	
PACU	6(7.3)	5(8.8)	8(8.4)	3(6.8)	1(1.9)	10(11.8)	
Residency yr			.156		.211		.049*
R-1	10(13.2)	8(32)	15(15.8)	3(50)	2(5.9)	16(23.9)	
R-2	22(28.9)	4(16)	25(26.3)	1(16.7)	12(35.3)	14(20.9)	
R-3	23(30.3)	6(24)	28(29.5)	1(16.7)	10(29.4)	19(28.4)	
R-4	21(27.6)	6(24)	27(28.4)	1(16.7)	10(29.4)	18(26.9)	

5.4. Predictors of Healthcare professionals' level of KAP on ERAS protocol

Multicollinearity diagnostics were performed using linear regression for all three dependent variables before running the binary logistic regression model. All predictor variables had Variance Inflation Factor (VIF) values less than 2.5 and tolerance values above 0.4, showing no substantial multicollinearity issues among the independent variables.

As we observed that the HCPs subgroup, Anesthesiologists, had very few participants and unveiled quasi-complete separation in the precursory analysis models. Given the clinical and role similarity with Anesthetists and also in line with recommendations from other literature to merge categories when small cell sizes that impair model validity (Pate et al., 2023), we recoded these two groups into a single category, Anesthesia professionals, for inferential analysis.(43)

To determine the predictors of good knowledge toward the ERAS protocol among HCPs, a bivariate analysis was performed with each independent variable. Gender, participants' age group, profession, educational level, work experience, hospital type, prior training on ERAS protocol, previously adopted guideline, and familiarity with ERAS protocol were variables that showed statistical significance at $p < 0.25$ with the outcome variable. In multivariable analysis, profession of the participants, hospital type, work experience, and familiarity with ERAS protocol were variables that showed a significant statistical association with good knowledge of HCPs toward ERAS protocol at $p < 0.05$. The χ^2 test showed that the full model with predictors significantly improved the prediction of attitude level in comparison to the intercept-only model ($LR \chi^2 (15) = 354.271, p < 0.001$).

In this study, participants from ARTH were 2.07 times more likely to exhibit good knowledge when compared to participants from AHMC (AOR=2.07, 95% CI 1.07-3.98), but participants from AHMC were 1.63 times more likely to have good knowledge than participants from GRTH (AOR=1.63, 95% CI 1.67-2.96). Healthcare professionals with more than 10 years of work experience were less likely to possess good knowledge compared to those who had 1 to 5 years of work experience. (AOR=0.19, 95% CI 0.06-0.59). Similarly, HCPs who reported they were familiar with the ERAS protocol were 2.58 times more likely to possess good knowledge compared to HCPs who reported they were not familiar with the ERAS protocol (AOR=2.58, 95% CI 1.33-4.99).

Other variables such as profession, educational level, Prior training, and age group were not statistically significant for knowledge level. Table 3

To determine the predictors of positive attitude toward the ERAS protocol of HCPs' a bivariate analysis was performed with each independent variable. Gender, participants' age group, profession, educational level, work experience, hospital type, previously adopted guideline, and familiarity with the ERAS protocol were variables that showed statistical significance at $p < 0.25$ with the outcome variable. In multivariable analysis, profession of the participants, and familiarity with the ERAS protocol were variables that showed statistically significant association with positive attitude of HCPs toward the ERAS protocol at $p < 0.05$. The χ^2 test showed that the full model with predictors significantly improved the prediction of attitude level in comparison to the intercept-only model ($LR \chi^2 (14) = 299.388, p < 0.001$).

In this study, from the participants' professional category, residents were 3.12 times more likely to have a positive attitude than nurses toward ERAS protocol (AOR=3.12, 95% CI

1.97-10.05). Similarly, the participants who reported they were familiar with ERAS protocol had 3.2 times more likely positive attitude than HCPs who reported they weren't familiar with ERAS (AOR=3.20, 95% CI 1.51-6.81).

Other variables, including gender, educational level, type of hospital, age group, presence of any adopted guideline, and work experience, did not show a significant statistical association with attitude level($p>0.05$).

Table 4

To determine the predictors of good practice regarding the ERAS protocol of HCPs, a bivariate analysis was performed with each independent variable. Gender, participants' age group, profession, work experience, hospital type, prior training, previously adopted guideline, and familiarity with the ERAS protocol were variables that showed statistical significance at $p<0.25$ with the dependent variable. In multivariable analysis, participants' profession, work experience, training on ERAS, and familiarity with ERAS protocol were variables that exhibited statistically significant association with good practice by HCPs toward the ERAS protocol at $p<0.05$. The χ^2 test indicated that the full model with predictors significantly improved the prediction of practice level in comparison to the intercept-only model (LR χ^2 (13) = 435.733, $p<0.001$).

