**ARSI UNIVERSITY**

**COLLEGE OF HEALTH SCIENCE**

**DEPARTMENT OF ANESTHESIA**

# Effectiveness of Ultrasound-guided Rectus Sheath Block versus Conventional Systemic Analgesia for Pain Control and Quality of Recovery after Midline Laparotomy: A Prospective Cohort Study.

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# ABSTRACT

**Introduction:** Postoperative pain is a significant concern following laparotomy. Previous studies in Ethiopia have reported a high prevalence of moderate-to-severe pain among surgical patients. Despite advances in perioperative care, the effectiveness of the rectus sheath block remains poorly investigated in resource-limited settings. Therefore, studying the effectiveness of ultrasound-guided rectus sheath block over conventional systemic analgesia for pain control and quality of recovery is an important aspect for improving postoperative outcomes.

**Objective:** The main aim of the study was to assess the effectiveness of ultrasound-guided rectus sheath block versus conventional systemic analgesia for pain control and quality of recovery after midline laparotomy from July 1 to September 30 /2025

**Method and Materials:** An institution-based prospective cohort study was conducted from July 1 to September 30/2025, by recruiting 39 patients in the rectus sheath (RSB) group and 39 patients in the conventional systemic analgesia (CSA) group using a systematic random sampling technique. The exposed group received an ultrasound-guided rectus sheath block with 40ml of 0.25% bupivacaine bilaterally, whereas the non-exposed group received routine postoperative systemic analgesia. Data cleaning and analysis were done on SPSS version 26. The Independent sample t-test and the Mann-Whitney U test were used for normally and non-normally distributed data, respectively. P-values of $< 0.05$ at 95% CI were considered statistically significant.

**Result:** Patients receiving ultrasound-guided rectus sheath block reported significantly lower mean Numeric Rating Scale scores than those managed with conventional systemic analgesia during the first eight hours postoperatively ($p<.05$). The mean time to first rescue analgesic was prolonged among the exposed group (579 min vs. 302 min, $p<.001$). Twenty-four hours analgesic consumption was also significantly reduced among exposed patients ($p<.001$), and Quality of recovery at 24 hours was higher in the exposed group than in the non-exposed group (111.15±7.07 vs 94.03±7.15; mean difference =17.13; (95% CI: 13.92–20.34; $p<.001$)).

**Conclusion:** Ultrasound-guided RSB provides superior postoperative pain control, delays the need for rescue analgesia, and enhances recovery quality in midline laparotomy. We recommend practice of Ultrasound-guided RSB as a routine post-operative pain management protocol.



**Key words:** Rectus sheath block, Laparotomy, Pain, Recovery, Cohort

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## Table of Contents

# LIST OF TABLES

# LIST OF FIGURES

# ACRONYMS AND ABREVIATIONS

| | |
|---|---|
| **ASA** | American Society of Anesthesiologist |
| **BRSB** | Bilateral Rectus Sheath Block |
| **BMI** | Body mass index |
| **CSA** | Conventional Systemic Analgesia |
| **ERAS** | Enhanced Recovery after Surgery |
| **LA** | Local Anesthesia |
| **MMA** | Multi-modal Analgesia |
| **NRS** | Numeric Rating Scale |
| **QoR** | Quality of Recovery |
| **PCA** | Patient controlled Analgesia |
| **PACU** | Post Anesthesia Care Unit |
| **PONV** | Postoperative Nausea and vomiting |
| **RSB** | Rectus Sheath Block |
| **SD** | Standard Deviation |
| **TAP** | Transversus Abdominis Plane |
| **TEA** | Thoracic Epidural Analgesia |
| **U/S** | Ultra-Sound |
| **VAS** | Visual Analogue Scale |

# 1. INTRODUCTION

## 1.1. Background information

Postoperative pain management is an important aspect of surgical care. Evidence suggests that less than half of surgical patients report adequate postoperative pain relief (1). Poorly controlled pain negatively affects quality of life and functional recovery, and is associated with the risk of post-surgical complications. The consequences of suboptimal postoperative pain control can also increase morbidity, delay recovery time, hospitalization time, and patient distress (2,3).

Laparotomy is a surgical procedure involving a large incision through the abdominal wall to gain access to the abdominal cavity. A midline laparotomy involves a vertical incision along the linea alba. It provides rapid and wide access to abdominal organs and is commonly employed in procedures involving the gastrointestinal tract, gynecological organs, and abdominal trauma. Despite its clinical significance, it is associated with significant postoperative morbidity**,** including infection, hernia formation, and, most notably, acute postoperative pain**.** Studies show that patients undergoing midline laparotomy often report moderate to severe pain, especially within the first 24–72 hours post-surgery (4–6).

Pain management in the postoperative setting presents a challenge as the development and severity of pain after surgery is dependent on various patient and procedural factors (7,8). Conventional systemic analgesia remains a cornerstone of postoperative pain control after midline laparotomy. Multimodal regimens combine non-steroidal anti-inflammatory drugs (NSAIDs), paracetamol, and opioids to achieve synergistic analgesia through different mechanisms (9). NSAIDs act via inhibition of prostaglandin synthesis, while paracetamol provides central analgesia with minimal adverse effects. Systemic opioids remain highly effective for moderate to severe pain but, they are associated with nausea, sedation, constipation, and respiratory depression, which may delay recovery and prolong hospitalization (10–12).

Consequently, despite their effectiveness, the adverse effects of systemic analgesics emphasize the need for other techniques to enhance postoperative recovery and reduce opioid consumption. In recent years, regional anesthesia techniques have gained popularity for postoperative pain control. Among these, truncal blocks such as the transversus abdominis

plane (TAP) block and rectus sheath block (RSB) have been explored in abdominal surgeries (13,14).

The rectus sheath block involves deposition of local anesthetic between the posterior rectus sheath and the rectus abdominis muscle to anesthetize the terminal branches of the lower thoracic intercostal nerves (T7-T12). This block is particularly useful for somatic pain originating from midline incisions. RSB use has been described in a wide variety of surgeries, including umbilical hernia repair, epigastric hernia repair, open gynecological surgeries, major open urological pelvic surgeries, and midline laparotomies (13–15).

Despite the introduction of RSB into clinical practice in 1899, its application remained limited due to inconsistent success and the lack of accurate localization techniques. The introduction of the ultrasound-guided rectus sheath block in 2006 by H. Willschke significantly improved its safety and efficacy, leading to a new era for regional abdominal wall analgesia. Since then, the use of RSB has gained popularity in various abdominal surgeries due to its high success rate and low complication rate (15–17).

Although previous studies have shown that ultrasound-guided RSB can reduce postoperative pain intensity and opioid requirements in patients undergoing midline abdominal surgery, the existing evidence remains heterogeneous (18–21). Moreover, further research is needed to assess its impact not only on pain control but also on broader recovery parameters such as quality of recovery (QoR).

## 1.2. Statement of the problem

Pain is an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage (22). More than 80% of patients who undergo surgical procedures experience acute postoperative pain, and approximately 75% of those with postoperative pain report the severity as moderate, severe, or extreme (1). Uncontrolled pain triggers physiological stress responses, impedes recovery, and increases risks of pulmonary complications, thromboembolism, and chronic postsurgical pain (CPSP) (23).

Midline incisions laparotomy is associated with severe postoperative pain mainly due to extensive tissue dissection and retraction. Despite advances in multimodal analgesia, 30–50% of patients undergoing laparotomy experience moderate to severe pain (VAS > 4) within 48 hours postoperatively, which leads to prolonged hospital stays, increased opioid consumption, and reduced quality of life (17,24).

Therefore, effective pain management reduces the risk of undesirable outcomes such as hemodynamic instability and respiratory complications; it also preserves the patient's functional abilities, as well as physical and psychological well-being, and enhances the quality of life for patients with acute pain during the postoperative period.

The caregiver's awareness and practice regarding multi-modal analgesia, the patient's understanding of pain and use of analgesics, the availability of medications and equipment, and the presence of institutional postoperative pain management guidelines all influence the occurrence of postoperative pain and influence the patient's quality of recovery. In addition, the preoperative condition of patients, demographic, anesthetic, and surgical factors will determine patient outcome (2,8,20,25).

Although a range of analgesic techniques, such as parenteral analgesics, abdominal field blocks, and thoracic epidural analgesia (TEA), are available for postoperative pain management following midline laparotomy, clinical practice in resource-limited settings, including our country, continues to depend mainly on systemic analgesics. This may be associated with an increased risk of adverse effects such as respiratory depression, postoperative ileus, nausea, and contribute to the opioid crisis (11,26,27).

Even though TEA is considered the gold standard for pain management in major abdominal surgeries, it may not always be feasible due to patient-specific contraindications, equipment cost, specialist availability, hypotension, operation theatre time constraint, and technical difficulties (26). The transverse abdominis plane (TAP) block has gained popularity in recent years after abdominal surgeries, but it does not guarantee an incision extending above the umbilicus (26,27).