In this study, nurses were about 0.281 times less likely to have good practice toward ERAS protocol compared to anesthesia professionals, 0.256 times less likely compared to surgeons, and 0.247 times less likely compared to residents, respectively (AOR=0.281, 95% CI 0.13-0.60, AOR=0.256, 95% CI 0.11-0.62, AOR=0.247, 95% CI 0.11-0.55). Similarly, participants with work experience of more than 10 years were 0.38 times less likely to have good practice compared to participants with work experience of 1 to 5 years (AOR=0.38, 95% CI 0.15-0.95).

Respondents who had previously received training on ERAS protocols were 56.7% more likely to demonstrate good practice than those with no prior training (AOR=0.43, 95% CI 0.20-0.95). Similarly, participants who reported they were familiar with ERAS protocol were 4.12 times more likely they have good practice when compared to those who reported they weren't familiar with ERAS protocol (AOR=4.12, 95% CI 2.08-8.47). Other factors, including prior training, presence of adopted guidelines, age group, and work experience, were not statistically significant predictors of good practice.

Table 5

Table 3: Multiple logistic regression between independent variables and knowledge level of healthcare professionals across three tertiary hospitals, Ethiopia, 2025, (N=382)

Variables	Knowledge Level		
	COR (95%CI)	AOR (95%CI)	<i>p-value</i>
Age			
20-30(r)	1	1	1
31-40	.08(.623,1.87)	1.99(.81,4.91)	.133
>41	.23(.11,.46)	1.101(.32,3.80)	.879
Gender			
Female(r)	1	1	
Male	1.32(.83,2.11)	1.05(.57,1.94)	.875
Profession			
Nurse(r)	1	1	1
Anesthesia Professionals	6.34(2.84,14.178)	1.90(.71,5.14)	.204
Surgeon	2.84(1.39,5.81)	.87(.253,3.00)	.827
Resident	2.11(1.20,3.72)	.57(.23,1.40)	.220
Educational			
Diploma(r)	1	1	1
MD/BSc	2.06(.67,6.33)	1.72(.46,6.39)	.418
Specialty/	3.80(1.16,12.46)	3.20(.64,16.17)	.158
Hospital			
AHMC(r)	1	1	1
ARTH	2.74(1.56,4.81)	2.16(1.13,4.14)	.021*
GTH	1.17(.66,2.10)	1.63(1.67,2.96)	.040*
Experience			
1-5yrs(r)	1	1	1
6-10yrs	1.44(.78,2.67)	.74(.31,1.78)	.499
>10yrs	.32(.18,.57)	.19(.06,.59)	.004*
Training			
No(r)	1	1	1
Yes	.074(.01,.55)	.17(.024,1.45)	.108

Familiarity			
Not (r)	1	1	1
Familiar	4.45(2.76,7.2)	2.57(1.33,4.95)	.005*

Table 4 Multiple logistic regression between independent variables and Attitude level of healthcare professionals across three tertiary hospitals, Ethiopia, 2025, (N=382)

Variables	Attitude level		
	COR (95%CI)	AOR (95%CI)	<i>p-value</i>
Age			
20-30(r)	1	1	1
31-40	1.30(.70,2.43)	1.10(.39,3.15)	.858
>41	.39(.18,.83)	.77(.19,3.11)	.712
Gender			
Female(r)	1	1	1
Male	1.77(1.04,3.01)	.99(.51,1.90)	.973
Profession			
Nurse(r)	1	1	1
Anesthesia Professionals	2.66(1.31,5.42)	.94(.36,2.45)	.869
Surgeon	4.25(1.70,10.60)	1.04(.25,4.29)	.956
Resident	7.33(2.98,18.02)	3.12(1.97,10.05)	.047*
Educational			
Diploma(r)	1	1	1
MD/BSc	1.74(.51,5.86)	.96(.23,3.93)	.954
Specialty/	3.78(1.01,14.16)	2.02(.34,12.19)	.442
Hospital			
AHMC(r)	1	1	1
ARTH	1.42(.75,2.66)	1.11(.54,2.30)	.770
GTH	.66(.35,1.26)	.65(.31,1.34)	.237
Experience			
1-5yrs(r)	1	1	1
6-10yrs	1.79(.87,3.66)	1.45(.51,4.15)	.491
>10yrs	.49(.26,.91)	.72(.21,2.51)	.606

Familiarity			
Not (r)	1	1	1
Familiar	5.45(3.11,9.55)	3.20(1.51,6.81)	.003*
Guideline			
No(r)	1	1	1
Yes	.28(.04,2.13)	.40(.05,3.32)	.397

Table 5 Multiple logistic regression between independent variables and Practice level of healthcare professionals across three tertiary hospitals, Ethiopia, 2025, (N=382)

Variables	Practice Level		
	COR (95%CI)	AOR (95%CI)	p-value
Age			
20-30(r)	1	1	1
31-40	.82(.512,1.31)	1.14(.57,2.29)	.720
>41	.22(.09,.53)	.78(.22,2.76)	.702
Gender			
Female(r)	1	1	
Male	.74(.48,1.15)	.82(.48,1.39)	.458
Profession			
Nurse(r)	1	1	1
Anesthesia Professionals	.70(.38,1.27)	.28(.13,.60)	0.001*
Surgeon	.71(.38,1.35)	.26(.11,.62)	.003*
Resident	.80(.47,1.36)	.25(.11,.55)	.001*
Educational			
Diploma(r)	1	1	1
MD/BSc	1.85(.50,6.89)	3.21(.73,14.18)	.125
Specialty/	1.94(.51,7.46)	4.62(.85,25.13)	.077
Hospital			
AHMC(r)	1	1	1
ARTH	2.04(1.27,3.27)	1.57(.90,2.73)	.113
GTH	1.120(.67,2.14)	1.24(.65,2.37)	.509
Experience			

1-5yrs(r)	1	1	1
6-10yrs	1.27(.78,2.07)	1.06(.53,2.15)	.863
>10yrs	.38(.21,.68)	.40(.15,1.06)	.065
Training			
No(r)	1	1	1
Yes	.35(.17,.72)	.43(.20,.95)	.037*
Familiarity			
Not (r)	1	1	1
Familiar	2.49(1.53,4.03)	4.12(2.08,8.47)	<.001*

5.5. Differences in Knowledge, Attitude, and Practice Levels among the Types of Healthcare Professionals

Knowledge scores of HCPs were not normal on the Shapiro-Wilk test, whereas attitude and practice scores were normal.

The Man-Whitney test was conducted to evaluate differences in knowledge scores between female and male participants. However, no statistically significant difference was observed between the two groups ($Z = -.235$, $p = .814$). A Kruskal-Wallis H test disclosed that knowledge scores among healthcare professionals were statistically significant ($H=18.007$, $p<0.001$). Post-hoc pairwise comparisons using the Bonferroni correction showed that anaesthesia professionals had substantially higher knowledge scores than Nurses ($p<0.001$) and Residents ($p=0.015$). But no significant differences were noticed between the Surgeons and the other groups. Similarly, a statistically significant difference was observed across hospitals in knowledge scores ($H=10.380$, $p<0.006$), Table 6. Post-hoc pairwise showed that participants from ARTH had higher knowledge scores than participants from AHMC ($p=0.002$). However, there was no statistically significant difference in knowledge score between ARTH and GRTH, AHMC and GRTH ($p > 0.05$).

An independent t-test was conducted to compare attitude and practice scores between female and male participants regarding ERAS. There was no statistically significant difference in attitude and practice scores between female and male participants ($t(380) = -0.379$, $p = 0.705$), $t(380) = 0.196$, $p = 0.845$.

One-way ANOVA was performed, but because the assumption of equal variance was violated ($p>0.05$), Welch ANOVA was applied, which showed a significant difference in attitude

scores across professionals ($F(3,174) = 9.804, p < 0.001$). The Game-Howell post-hoc test revealed that Nurses had a lower attitude mean score than Surgeons ($p < 0.001$) and Residents ($p = 0.002$). But no statistically significant difference was observed between Anesthesia professionals and other health professionals ($p > 0.05$), see *Table 6*.

Similarly, the Welch ANOVA revealed a significant difference across hospitals in mean attitude score toward ERAS ($F(2,165) = 3.838, p = 0.006$). According to Games-Howell pairwise comparison, participants from ARTH showed a higher mean attitude than both AHMC and GRTH ($p = 0.039$). However, there was no difference between AHMC and GRTH ($p = 0.663$), *Table 6*.