The Rectus Sheath Block has emerged as a promising opioid-sparing technique. Previous studies have investigated the analgesic effectiveness of RSB in reducing postoperative pain and opioid consumption in the first 24 hours post-laparotomy. However, there are still inconsistent findings (21,28). Also, its role in the overall quality of recovery has not been sufficiently explored. Therefore, identifying optimal analgesic techniques that improve both pain control and recovery outcomes has paramount importance for both the patient and the health care providers.

A previous study conducted in our country used the blind technique for rectus sheath block, which depends on anatomical landmarks without direct visualization of the underlying structures. While this method has been traditionally used, it is associated with limitations, including variable success rates and a higher risk of inadvertent complications (14,17).

The use of ultrasound guidance over the blind technique will improve the accuracy of local anesthetic placement by enabling real-time visualization of the rectus sheath, the rectus abdominis muscle, and adjacent structures. This enhanced precision reduces the likelihood of complications such as peritoneal puncture, bowel injury, or vascular trauma. Furthermore, ultrasound-guided RSB increases block success rates, as it ensures correct deposition of the anesthetic in the intended fascial plane. It also allows for the use of a lower volume of local anesthetic while achieving effective analgesia, thereby reducing the risk of systemic toxicity (29–31).

The primary outcome of this study was to assess analgesic effectiveness of Rectus sheath block versus Conventional systemic analgesia (CSA) in terms of NRS, time to first analgesic request and total postoperative analgesic consumption in 24 h period, While the secondary outcome of interest was to compare quality of recovery between groups in terms of 15-item Quality of Recovery questionnaire (QoR-15) following midline incision laparotomy.

## 1.3. Significance of the study

Practice of adequate pain management during intraoperative and the postoperative period is an important aspect of the overall anesthesia management protocol. Poorly controlled postoperative pain following midline incision laparotomy experienced by patients will lead to several complications and delay recovery time.

Therefore, to minimize postoperative complications, the use of a multimodal pain management strategy is a cornerstone for improving surgical outcomes. Currently, it is recommended to reduce the use of systemic opioids by the practice of epidural catheter, Patient Controlled Analgesia (PCA), and peripheral nerve block for enhanced recovery following surgery (ERAS).

Among several techniques for management of postoperative pain following midline incision laparotomy, the bilateral rectus sheath block can be an option, especially for developing countries where they have no easy access to an epidural catheter. Therefore, conducting a valuable study on the effectiveness of rectus sheath block versus conventional systemic analgesia for pain control and quality of recovery has several advantages for different stakeholders, which include:

1. For patients, it will provide promising results, including improved pain relief, faster functional recovery, a shorter hospital stay, and better overall satisfaction with surgical care.
2. The finding will help healthcare workers to follow evidence-based techniques that will minimize opioid-related side effect and lower workload in administering rescue analgesia.
3. The study's results also provide recommendations for policymakers to improve clinical guidelines, reduce healthcare costs, and promote public health by establishing safer and more effective pain management practices.
4. It will open the door to the improvement of postoperative pain management strategies and facilitate further research in this area.

# 2. LITERATURE REVIEW

Patients who have had midline incision laparotomies need effective postoperative pain management to achieve optimal results and facilitate quicker recovery. The Rectus sheath block is a technique in regional anesthesia used as part of a multimodal analgesia approach to abdominal surgeries. While there have been many studies on the technique's analgesic benefits, more research is needed on patient-centered outcomes and the ability to reduce opioid consumption. In addition to research on the analgesic benefits, studies have also focused on the recovery impact of RSB using the QoR-40 and QoR-15 recovery scales. This literature review aims to synthesize existing research on the effectiveness of ultrasound-guided rectus sheath block versus conventional systemic analgesia for pain control and recovery outcomes in patients undergoing midline laparotomy.

## 2.1. Pain following Surgery

Postoperative pain is a form of acute pain following surgical intervention. And it is due to skin incision, tissue dissection, manipulation, and traction during the surgical procedure. The magnitude may reach up to 85.5% globally. Age, gender, duration of surgery, and length of skin incision are common factors associated with postoperative pain (1,7,32).

The risk factors of postoperative pain can be divided into preoperative, intraoperative, and postoperative factors. The preoperative factors can be attributed to genetics, demographics, preexisting pain related or not related to the surgery site, previous surgery, work-related injury, and presence of comorbidities (irritable bowel syndrome, fibromyalgia, migraine, and Raynaud's disease). Younger patients and females experience more postoperative pain and are more likely to develop persistent chronic postoperative pain (2,33–35).

A multi-center, cross-sectional study conducted in Spain investigated the prevalence and intensity of postoperative pain, as well as patient satisfaction with pain management. The study reported a mean pain intensity score of 5.23 at rest and 5.7 during movement. Despite moderate pain levels, patient satisfaction with pain management was high, with 22.7% (n = 301) reporting satisfied and 59.2% (n = 786) reporting very satisfied. Presence of pre-surgical chronic pain, various surgical specialties and female gender were factors significantly associated with higher pain intensity (35).

A prospective longitudinal study done in Ethiopia on Quality of postoperative pain management by Eshete et al in 2019 indicates moderate to severe postoperative pain was present in 88.2% of patients, of which pain was inadequately treated in 58.4% of patients. The study presents that the prevalence of moderate to severe postoperative pain and its functional interference was high in Ethiopian patients. The reason behind this was that the treatment provided to patients was inadequate and not in line with international recommendations and standards (36).

## 2.2. Rectus Sheath block for postoperative pain control

Effective postoperative pain management is a cornerstone for optimizing patient outcomes, reducing postoperative complications, and facilitating early mobilization and discharge (35,36). Among regional anesthesia techniques, RSB has gained interest as a component of multimodal analgesia for midline abdominal surgeries. It involves the injection of local anesthetic into the potential space between the posterior aspect of the rectus abdominis muscle and its sheath, to provide somatic analgesia to the anterior abdominal wall (16,20,37).

Several studies are conducted to assess effectiveness of RSB for postoperative pain control, Study conducted in Japan evaluated the effectiveness of ultrasound-guided transversus abdominis plane (TAP) and rectus sheath (RS) blocks in pain management and recovery after gynecological single-incision laparoscopic surgery (SILS), A bilateral TAP block (Group A, n=9), bilateral TAP and RS blocks (Group B, n=10), and a bilateral RS block (Group C, n=9) with 40 ml ropivacaine was given per patient concluded that the RS block alone was the most effective in relieving pain and accelerating general recovery after gynecological SILS (38).

Randomized, controlled trial done in Egypt on sixty-three ASA I/II adult patients to investigate the efficacy of combined ultrasound-guided anterior and posterior rectus sheath block for postoperative analgesia following umbilical hernia repair. Twenty-four hours postoperative morphine consumption, Intraoperative rescue fentanyl dose, equivalent morphine dose in the recovery unit and first morphine dose were recorded. The finding suggests that the addition of ultrasound-guided anterior rectus sheath block, together with posterior rectus sheath block, provides more significant analgesia than performing posterior rectus sheath block alone (16). In line with this finding, others also suggest that US-guided BRSB resulted in reduced postoperative pain scores, decreased tramadol usage, and prolonged pain relief (14,17,18,39).

In contrast to the above findings, a randomized, single-blinded, interventional study was conducted in Japan, enrolling 62 patients (RSB group, n = 31, LA group, n = 31). The RSB group received bilateral RSB with 10 mL of 0.375% ropivacaine, and the LA group received subcutaneous and fascial injection with 10 mL of 0.75% ropivacaine at the umbilical wound. The study demonstrated that on postoperative day 1 (POD1), the mean VAS scores were 36.4 ± 18.9 and 29.4 ± 15.4 in the RSB group and the LA group, respectively, indicating that the LA group tended to report less postoperative pain than the RSB group. The surgery type and the use of lower concentration local anesthetics for the RSB group may be the possible reason (21).

A systematic review with meta-analysis of eight randomized controlled trials (RCTs) also found that RSB did not significantly reduce postoperative pain intensity or opioid consumption compared to the control group in abdominal surgery. The meta-analysis found no supporting evidence for RSB's effectiveness in improving pain control or delaying the need for analgesics. These results can be explained by the limited analgesic effects of RSB, which cannot substantially improve visceral pain, but rather aim to relax the abdominal wall (28).

A Randomized Controlled Study done in Korea to compare preoperative versus postoperative RSB for Acute Postoperative Pain Relief after Laparoscopic Cholecystectomy; Total rescue analgesic consumption at 24 h post-surgery was significantly lower in the pre-RSB group than in the post-RSB group. The cumulative rescue analgesic consumption was significantly lower in the pre-RSB group than in the post-RSB group at 1 h, 9h, and 18h post-surgery (33). When compared with post-RSB, pre-RSB reduced the analgesic requirements in patients undergoing Laparoscopy Cholecystectomy (33), Midline incision laparotomy (40), but no significant difference in transabdominal gynecology surgery (8,33,41).

A prospective observational study conducted in Ethiopia on rectus sheath block and emergency midline laparotomy by recruiting 30 patients in the rectus sheath block group and 30 patients in the multimodal analgesia (MMA) group. The numeric rating scale score at recovery was significantly reduced in the RSB group. Postoperative numeric rating scale scores at 3rd, 6th, 12th, and 24th hours were statistically significantly lower in the RSB group. Postoperative tramadol consumption over 24 hours was significantly lower in the rectus sheath group (17).

Another study conducted in Ethiopia also found that the RSB group had significantly reduced VAS score at rest and during movement. Patients in the rectus sheath block group had reduced tramadol requirement compared to the non-exposed group. The 24 hours diclofenac consumption was significantly lower in the RSB group than in the non-exposed group. The mean time to first analgesic request was significantly longer in the RSB group than in the non-exposed group (14).

In consistent with the above findings, a study done at Addis Ababa University in 2017 assessed the role of bilateral rectus sheath block as part of postoperative analgesia in patients who undergo midline laparotomy at Menelik II Referral Hospital. There was a statistically significant difference among the groups depending on the postoperative pain score, measured by the numeric rating scale (NRS), in the first 6 hours and total analgesia consumption within the 12 hours postoperatively (19).

## 2.3. Rectus sheath block on quality of recovery

Recovery after surgery and anesthesia is a complex process that depends on patient, surgical, and anesthetic characteristics, as well as the presence of various adverse sequelae. Most studies evaluating recovery after anesthesia and surgery have focused primarily on physiological endpoints, recovery times, and the incidence of adverse events, such as major morbidity and mortality. Although these parameters are important and should be measured, they mostly ignore quality of recovery (QoR) from the patient's perspective and therefore a variety of measurement tools have been developed (42).

The Quality of Recovery-15 (QoR-15) is a short form of the global QoR-40 score, designed and validated by Dr. Myles in Australia in 2013. It's a patient-reported outcome measure (PROM) that assesses various aspects of recovery, including physical comfort, pain, physical independence, psychological support, and emotional state. It is mainly used to assess the early postoperative recovery of quality of life after general anesthesia and surgery. At present, QoR-15 has been validated and used in various countries and has been successfully used to evaluate the quality of recovery after different surgical methods or anesthesia (43,44).

A randomized controlled trial conducted in China involving 90 women undergoing transabdominal midline gynecological surgery assessed the effect of preoperative ultrasound-guided RSB with 0.4% ropivacaine. The primary outcome was measured using the 40-item

Quality of Recovery questionnaire (QoR-40). Results indicated that the RSB group had significantly higher QoR-40 scores on the first postoperative day compared to the control group. Additionally, the RSB group experienced reduced intraoperative opioid consumption, earlier return of bowel function, and greater patient satisfaction (15).

In line with the above finding, A randomized controlled trial conducted in Egypt on patients scheduled for elective midline laparotomy also found that Median global QoR-15 scores at 24 hour were significantly greater in the RSB group, indicating good quality of recovery compared with the control group; 107 (101-112) vs. 72 (68-74), $P < 0.001$. In addition, the pain profile was improved in the RSB group; 41% of patients required additional boluses of morphine during the 24 hours, compared to 100% of patients in the control group (45).

With the advent of ultrasound-guidance, the accuracy and safety of RSB have improved significantly, enhancing its clinical applicability across a variety of procedures, including laparoscopic surgeries, hernia repairs, and cesarean deliveries (16,40,46). Studies have demonstrated that RSB can reduce opioid consumption (18,47), improve pain scores (40), and contribute to faster recovery (15,38,45), particularly in surgeries involving midline incisions. However, variability in techniques, dosing regimens, and surgical populations has led to heterogeneity in outcomes across the literature.

Even though the effect of RSB is well-studied for pain relief, there is still a conflicting idea on its overall effectiveness, and its role in influencing the overall quality of recovery following surgery, including mobility, sleep, emotional well-being, and early return to baseline function, is an emerging focus of clinical research. Therefore, this study aimed to compare postoperative analgesic effectiveness and quality of recovery between ultrasound-guided rectus sheath block and Conventional systemic analgesia for midline incision laparotomy surgery in Asella Referral and Teaching Hospital.

Research Hypothesis

H0: There is no statistically significant difference in pain control and quality of recovery between patients receiving bilateral rectus sheath block and conventional systemic analgesia.

H1: Patients receiving bilateral rectus sheath block report statistically significant lower postoperative pain compared to those receiving conventional systemic analgesia.

H2: The use of bilateral rectus sheath block leads to statistically significantly higher quality of recovery compared to those receiving conventional systemic analgesia.

## 2.4. Conceptual framework

This conceptual framework is developed by referring to different literatures (15–17,26,36,48) related to the effectiveness of bilateral rectus sheath block on pain control and quality of recovery compared to Conventional systemic analgesia for midline incision laparotomy surgery in order to indicate relationships between variables. It represents a set of interrelated concepts that represent an image of association between postoperative pain and quality of recovery with factors affecting them. This structure will provide guidance for the study.

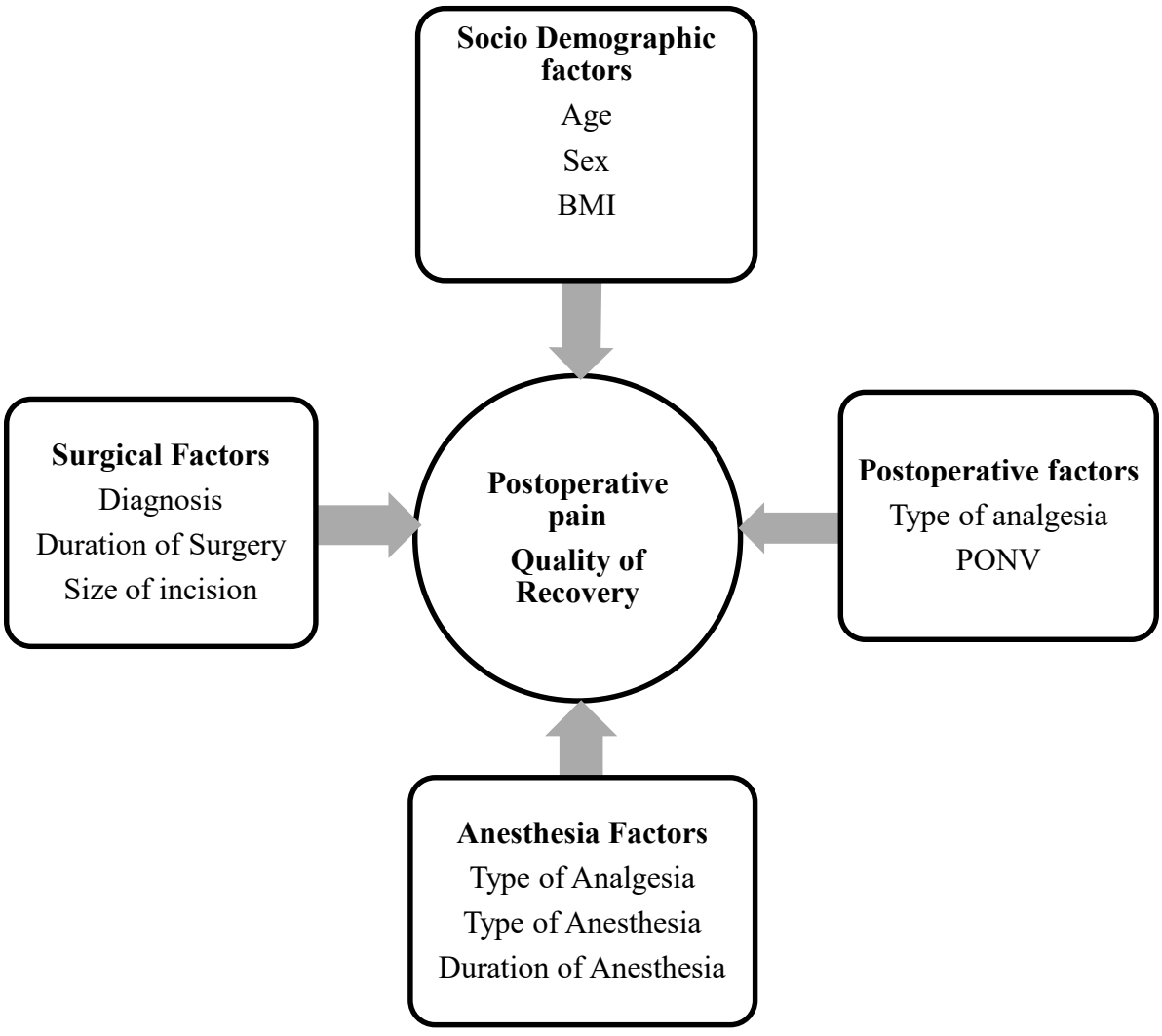


Figure 1 Conceptual framework developed by the investigator based on literatures (15–17,26,36,48)

# 3. OBJECTIVES

## 3.1. General Objective

The general objective of the study was to assess the effectiveness of Ultrasound-guided Rectus Sheath Block versus Conventional Systemic Analgesia for Pain control and Quality of Recovery after Midline Laparotomy from July 1 to September 30/2025.