One-way ANOVA was conducted to evaluate whether a difference between groups of health professionals in practice scores toward the ERAS protocol, but the result indicated there was no statistically significant difference among health professionals in practice scores ($F(3,378) = 0.623, p = 0.601$). Contrastingly, one-way ANOVA revealed a statistically significant difference among hospitals in practice scores ($F(2,379) = 7.275, p = 0.001$). The Tukey test showed that participants from ARTH demonstrated better practice scores than those from AHMC ($P = 0.001$), while GRTH showed no significant difference with either AHMC or ARTH ($p = 0.382, p = 0.175$), *Table 6*.

Table 6 Comparison of Knowledge, Attitude, and Practice scores by healthcare professional and hospital types across three tertiary hospitals, Ethiopia, 2025 (N=382)

Variable	Test statics	p-value	Post hoc Test Results
Knowledge Score			
Profession	$X^2=18.007$	$p<.001$	Anesthesia professional>Nurse($p>.001$) Anesthesia professionals> Resident($p=.015$)
Hospital	$X^2=10.380$	$p<.006$	ARTH>AHMC($p=.002$)
Attitude Score			
Profession	$F=9.804$	$p <.001$	Surgeon>Nurse($p=.001$) Residents>Nurse($p=.002$)
Hospital	$F=3.838$	$p= .006$	ARTH>AHMC ($p = .039$) ARTH>GRTH ($p = .039$)
Practice Score			
Hospital	$F = 7.275$	$p = .001$	ARTH>AHMC($p=.001$)

6. Discussion

6.1. Introduction to KAP of ERAS among Healthcare professionals

This multicentre study assessed healthcare professionals' knowledge, attitudes, practices, and associated factors related to the ERAS protocol across three hospitals. The study's overall findings demonstrated that the majority of participants had good knowledge, 73.3% (95 % CI: 68.9%, 77.8%), and a positive attitude, 82.2% (95% CI: 78.4%, 86.0%), toward ERAS. Despite good knowledge and favourable attitudes, only about 35.6% (95% CI: 30.8%, 40.4%) of participants reported good practice adherence to the ERAS protocol. The key factors associated with higher KAP levels were profession, work experience, hospital affiliation, prior training, and familiarity with ERAS protocol. These results highlight a gap between knowledge and practice, a gap noted in several similar studies across different settings.

6.2. Knowledge of healthcare professionals about the ERAS protocol

In the present study, the majority of healthcare professionals (73.3%) demonstrated good knowledge about the ERAS protocol. The result is somewhat higher than that reported in several local studies. For instance, a study at the University of Gondar Hospital found an overall mean correct response rate of 66.4%, with anesthetists scoring significantly higher (88.8%) than surgeons (66.8%), interns (60%), and nurses (55%), while a thesis conducted at Tikur Anbessa Specialized Hospital, (Getu Ashagrie, 2021) found that slightly more than half of healthcare professionals had good knowledge, with anesthesiology residents scoring 90.7% compared to only 21% among nurses. The difference in results may be due to the relatively small sample than this study. (14,17) Similarly, a 2023 multicenter study among surgical nurses by Asichale Alimawu reported that 64.1% of respondents had good knowledge of ERAS, which is close to the 59% level of good knowledge among nurses in this study. (16)

In a 2024 study in China, the knowledge score rate among nursing interns was 68.4%. (37) The other multicenter study, 2022, among nurses had a good knowledge level, which is in line with our study, except their study single population(35). According to a study in Pakistan in 2023, done on the' majority of surgeons, or 86% were aware of the ERAS protocol. Despite the encouraging level of awareness, participants identified several crucial areas for improvement. (34) In another related Vietnamese study, Bang et al. 2025, the mean knowledge score of

nurses and anesthesia technicians was reported as 7.66 ± 1.46 , reflecting a relatively good understanding of the ERAS program. (25)

A study in India in 2021, among anesthesiologist reported high ERAS awareness, but low understanding of specific items(30). Similarly, a 2025 national survey among Chinese anesthesiologists found that over 90% were aware of ERAS, but only 70% demonstrated good knowledge (44). The other study in Pakistan demonstrated low ERAS knowledge unlike our study this might be their population dominated by residents >90% which our mixed of balanced professions(38) The knowledge level in our study higher than a multicentre survey 2024, which reported 80% awareness and only 52% demonstrated adequate knowledge and the variation is maybe their high sample size and study on single population among pediatric nurses(36).

The current study revealed that the knowledge level of HCPs on ERAS protocol was significantly associated with age, profession, hospital affiliation, work experience, familiarity with ERAS, and prior training. This finding is in line with a study conducted at the University of Gondar Hospital (2017), which found that anesthetists had the highest knowledge scores, followed by surgeons and interns, while nurses had the lowest scores, reflecting professional variability in understanding of ERAS. (14) Similarly, a multicentre study (2024) reported that nurses working in teaching hospitals and those who had received on-the-job ERAS training were significantly more knowledgeable than their counterparts. (16) The Tikur Anbessa Specialized Hospital study, 2021, also demonstrated that anesthetists and anesthesiologists possessed substantially higher ERAS knowledge than nurses, with younger professionals (20–30 years) showing better awareness than older age groups. (17)

Comparable trends have been observed in international studies. Two studies in China —Liu et al. 2024 (profession, training, and hospital affiliation) and Zhang et al. 2023 (profession and hospital affiliation)—found that profession, training, and hospital affiliation were factors associated with a high level of knowledge of ERAS protocols. (36,44). Likewise, a 2025 study in Rwanda found that structured educational interventions significantly enhanced ERAS awareness among multidisciplinary teams. (39) The study in China indicated that internship duration, level of education, voluntary choice of the nursing profession, ERAS training experience, and level of ERAS knowledge were significant factors affecting the scores of knowledge. (37) Similarly, a multicentre study among nurses identified factors like profession, work experience, hospital type, and training on ERAS in line with our study(35).

6.3. Attitude of healthcare professionals about ERAS protocol

In this study, the attitude level of HCPs toward the ERAS protocol was 82.2% and which showed significant associations with gender, age group, profession, work experience, educational level, familiarity with the ERAS protocol, and prior training. Logistic regression further revealed that profession and familiarity with the ERAS protocol were independent predictors of a positive attitude, with residents 3.12 times more likely to have a positive attitude than nurses, and those familiar with ERAS 3.2 times more likely to demonstrate a positive attitude than those unfamiliar.

These findings align with a study conducted at Tikur Anbessa Specialized Hospital in 2021, which reported that anesthetists and anesthesiologists showed more positive attitudes toward ERAS implementation than nurses and general practitioners. Similarly, the study at University of Gondar Hospital (2017) revealed that anesthetists scored the highest attitude levels (84.6%), followed by surgeons and interns, while nurses demonstrated the lowest proportion of positive attitudes toward ERAS. (14,17) On the other hand, a multicenter study among nurses, 2024 reported that only more than half (51.9%) of surgical nurses exhibited a positive attitude toward ERAS, a little bit lower than nurses' positive attitude in this study, 68% maybe that is due to our study having fewer participants in the respective nurses only. (16)

Regionally, Kifle et al. (2024) and the Kenyan study (2023) reported generally favourable attitudes toward ERAS, but highlighted resistance to change and weak teamwork as barriers to these attitudes. (11,42) Likewise, the Rwandan study 2024 found that more than 90% participants agreed that ERAS improved perioperative outcomes and indicated that acceptance grows with institutional exposure and the availability of guidelines (39).

Comparable international evidence further supports these trends. According to a 2025 study in Vietnam, the mean attitude score of nurses and anesthesia technicians towards ERAS was notably positive, at 40.10 ± 5.24 . (25) Comparable to our study, Liu et al. 2024 reported a 74 % positive attitude, and that profession, hospital type, and familiarity with ERAS guidelines significantly influenced attitudes toward ERAS. (36) Zhang et al. (2023) noted that positive attitude and profession, educational levels, and formal training are associated with favourable perceptions of ERAS benefits. (44) Nationwide survey in Australia, 2024, most participants agreed that ERAS improves perioperative patient care, and nurses generally scored a lower

level of attitude toward ERAS(24). Similar to our study in Pakistan, reported an overall positive attitude toward the ERAS protocol

6.4. Practice level of healthcare professionals about the ERAS protocol

In the present study, the practice level of healthcare professionals regarding the ERAS protocol was 35.6% and was significantly associated with age group, profession, hospital affiliation, work experience, familiarity with ERAS, prior training, and residency year. On multivariate analysis nurses exhibited less good practice than anesthesia professionals, surgeons, and residents, participants with work experience more than 10 years 0.38 times lower than participants with 1 to 5 years of experience, those with training 56.7% more good practice than those without training and professionals those reported they were familiar with ERAS protocol 4.12 times had good practice than those reported not familiar.