## 3.2. Specific Objectives

- To compare the mean postoperative pain severity score by the Numeric Rating Scale between exposed and non-exposed groups during the first 24 hours.
- To compare the mean time (in minutes) until first analgesic request between the exposed and non-exposed groups during the first 24 hours.
- To compare total postoperative analgesic consumption within the first 24 hours between the exposed and non-exposed groups.
- To compare the mean Quality of Recovery score by the QoR-15 between the exposed and non-exposed groups at 24 hours.

# 4. METHODS

## 4.1. Study area

The study was conducted at Asella Referral and Teaching Hospital (ARTH), one of the federal referral hospitals located in Arsi Zone, Oromia Region, southeastern Ethiopia, approximately 159km from the capital city, Addis Ababa. Since its establishment in 1964, the hospital has been providing services to a catchment population of about 5.2 million people. It provides surgical, medical, gynecological, obstetrical, pediatric, maxillofacial, urologic, plastic, ENT, Anesthesia (including ICU), dental, ophthalmologic, psychiatric, and dermatologic services. The operating theatre has five functional tables for emergency and elective surgical, gynecologic, pediatric, orthopedic, cesarean section, and neurosurgical procedures. The availability of a large number of abdominal surgeries, the absence of a postoperative pain management protocol, the presence of trained staff and necessary equipment, and the routine practice of rectus sheath block made the setting suitable for conducting the study.

## 4.2. Study design and period

A prospective cohort study was conducted from July 1/2025, to September 30/2025.

## 4.3. Source and study population

### *4.3.1 Source Population*

All adult patients who underwent midline incision laparotomy at the study setting were the source population.

### *4.3.2 Study Population*

Selected patients who underwent midline incision laparotomy during the study period who fulfilled the inclusion criteria were the study population.

### *4.3.3 Study Unit*

Each individual patient selected for data collection was the study unit

Inclusion criteria:-

Patient's aged 18 years and above

Patients with American Society of Anesthesiologists (ASA) physical status I and II

Patients who underwent midline laparotomy under general anesthesia

Exclusion criteria:-

Patients who received a combination of TAP and RSB

Patients who received both Bupivacaine and Lidocaine for RSB

Patients who received strong opioids during the immediate postoperative period

Morbidly obese patients (BMI $\geq$40kg/m$^2$)

Patients with chronic opioid dependence

Patients with severe renal failure

Patients who required emergency re-laparotomy

## 4.4. Sample size determination and Sampling procedures

### *4.4.1 Sample size determination*

In this study, which involved two independent groups, the sample size for each group was calculated based on the mean difference in VAS scores between the two groups, using data from a previous study conducted in Gondar. The calculation was performed using two outcome variables, and the larger sample size was selected for recruiting study participants, with mean ± SD values of 3.54 ± 0.98 and 4.13 ± 0.76 for the two groups, respectively (14).

$$n = \frac{(\sigma 1^2 + \sigma 2^2) \times (\alpha/2+\beta)^2}{(\mu 1 - \mu 2)^2}$$

Where n = the sample size in each of the groups

$\mu 1$ = population mean in RSB group

$\mu 2$ = population mean in non-exposed group

$\mu 1 - \mu 2$ = the mean difference between two groups

$\sigma^2$ = population variance ($SD^2$)

$\alpha$ = alpha =0.05, which is 1.96

β = power = 0.80, which is 0.842 from the above literature the mean VAS score, μ1= 3.54 in RSB group, μ2= 4.13 in non-exposed group and σ1 = 0.98, σ2 = 0.76 Substituting for these variable gives:-

$$n = \frac{(0.98^2+0.76^2) \times (1.96+0.842)^2}{(3.54-4.13)^2}$$

n = 35, using a 1:1 ratio between groups, a total of 70 patients was required. By adding a 10% non-respondent rate, the total required sample size was 78.

*4.4.2 Sampling procedures*

A systematic random sampling technique was used to select participants among the source population. A sample survey was done using the last three months' document review to estimate the average number of procedures that can be carried out in the setting within a month. Based on the findings, one hundred and fifty (150) cases of midline incision laparotomy were performed during the study period. To implement systematic sampling, a sampling interval (k) was calculated by dividing the estimated surgery by sample size (N/n), and an interval of two (2) was used to select participants. To get the first participant, the lottery method was utilized. Patients were categorized as exposed and non-exposed groups based on their exposure status and a separate code given by the intraoperative data collectors, Anesthetists. Meanwhile, the postoperative data collectors were unaware of the exposure status of the groups. The exposure status of the patients was determined based on the independent choice of the responsible anesthetist.

## 4.5. Study variables

*4.5.1 Dependent variables*

Postoperative pain assessed by NRS
First analgesia request time
Total Analgesic consumption within 24 hours
Quality of recovery

*4.5.2 Independent variables*

Socio-demographic factors: Age, Sex, BMI, ASA physical status.
Surgical factors: diagnosis, duration of surgery, size of skin incision
Anesthesia factors: duration of Anesthesia, type of intraoperative Anesthesia and analgesia.
Postoperative factors: The study groups (RSB and CSA), PONV

## 4.6. Operational definition

**Postoperative pain:** Numeric Rating Scale (NRS) above zero, recorded at different time intervals after surgery (2).

**Quality of recovery:** measured in 15-item tool; each rated on an 11-point numerical scale from 0 (Poor) to 10 (Excellent), covering five dimensions: Physical comfort, Emotional state, Physical independence, Psychological support, and Pain. Each item is scored individually, and the total score ranges from 0 (poorest recovery) to 150 (best possible recovery) (42).

**Time for first analgesia request:** The duration, measured in minutes immediately after administration of either rectus sheath block or conventional systemic analgesia, to the time when the patient first requests additional analgesia (14).

**Effectiveness**: When postoperative pain is less than four in NRS and Patients who have a higher QoR-15 score (49,50).

**Midline laparotomy:** a vertical incision that extends both above and below the umbilicus, which allows wide access to the most abdominal cavities and needs early intervention (17).

**Exposed Group:** Patients who received a bilateral rectus sheath block as part of their postoperative analgesic regimen during the postoperative period.

**Non-Exposed Group:** Patients who received a conventional type of systemic analgesia as their primary postoperative pain management during the postoperative period.

**Conventional systemic analgesia:** refers to the routine postoperative pain management method using systemic administration of analgesic medications such as intravenous or intramuscular opioids and/or non-opioid analgesics, without the use of regional or nerve block techniques (10).

**NRS:** A valid pain intensity assessment tool that involves asking a patient to rate his pain from 0-10 (11-point scale), 0 means “no pain” and 10 means “the worst possible pain”.

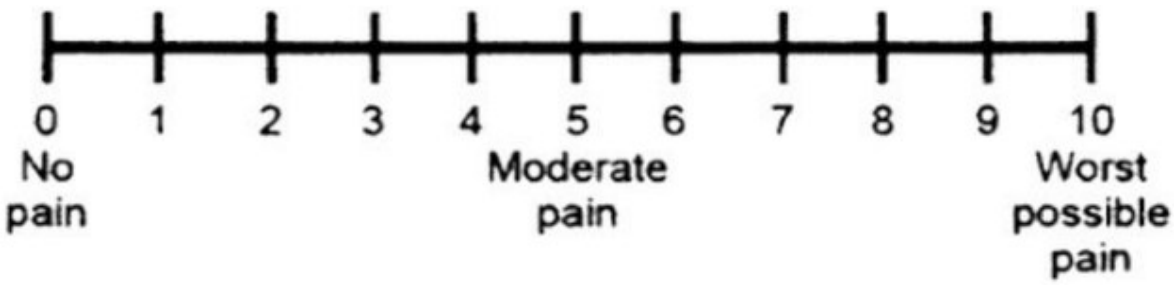


Figure 2 NRS- Adopted from the National Initiative on Pain Control™ (NIPC™)

## 4.7. Data collection procedures

Before starting the actual data collection, training was given to the data collectors. A pretest of tools and questionnaires was made on 10% of the sample in Adama Health and Medical College. Data were gathered through a structured questionnaire using Kobo Toolbox from the charts and patients who fulfilled the inclusion criteria. Data was collected by five data collectors (three postgraduate Anesthetist students for intraoperative data and two BSc Nurses for postoperative data, who are working outside of the operating room).