These findings are consistent with local evidence. According to a multicentre study by Agmuas Asichale (2024), it was reported that although nurses demonstrated that only 30.1% had good practice toward ERAS protocols, indicating a significant gap between knowledge and practical application. (16) The study at Tikur Anbessa Specialized Hospital, 2021, similarly observed that professionals with 1–5 years of experience exhibited the best ERAS practice, while those with longer experience showed reduced adherence. The Gondar University Hospital study, 2017, also highlighted that despite relatively good knowledge and attitudes among anesthetists and surgeons, ERAS practice was inconsistent across departments. (14,17) A Kenyan study in 2023 reported moderate compliance(50.2%) and adherence decreased with seniority, a slightly higher practice level than our study, which might be due to low sample size and only among the surgical team. (42)

International findings align with these trends. In line with our study in China 2024, the reported practice level was 34% and was strongly related to hospital category and familiarity with ERAS(36). According to a study in Pakistan 2023, with the majority of surgeons having high awareness, the level of practice was less than half; only 49% reported they have successfully implemented of ERAS protocol in their practice. (34) Similarly, according to Bang et al. 2025, there was only a moderate level of adherence to ERAS guidelines, with the mean practice score of 6.51 ± 1.26 for nurses and anesthesia technicians. (25) Zhang et al. 2023, which reported low practice level, emphasized that continuous ERAS training, availability of written guidelines, and hospital-level support significantly improved adherence to ERAS components. (44) Nyundo et al.,2025, in Rwanda, also demonstrated that

multidisciplinary collaboration and training led to notable improvement in ERAS practice across surgical teams. (39)

6.5. Strengths of the Study

A multicenter study design was carried out across three large teaching and referral hospitals, further likely to result in generalizability of the findings to a larger population of Ethiopian healthcare professionals.

Inclusion of multiple professional categories: The study included surgeons, anesthesia professionals, nurses, and residents, which allowed for interprofessional comparison and for identifying training needs across disciplines

Validated and Structured Questionnaire: The data collection tool was designed using prior validation instruments and developed and adapted to the local context, thereby improving validity and reliability.

The large sample size and multicentre participation enhanced the statistical power and representativeness of the results.

Describe a Timely and Understudied Issue: Enhancing Recovery After Surgery, a global initiative, is growing, but little is known about how it works in resource-limited settings. This study fills an important evidence gap in Ethiopia.

6.6. Limitations of the study

Although this study provides valuable insights into ERAS-related knowledge, attitude, and practice among healthcare professionals in Ethiopian teaching hospitals, it has several limitations:

Cross-sectional design: The study design limits the ability to establish cause-and-effect relationships between variables.

Self-reported data: Responses were based on participants' self-assessment, which may be subject to recall or social desirability bias.

Limited generalizability: The study was conducted in three referral and teaching hospitals, which may not represent all healthcare settings in Ethiopia, particularly private and district hospitals.

ERAS implementation variation: The absence of standardized ERAS policies across the hospitals may have influenced participants' understanding and responses.

Lack of qualitative insights: The study did not explore underlying reasons for poor ERAS practice, which could have been enriched through interviews or focus groups

Despite these limitations, the study provides an important baseline for understanding ERAS awareness and practice gaps in resource-limited teaching hospitals

7. Conclusions and Recommendations

7.1. Conclusions

This multicentre study assessed HCPs' KAP regarding the EAS protocol across ARTH, AHMC, and GRTH. Overall, healthcare professionals demonstrated good knowledge and a generally favourable attitude toward ERAS; however, the actual level of practice remained suboptimal. Statistically significant associations were observed between knowledge level and factors such as profession, educational level, work experience, and prior training. Similarly, attitude level was significantly influenced by profession, familiarity with ERAS, and previous training, while practice level was associated with work experience, profession, hospital affiliation, familiarity with ERAS, and ERAS training.

Multivariate logistic regression identified profession and familiarity with ERAS as significant predictors of positive attitude, and hospital affiliation and familiarity with ERAS as predictors of good practice. These findings highlight that awareness, institutional exposure, and ongoing professional development are crucial to promoting ERAS implementation.

Therefore, it can be concluded that while awareness and perception toward ERAS are promising, practical implementation remains limited. Efforts should focus on capacity building, institutional support, and the integration of ERAS guidelines into hospital systems to achieve better surgical outcomes.

7.2. Recommendations

7.2.1. For Healthcare Institutions and Hospital Management

Integrate ERAS protocols into institutional surgical and perioperative care guidelines.

Implement continuous professional development and in-service training focused on ERAS components.

Establish ERAS committees to monitor and support multidisciplinary teamwork in perioperative care.