The trained Anesthetists collected demographic data from patients' charts and intraoperative data, including diagnosis, size of skin incision, duration of surgery and anesthesia, type of anesthesia, and baseline NRS immediately upon admission to the PACU. The Anesthetists also identified the exposure status of each patient and assigned a separate code. The second data collectors, who were unaware of the patients' exposure status, collected postoperative data including NRS pain score, time to first analgesia request, type and amount of analgesia consumed, incidence of nausea and vomiting, and quality of recovery using QoR-15 questionnaire. These data were obtained from the follow-up chart and directly from the patients over a 24-hour period. The data collection process was supervised by one MSc anesthetist.

In our setting, ultrasound-guided rectus sheath block is routinely performed in the Post Anesthesia Care Unit by postgraduate anesthesia students under the direct supervision of Senior Anesthetists/Anesthesiologists. For the RSB group, patients who received an ultrasound-guided bilateral rectus sheath block with 20 mL of 0.25% bupivacaine on each side were included, whereas for the CSA group, patients who received conventional postoperative analgesia based on routine postoperative pain management techniques were included. Analgesia consisted of an intramuscular injection of diclofenac 75 mg in the PACU before transfer to the ward. Thereafter, diclofenac and tramadol were administered upon patient request, with additional rescue analgesia using intravenous morphine boluses if the NRS score exceeded 4.

## 4.8. Data analysis procedure

After the completion of data collection, the variables were coded and cleaned. Data entry, cleaning and analysis were performed on SPSS version 26. Stata version 14 and Microsoft Excel were used to draw graphs and charts. The Shapiro-Wilk normality test was used to assess the normality of the distribution of dependent variables. Homogeneity of variance was assessed using Levene's test for equality of variances. An independent sample t-test was used for the numerical variable, and the results were expressed as mean ± standard deviation (SD). Categorical data were summarized as frequencies and percentages, and associations between independent and dependent variables were analyzed using the chi-square ($\chi 2$) test or Fisher's exact test as appropriate. The Mann-Whitney U test was applied for non-parametric data and presented as median (Interquartile range, IQR). A P-value of $< 0.05$ at a 95% confidence interval was considered statistically significant.

## 4.9. Data quality assurance

Before actual data collection, a pretest was conducted on 10% of the sample size to evaluate the effectiveness of the data collection tool and questionnaire. Training was given to data collectors, and data were collected and recorded using the prepared format. The completed questionnaires were checked for their accuracy, clarity, and consistency. In case of ambiguity or incompleteness, corrections were made accordingly. The completeness of the questionnaires was reviewed and supervised daily by the principal investigator.

## 4.10. Ethical Consideration

This study was conducted in line with the principles of the Declaration of Helsinki (51) and was approved by the Ethical Committee of Arsi University, College of Health Sciences (Approval No. CoHS/R/189/2025). Participation was voluntary and anonymous. The purposes of the study and the research methods used were explained to the participants before they made a final decision to participate. Participants who agreed to participate signed an informed consent form and were informed that they could withdraw from the study at any point, despite having given written consent. The confidentiality of participant information was maintained throughout the study, and participants' safety was ensured by avoiding any potential harm.

## 4.11. Dissemination plan

The findings of the study will be presented to the Department of Anesthesia as part of MSc. thesis requirement. In addition, the result will be disseminated to the Ethiopian Society of Anesthetists to serve as an input for improving quality of patient care and to encourage further research in this area. Finally, it will be sent to high impact reputable journals for publication purposes.

# 5. RESULT

## 5.1 Demographic characteristics

A total of 78 patients who underwent midline incision laparotomy were included in this study. From them, 39 patients received bilateral rectus sheath block (Exposed to BRSB), during the postoperative period, and 39 patients were managed with conventional systemic analgesia (Non-Exposed). No statistically significant differences were observed among the groups with respect to age, sex, BMI, and ASA status (Table 1).

**Table 1: Demographic characteristics of patients who underwent midline laparotomy at Asella Referral and Teaching Hospital, Asella, 2025**

| **Variables** | **Exposed, BRSB (n=39)** | **Non-Exposed, CSA (n=39)** | **P value** |
|---|---|---|---|
| **Age, year, mean±SD** | 47.7 ± 14.3 | 44.9± 13.4 | .363 |
| **Sex, n (%)** | | | |
| Male | 30 (76.9) | 28 (71.8) | .604 |
| Female | 9 (23.1) | 11 (28.2) | |
| **BMI, Kg/M², mean±SD** | 22.1± 2.1 | 21.8± 1.9 | .496 |
| **ASA Physical status, n (%)** | | | |
| I | 21 (53.9) | 23 (59) | .648 |
| II | 18 (46.1) | 16 (41) | |
| **Surgery type, n (%)** | | | |
| Emergency | 24 (61.5) | 25 (64.1) | .815 |
| Elective | 15 (38.5) | 14 (35.9) | |

*Independent t-test for mean±SD, and fisher's exact test for number n (%)*

## 5.2 Intraoperative Characteristics of patients

There were no statistically significant differences between the Exposed (BRSB) and Non-Exposed (CSA) groups regarding patient diagnosis, induction agent, inhalational agent, intraoperative analgesia, skin incision size, the duration of surgery and anesthesia (Table 2).

**Table 2: Intraoperative Characteristics of patients who underwent midline laparotomy at Asella Referral and Teaching Hospital, Asella, 2025**

| Variables | Exposed, BRSB (n=39) | Non-Exposed, CSA (n=39) | P value |
|---|---|---|---|
| **Diagnosis, n (%)** | | | .342 |
| Small bowel Obstruction | 6 (15.4) | 8 (20.5) | |
| Large bowel Obstruction | 6 (15.4) | 4 (10.3) | |
| Colostomy reversal | 4 (10.3) | 8 (20.5) | |
| Hernia (Epigastric, Incisional) | 8 (20.5) | 6 (15.4) | |
| Perforated Appendicitis | 4 (10.3) | 8 (20.5) | |
| Perforated PUD | 7 (17.8) | 2 (5.1) | |
| Others | 4 (10.3) | 3 (7.7) | |
| **Type of induction Agent, n (%)** | | | .621 |
| Ketamine | 14 (35.9) | 16 (41) | |
| Ketofol | 21 (53.8) | 17 (43.6) | |
| Propofol | 4 (10.3) | 6 (15.4) | |
| **Inhalational Agent, n (%)** | | | .810 |
| Isoflurane | 27 (69.2) | 25 (64.1) | |
| Halothane | 12 (30.8) | 14 (35.9) | |
| **Intraoperative Analgesia, n (%)** | | | .640 |
| Pethidine | 23 (58.9) | 26 (66.7) | |
| Morphine | 16 (41.1) | 13 (33.3) | |
| **Skin incision size, CM, Mean±SD** | 13.9±3.1 | 13.4±2.6 | .428 |
| **Duration of Surgery, Min, Mean±SD** | 132.7±65.69 | 136.2±63.65 | .814 |
| **Duration of Anesthesia, Min, Mean±SD** | 144±68.16 | 147±65.49 | .845 |

***Hint:*** *Chi-square or fisher's exact test for number (%) and Independent t-test for mean±SD:*
***Others:*** *Sigmoidectomy, Blunt abdominal Injury, Myomectomy*

### 5.3 Comparison of postoperative pain severity by numeric pain rating scale

The mean Numerical Rating Scale pain scores between groups were comparable at baseline and at 30 minutes postoperatively (p>.05). Statistically significant differences in mean pain scores between groups were observed at the first 10 hours postoperatively. The Non-Exposed group reported higher mean pain scores compared with the Exposed group at 1 hour (2.38±0.81 vs. 1.92±1.06, p=.034), 2 hours (2.77±0.98 vs. 2.18±1.02, p=.011), 4 hours (3.49±1.05 vs. 2.79±0.89, p=.002), and 6 hours (5.26±1.23 vs. 3.21±0.77, p<.001). The BRSB group's mean NRS pain score was lower than the CSA group's for the first six hours postoperatively. At 8 hour, the NRS of the RSB group (4.15±1.27) was slightly higher, indicating that the effect of nerve block had begun to wear off. The CSA group, on the other hand, required their first rescue analgesia at 6 hours. At the 10-hour mark, the BRSB group's mean NRS score of (5.31) was statistically significantly higher than the CSA group's (4.51), coinciding with the time when most patients requested their first rescue analgesia (Table 3).