Ensure availability of ERAS guidelines in all relevant hospital departments (wards, operating theatres, and PACUs).

7.2.2. For policymakers

Incorporate ERAS into national perioperative care standards and postgraduate training curricula.

Strengthen inter-hospital collaboration for experience sharing and standardization of ERAS implementation.

Provide resources and funding to support ERAS training, supervision, and evaluation in tertiary hospitals.

7.2.3. For future researchers

Conduct large-scale multicenter studies including diverse healthcare facilities.

Employ mixed-method or qualitative designs to explore barriers and facilitators to ERAS adoption.

Investigate the impact of ERAS implementation on patient recovery outcomes and healthcare costs in Ethiopia.

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9. Annexes

Annex 1: Information Sheet

Good morning/afternoon. This is Ermias Asefa, and I'm from Arsi University. We are collecting research data for the study entitled "Assessment of Knowledge, Attitude and Practice of ERAS on Health care professionals across three hospitals," conducted under Arsi University, department of Anesthesia. This questionnaire prepared for our study for collection of data.

The study was done by Ermias Asefa for his partial fulfillment of Master's in Advanced Clinical Anesthesia.

Information for study participants:

Your participation is requested for this study. Your responses will help improve understanding and potentially enhance surgical care quality. If you agree to participate, you will be asked to complete a questionnaire that will take about 10–15 minutes of your time. Your participation is entirely voluntary.

All information will remain confidential. No personal identifiers will be collected. Data will be stored securely and used only for research purposes. Participation is voluntary. You may refuse to answer any question or withdraw at any time without penalty or loss of benefits.

Name: Ermias Asefa

Phone number: +251 915804402

Email: aermias798@gmail.com

Annex 2: Consent Form

I have been invited to participate in this study. I understand the purpose of the research is to assess the knowledge, attitude, and practice of Enhanced Recovery After Surgery (ERAS) among healthcare professionals at Asella Referral and Teaching Hospital (ARTH), Adama Hospital Medical College (AHMC), and Goba Referral and Teaching Hospital (GRTH). I have been informed that the information I provide will be kept confidential and will not be used for any purpose other than this study. I voluntarily agree to participate.

A. Yes B. No

If yes, go to the next section. If no, go to the next participant

Questionnaire code_____

Name of data collector_____

Signature _____

Annex 3

Section A: Demographic Information

101. Age: _____

102. Gender: ☐ Male ☐ Female

103. Profession: ☐ Surgeon ☐ Nurse ☐ Anesthetist ☐ Anesthesiologist ☐ Resident ☐

104. Department/Ward/Unit: _____ (For Nurses only)

105. For residents only: R1 ☐ R2 ☐ R3 ☐ R4 ☐

106. Educational Level: ☐ Diploma ☐ MD/ BSc ☐ Specialist/ MSc ☐ PhD

107. Work experience: ☐ <1 year ☐ 1–5 years ☐ 6–10 years ☐ >10 years

108. Hospital affiliation: ☐ ARTH ☐ AHMC ☐ GRTH

109. Have you received any formal training on the ERAS system? ☐ Yes ☐ No

110. Is there a formal written ERAS protocol or guideline that has been adopted by the hospital? ☐

Yes ☐ No

111. How familiar are you with ERAS protocols? ☐ Not familiar ☐ Somewhat familiar ☐ Very familiar

Section B: Knowledge About ERAS

201	Which of the following represent the ERAS acronym correctly?	A. Emergency Recovery and Surgery B. Early Resuscitation and Stabilization C. Enhanced Recovery After Surgery D. Exaggerated Risk Approach for Surgery
202	What are selected patients for ERAS?	A. Elective surgeries B. Emergency surgeries C. Day care procedures D. Surgeries of all type
203	According to ERAS guidelines, which statement is correct about ERAS protocols?	A. ERAS is a single-component protocol focusing only on anesthesia. B. ERAS is a multidisciplinary, evidence-based perioperative care pathway C. ERAS requires patients to fast for >12 hours before surgery. D. ERAS only applies to Colorectal surgery
204	Which of the following is one of the core principles of ERAS?	A. Delayed feeding after surgery B. Early ambulation C. Prolonged bed rest D. All of the above
205	What are the elements of the ERAS protocol?	A. Thorough preoperative assessment & optimization of the patient B. Adequate pain management & Intraoperative fluid C. Early removal of catheters and tubes D. Follow up postoperatively E. The addition of all
206	When should ERAS protocols begin for a surgical patient?	A. post-operatively only B. During hospital discharge C. From the pre-operative phase D. One day before surgery
207	Which surgical approach is preferable according to	A. Open laparotomy B. Laparoscopic surgery C. Both methods have the same effect

	ERAS?	D. Uncertain
208	Which practice aligns with ERAS fasting guidelines?	A. Clear fluids up to 2 hrs before surgery B. Solid food up to 2 hrs before surgery C. No fluids after midnight D. Standard fasting
209	When do you think giving Prophylactic antibiotics has a better effect?	A. 30-60 minutes before the procedure B. Immediately before skin incision C. Immediately after surgery D. Not important at all E. Not my task
210	Regarding fluid management of surgical patients according to the ERAS protocol	A. Goal-directed fluid therapy enhances recovery after surgery B. Giving more fluids than the calculated dose hastens post op recovery C. Fluids should be restricted to enhance recovery D. not my task
211	How to perform temperature protection during the perioperative period? Multiple-choice is possible	A. Fluid regimes according to the 4-2-1 B. Fluid regimes according to the patient's input and output, more rather than less C. Individualized fluid therapy management D. All patients should receive Goal-Directed fluid Therapy (GDT) E. Uncertain
212	Do you think regional anaesthesia decrease hospital length of stay than general anaesthesia?	A. Yes B. No C. Uncertain

213	What are the most effective strategies for the prophylaxis for post op delayed bowel motility or ileus?	A. Excessive fluid administration B. Long-acting opioids use C. Gum chewing post operatively D. Uncertain
214	In your opinion, what is the pain management strategy of ERAS during the perioperative period? [Multiple-choice Possible]	A. Minimize the types and side effects of drugs B. Multimodal analgesia C. Preemptive analgesia D. Individualized analgesia E. Minimize the use of opioid drugs as much as possible F. Minimize the use of nonsteroidal anti-inflammatory drugs
215	Which specialty has ERAS guidelines? You can choose multiple options.	A. Elective colorectal surgery B. Emergency laparotomy C. Breast reconstruction D. Thoracic surgery E. Orthopaedic surgery F. Obstetric and Gynecology H. Urology I. Paediatrics J. None
216	ERAS promotes shorter hospital stays and fewer complications.	A. True B. False
217	What is the recommended time period for quitting smoking before surgery? And how many weeks of smoking cessation are essential to avoid complications?	A. 4, 2 B. 6, 2 C. 8, 4 D. 8, 2 E. Uncertain

Section C: Attitude Toward ERAS

S. N	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
301	ERAS protocols are evidence-based and improve recovery					
302	In our hospital, ERAS can be successfully implemented					
303	Preoperative patient counselling & optimization improve postoperative outcomes and hasten recovery					
304	I feel confident applying ERAS in my daily work					
305	All staff should be trained in ERAS principles.					
306	My department supports ERAS implementation.					
307	Early postoperative mobilization promotes accelerated functional recovery and reduces hospital LOS					
308	Avoiding routine postoperative NGT and drains or early removal facilitate accelerated recovery					
309	Multidisciplinary collaboration is a requisite of ERAS.					
310	Through reduced lengths of stay, ERAS will reduce hospital costs					
311	It unreasonably increases my workload					

Section D: Practice of ERAS

S. N	Practice Item	Always	Often	Sometimes	Rarely	Never
401	I educate patients about ERAS before surgery.					

402	I strictly enforce preoperative cessation of alcohol and smoking besides permit clear oral fluid until 2 hrs prior to surgery					
403	I give carbohydrate drinks preoperatively					
404	I use multimodal pain management as per ERAS.					
405	I initiate early feeding post-operatively.					
406	I remove NGT, urinary catheters early (<24 hrs)					
407	I promote early mobilization after surgery.					
408	I monitor fluid administration carefully					
409	I actively seek information related to ERAS for perioperative management through various channels (e.g., books, the internet, literature).					
410	I follow a standardized ERAS checklist.					
411	My department audits ERAS adherence					

Declaration

Assurance of principal investigator

I, the undersigned, declare that I have developed and the enclosed thesis which is my original work in partial fulfilment in the requirements of master degree in clinical Anesthesia. I understand that plagiarism will not be tolerated and all literal quotations are clearly marked.

Investigator: **Ermias Asefa** Signature: _____ Date: _____

Approval of Primary Advisor

Name: _____ Signature: _____ Date: _____

Approval of Examiners

Name: _____ Signature: _____ Date: _____

Name: _____ Signature: _____ Date: _____