**Table 3: Comparison of postoperative pain severity by numeric pain rating scale among patients who underwent midline laparotomy at Asella Referral and Teaching Hospital, Asella, 2025**

| Variables | Exposed, BRSB (n=39) | Non-Exposed, CSA (n=39) | P value |
|---|---|---|---|
| **NRS baseline** | 1.18±0.82 | 1.36±1.01 | .393 |
| **NRS at 30 min** | 1.74±0.85 | 2.05±0.76 | .096 |
| **NRS at 1 hr.** | 1.92±1.06 | 2.38±0.81 | .034* |
| **NRS at 2 hr.** | 2.18±1.02 | 2.77±0.98 | .011* |
| **NRS at 4 hr.** | 2.79±0.89 | 3.49±1.05 | .002** |
| **NRS at 6 hr.** | 3.36±0.74 | 5.26±1.23 | < .001** |
| **NRS at 8 hr.** | 4.15±1.27 | 3.41±0.72 | .002** |
| **NRS at 10 hr.** | 5.31±1.31 | 4.51±1.19 | .006** |
| **NRS at 12 hr.** | 3.05±1.21 | 3.62±1.61 | .084 |
| **NRS at 24 hr.** | 3.44±0.88 | 3.74±1.09 | .175 |

*Independent t-test for mean±SD, * Significant, ** Highly Significant*

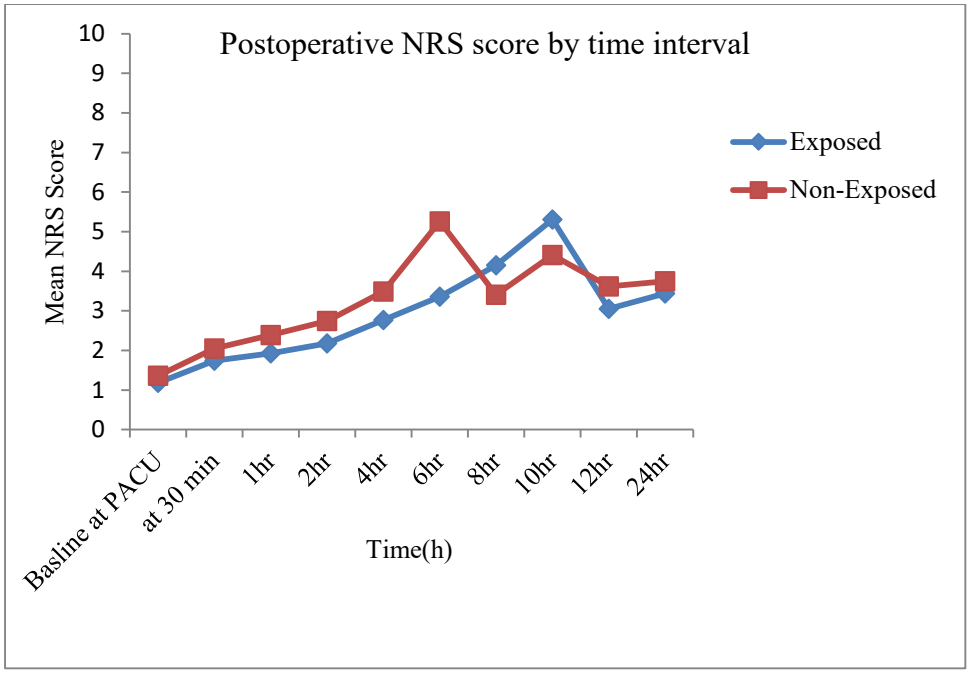


**Figure 3: Line graph showing mean NRS score over time between groups**

The highest postoperative pain intensity was experienced at 6 hours in the non-exposed group, whereas the exposed group experienced peak postoperative pain at 10 hours, as measured by the mean NRS score. The greatest between-group difference occurred at 6 hours, when the RSB group had a mean pain score of 3.36±0.74 compared with 5.26±1.23 in the CSA group.

## 5.4 Total Analgesia consumption within 24hours period among the groups

Total analgesia requirements within 24 hours for diclofenac, tramadol, and morphine were statistically significantly different between the groups (P<.05). Patients in the exposed group received significantly lower doses of diclofenac compared to those in the non-exposed group, with a median dose of 75 mg (IQR: 75–150 mg) versus 150 mg (IQR: 75–225 mg), respectively (p<.001). Similarly, tramadol consumption was lower in the exposed group, with a mean dose of 94.23 ± 32.64 mg compared to 161.54 ± 54.36 mg in the non-exposed group, mean difference 67.31 mg (95% CI: 43.55–91.07 mg; p<.001). Morphine consumption also differed significantly between the groups, with the exposed group receiving a median dose of 3 mg (IQR: 2–4 mg) compared to 5 mg (IQR: 4–6 mg) in the non-exposed group (p = .003) (Table 4).

**Table 4: Total analgesic consumption within 24hr between groups of patients who underwent midline laparotomy at Asella Referral and Teaching Hospital, Asella, 2025**

| Variables | Exposed, BRSB (n=39) | Non-Exposed, CSA (n=39) | P value |
|---|---|---|---|
| **Diclofenac, mg** | 75(75-150) | 150( 75-225) | <.001[a]** |
| **Tramadol, mg** | 94.23±32.64 | 161.54 ± 54.36 | <.001** |
| **Morphine, mg** | 3 (2-4) | 5 (4-6) | .003[a]** |

*Data presented as (mean ± SD), median (interquartile range) ** indicates significant,*

*[a]indicates Mann-Whitney U test*

## 5.5 Comparison of time to first analgesia request between groups

To further assess the difference in time to first analgesia request between the groups, we used the Kaplan-Meier estimation technique. Figure 4 shows that there were differences among survival curves between the two groups in terms of time to first analgesia request. Based on the log-rank test ($\chi^2$ = 89.71, df =1, p<.001), the non-exposed group had a significantly shorter mean time to first analgesia request compared with the exposed group (302.05 minutes [95% CI: 289.2–314.9] vs. 579.23 minutes [95% CI: 557.7–600.8], respectively. The mean difference between groups was 277.18 minutes (95% CI: 251.67–302.69; p<.001), indicating a statistically significant delay in the time to first analgesia request among patients who received BRSB.

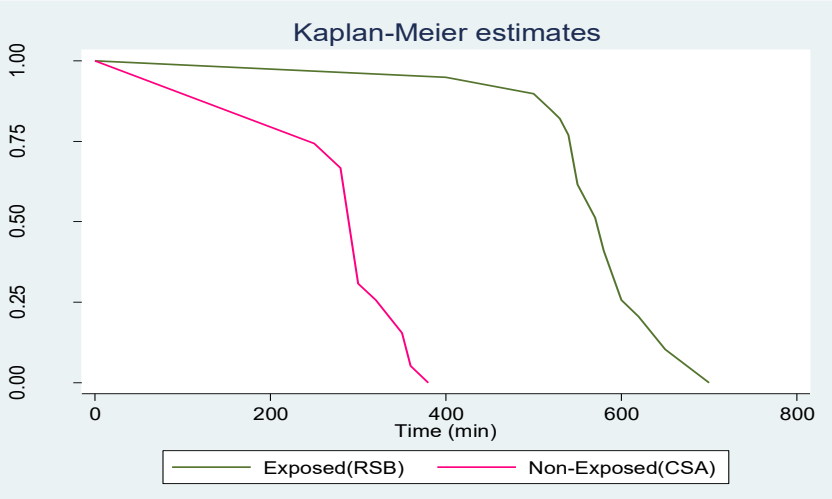


**Figure 4: Kaplan-Meier estimates of time to first analgesia request**

Figure 4: Kaplan-Meier estimates of time to first analgesia request Shows Kaplan-Meier curve analysis comparing groups. The X-axis shows the time for the first rescue analgesic requirement in minutes. The Y-axis shows the proportion of patients who did not require rescue analgesics. The average time to request the first rescue analgesic was prolonged in the RSB group compared to the CSA group.

### 5.6 Incidence of Nausea and Vomiting

The incidence of postoperative nausea and vomiting over 24 hours in the RSB group, it was 17(43.5%) and 6(15.4%), while in the non-exposed group was 21(53.8%) and 9(23.1%), respectively (p value: .237) (Figure 5).

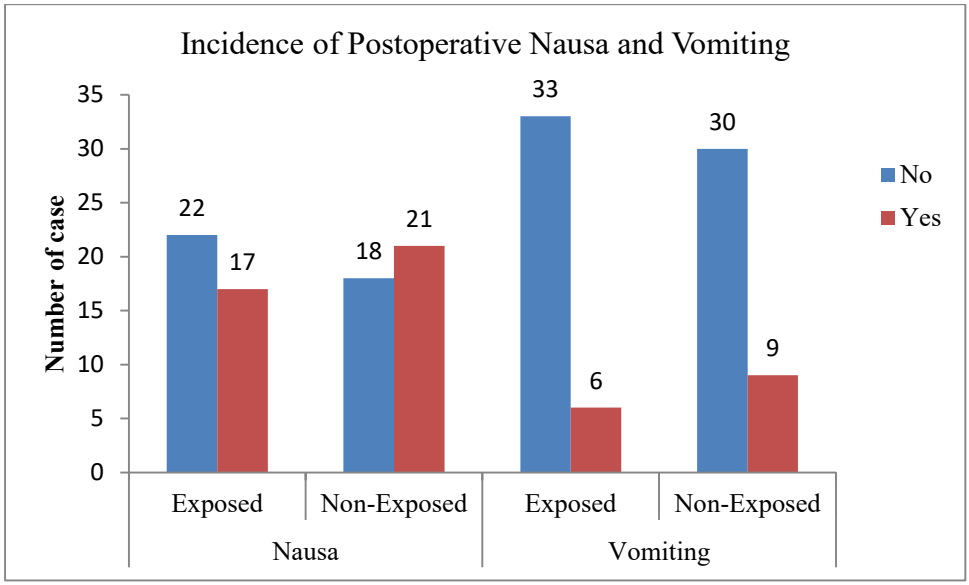


**Figure 5: Incidence of Nausea and Vomiting between the two groups**

### 5.7 Comparison of Quality of recovery using QoR-15 between groups

The analysis of Quality of Recovery (QoR-15) scores revealed statistically significant differences between the Exposed (BRSB) and Non-Exposed (CSA) groups. The Exposed group demonstrated better recovery quality across multiple domains. The total QoR score was significantly higher in the Exposed group, with a mean of 111.15±7.07, compared with 94.03±7.15 in the Non-Exposed group. The mean difference between groups was 17.13 (95% CI: 13.92–20.34; p<.001), indicating a statistically significant improvement in overall recovery quality among patients who received BRSB (Table 5).

**Table 5: Comparison of quality of recovery (QoR-15) between patients who underwent midline laparotomy at Asella Referral and Teaching Hospital, Asella, 2025**

| QoR- 15 Items | Exposed, BRSB (n=39) | Non-Exposed, CSA (n=39) | P value |
|---|---|---|---|
| **Able to breath easily** | 9.23±0.91 | 7.85±0.81 | <.001** |
| **Been able to enjoy food** | 5.92±1.84 | 5.21±1.59 | .069 |
| **Feeling Rested** | 8.05±1.78 | 6.00±1.05 | <.001** |
| **Have had a good sleep** | 7.21±1.85 | 5.13±1.51 | <.001** |
| **Able to look after personal toilet and hygiene unaided** | 6.15±1.64 | 5.26±1.62 | .018* |
| **Able to communicate with family and friends** | 8.15±1.58 | 7.56±1.64 | .110 |
| **Getting support from hospital Doctors and Nurses** | 6.36±1.84 | 5.44±1.65 | .022* |
| **Able to return work or usual home activities** | 4.08±1.36 | 3.64±1.41 | .169 |
| **Feeling comfortable and in control** | 8.15±1.74 | 6.11±1.14 | <.001** |
| **Having a feeling of general wellbeing** | 8.21±1.24 | 7.59±1.39 | .042* |
| **Moderate pain** | 7.33±1.44 | 6.08±1.53 | <.001** |
| **Severe pain** | 9.38±1.01 | 9.05±0.85 | .116 |
| **Nausea or vomiting** | 7.62±1.84 | 6.91±1.88 | .094 |
| **Feeling Worried or anxious** | 6.72±1.86 | 6.15±1.65 | .161 |
| **Feeling Sad or depressed** | 8.59±0.98 | 6.18±1.23 | <.001** |
| **Total QoR** | 111.15±7.07 | 94.03±7.15 | <.001** |

*Data presented as mean±SD, QoR – Quality of recovery, * indicates significant and ** indicates highly significant*

There were statistically significant differences in the mean quality of recovery score between the two groups in terms of all five domains: Comfort (7.96±1.93 vs. 6.87±1.74, P<.001), Emotional state (7.92±1.65 vs. 6.51±1.49, P<.001), Pain (8.36±1.61 vs. 7.56±1.94, P=.006), Physical independence (5.12±1.83 vs. 4.40±1.72, P=.013), and Psychological support (7.26±1.93 vs. 6.51±1.95, P=.016), as shown in Figure 6.

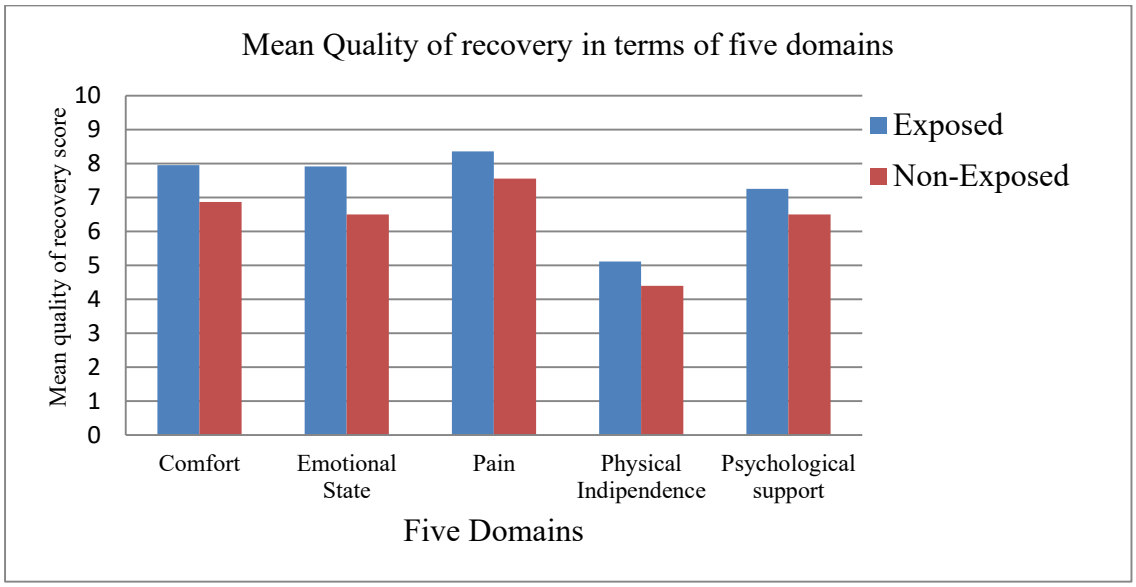


**Figure 6: Clustered bar graph displaying mean QoR in terms of the five dimensions between groups**

# 6. DISCUSSION

The current prospective cohort study evaluated the effectiveness of ultrasound-guided bilateral rectus sheath block compared with conventional systemic analgesia in patients who underwent midline incision laparotomy. The main findings of the result revealed that U/S guided BRSB significantly reduced postoperative pain scores, delayed the time to first analgesic request, lowered total analgesic consumption, and improved the quality of recovery (QoR) when compared with Conventional systemic analgesia.

Our study demonstrated that patients who received BRSB had significantly lower Numeric Rating Scale scores at multiple postoperative times, particularly at 1, 2, 4, and 6 hours. RSB provides a dense somatic block of the incisional site, blocking pain signals from the cutaneous and muscle layers of the abdominal wall. Since pain after midline laparotomy is largely somatic, this targeted blockade markedly attenuates afferent nociception, resulting in reduced systemic opioid requirements. These findings align with a previous study conducted by Bashandy and Elkholy (2014), who reported reduced opioid consumption and pain scores in patients undergoing abdominal cancer surgery with midline incisions. Similarly, Teshome et al. (2021) found that RSB significantly lowered pain scores and tramadol consumption in emergency midline laparotomy patients (17,18).

Our result finding is also consistent with a study conducted in India on 60 patients, who found that ultrasound-guided rectus sheath block is more effective than conventional types of postoperative analgesia in midline laparotomies, as evidenced by lower postoperative opioid consumption and reduced VAS score (48). RSB has also been found to be superior to local anesthesia infiltration for postoperative analgesia in umbilical hernia repair (31).

In contrast to our findings, Kitamura et al. (2022) found that local anesthetic infiltration provided better pain relief than RSB in laparoscopic cholecystectomy. These discrepancies may be attributed to the fact that they compared two different doses of local anesthetics using two different techniques, while we compared RSB with conventional analgesia. Differences in surgical procedures, anesthetic techniques, and the timing of block administration may also have contributed to the observed differences (21).

A systematic review with meta-analysis of eight randomized controlled trials (RCTs) also contradicts our result in terms of RSB reducing postoperative pain intensity and opioid consumption. They found no evidence supporting RSB's effectiveness in improving pain control or delaying the need for analgesics. This may be explained by the presence of technique variations among the included studies. Additionally, comparisons between laparoscopic and open surgeries, as well as differences in the doses and regimens of general and local anesthetics, could have influenced their outcomes (28).

The delayed time to first analgesia request in the BRSB group further supports the analgesic effectiveness of the rectus sheath block. Our finding is slightly higher than those reported in a previous study conducted in Ethiopia (14). This variation may be attributed to differences in population characteristics and the use of real-time ultrasound-guidance for local anesthetic deposition in the current study. However, our result aligns with a study conducted in India involving 60 adult patients, who demonstrated that ultrasound-guided BRSB prolonged the time to first analgesia request for more than ten hours (48).

In our study, RSB was effective in reducing 24-hour diclofenac, tramadol, and morphine consumption as an opioid-sparing pain management technique. This is important to minimize opioid-related adverse effects and dependency. The result aligns with previous studies, which reported that RSB can reduce pain in the early postoperative period, with beneficial effects reported after various abdominal surgeries (16,18,29,45,47).

In the current study, patients in the BRSB group reported significantly higher total QoR-15 scores than the non-exposed, indicating better overall recovery. Also, the RSB groups experienced better recovery quality in terms of the five Domains of QoR-15. Mean scores of Physical comfort, Emotional state, pain, psychological independence and Physical independence were higher in the Exposed group. This indicates that RSB may enhance recovery quality by decreasing postoperative pain, increasing sleep quality, and minimizing PONV. But in our study, there was no significant difference observed in terms of PONV. In summary, these findings suggest that RSB may be a promising postoperative analgesic strategy to promote early recovery and minimize the consumption of systemic analgesia without increasing the incidence of adverse effects.

Myles reported a change of 8 in QoR-15 score can indicate a meaningful change in health status, which was known as minimal clinically important difference (MCID). A mean difference of 17 between exposed and non-exposed groups of QoR-15 score in the current study has exceeded the MCID (52). Our results suggest that RSB significantly improves the postoperative health status after midline laparotomy. In line with our findings, Cheng et al. (2024) similarly found in their RCT of 90 patients, preoperative RSB improve QoR-40 scores, reduces intraoperative opioid use, and enhances patient satisfaction in gynecological surgeries (15).

A comparative RCT study done in Egypt on 52 patients was also comparable with our result. They found that ultrasound-guided rectus sheath block is more effective than patient-controlled analgesia with opioids in providing a higher quality of recovery profile in midline laparotomies, as evidenced by lesser postoperative morphine consumption, and low numeric pain scale scores (45).

Finally, our results confirm the contribution of ultrasound-guided RSB as a valuable, safe, effective, and opioid-sparing component of multimodal analgesia for midline laparotomies. RSB meets and supports the integration of recent perioperative targets as it achieves the important objective of improving the quality of recovery after surgery by significantly reducing pain scores after laparotomy, increasing the time to rescue analgesia, reducing the total amount of analgesics used, and improving overall recovery.

# 7. STRENGTH AND LIMITATION OF THE STUDY

## 7.1 Strength of the study

To the best of our knowledge, this is the first study conducted in the setting and in Ethiopia to assess the combined effect of real-time ultrasound-guided RSB on postoperative pain and quality of recovery. Its findings provide relevant evidence that supports the integration of ultrasound-guided rectus sheath block into routine postoperative pain management, potentially improving patient outcomes and reducing systemic analgesia consumption. We used validated and multidimensional outcome measures to evaluate pain control and recovery. The postoperative data collectors were unaware of group allocation, minimizing observer bias in subjective outcomes such as NRS and QoR-15. The use of ultrasound guidance for the RSB group strengthens the internal validity within the group.

## 7.2 Limitation

Our study has some limitations. First, we assessed pain only at rest, which may underestimate pain during movement. Second, the nerve block was given by different Anesthetists, which may introduce variability in technique and outcomes. Third, patient hemodynamics status was not assessed, considering it would be affected by anesthetic agents and intraoperative blood loss in addition to pain; we also followed patients only for 24 hours postoperatively, potentially missing delayed complications and readmissions. Finally, the study was conducted at a single Center, which may limit the generalizability of the findings to broader populations.

# 8. CONCLUSION AND RECOMMENDATION

## 8.1 Conclusion

Our study showed that adding bilateral U/S-guided RSB in the postoperative period provides superior postoperative pain control, prolongs the need for rescue analgesia, and enhances recovery quality compared with conventional systemic analgesia for patients undergoing midline laparotomy.

## 8.2 Recommendation

Based on the current finding we recommend:-

To integrate ultrasound-guided bilateral RSB into the institution's standard multimodal analgesia protocol for midline laparotomies to reduce opioid consumption and enhance early recovery.

To conduct a multi-center randomized controlled trial comparing ultrasound-guided RSB with other techniques, such as TAP with RSB blocks, and thoracic epidural in patients undergoing midline laparotomy.

References


1. Chou R, Gordon DB, Leon-Casasola OA de, Rosenberg JM, Bickler S, Brennan T, et al. Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. J Pain. 2016 Feb 1;17(2):131–57.

2. Kehlet H, Jensen TS, Woolf CJ. Persistent postsurgical pain: risk factors and prevention. The Lancet. 2006 May 13;367(9522):1618–25.

3. Gan TJ, Habib AS, Miller TE, White W, and JLA. Incidence, patient satisfaction, and perceptions of post-surgical pain: results from a US national survey. Curr Med Res Opin. 2014;30(1):149–60.

4. Chalya PL, Massinde AN, Kihunrwa A, Mabula JB. Abdominal fascia closure following elective midline laparotomy: a surgical experience at a tertiary care hospital in Tanzania. BMC Res Notes. 2015 June 30;8(1):281.

5. Rucklidge M, Beattie E. Rectus sheath catheter analgesia for patients undergoing laparotomy. BJA Educ. 2018 June;18(6):166–72.

6. Deerenberg EB, Henriksen NA, Antoniou GA, Antoniou SA, Bramer WM, Fischer JP, et al. Updated guideline for closure of abdominal wall incisions from the European and American Hernia Societies. Br J Surg. 2022 Nov 22;109(12):1239–50.

7. Coppes OJM, Yong RJ, Kaye AD, Urman RD. Patient and Surgery-Related Predictors of Acute Postoperative Pain. Curr Pain Headache Rep. 2020 Feb 18;24(4):12.

8. Yang MMH, Hartley RL, Leung AA, Ronksley PE, Jetté N, Casha S, et al. Preoperative predictors of poor acute postoperative pain control: a systematic review and meta-analysis. BMJ Open. 2019 Apr 1;9(4):e025091.

9. G. B, C. V, Sc S, A. S. B, Vs K, N RK, et al. Postoperative analgesia following elective abdominal surgery: a prospective observational study. Int Surg J. 2017 July 24;4(8):2710.

10. Cheung CK, Adeola JO, Beutler SS, Urman RD. Postoperative Pain Management in Enhanced Recovery Pathways. J Pain Res. 2022;15:123–35.

11. Brat GA, Agniel D, Beam A, Yorkgitis B, Bicket M, Homer M, et al. Postsurgical prescriptions for opioid naive patients and association with overdose and misuse: retrospective cohort study. BMJ. 2018 Jan 17;360:j5790.

12. Shafi S, Collinsworth AW, Copeland LA, Ogola GO, Qiu T, Kouznetsova M, et al. Association of Opioid-Related Adverse Drug Events With Clinical and Cost Outcomes Among Surgical Patients in a Large Integrated Health Care Delivery System. JAMA Surg. 2018 Aug 1;153(8):757–63.

13. Rahiri J, Tuhoe J, Svirskis D, Lightfoot NJ, Lirk PB, Hill AG. Systematic review of the systemic concentrations of local anaesthetic after transversus abdominis plane block and rectus sheath block. Br J Anaesth. 2017;118(4):517–26.

14. Assessment of the analgesic effectiveness of rectus sheath block in patients who had emergency midline laparotomy: Prospective observational cohort study. Int J Surg Open. 2020 Jan 1;24:27–31.

15. Cheng C, Wang J, Cao Y, Gu E, Liu X. Effect of Rectus Sheath Block on Postoperative Quality of Recovery After Transabdominal Midline Gynecological Surgery: A Randomized Controlled Trial. J Pain Res. 2024;17:2155–63.

16. Ibrahim M, El Shamaa H, Ads E. Efficacy of combined ultrasound guided anterior and posterior rectus sheath block for postoperative analgesia following umbilical hernia repair: Randomized, controlled trial. Egypt J Anaesth. 2016;32(4):519–26.

17. Teshome D, Hunie M, Essa K, Girma S, Fenta E. Rectus sheath block and emergency midline laparotomy at a hospital in Ethiopia: A prospective observational study. Ann Med Surg. 2021 Aug 1;68:102572.

18. Bashandy GMN, Elkholy AHH. Reducing Postoperative Opioid Consumption by Adding an Ultrasound-Guided Rectus Sheath Block to Multimodal Analgesia for Abdominal Cancer Surgery With Midline Incision. Anesthesiol Pain Med [Internet]. 2014 [cited 2025 Apr 17];4(3). Available from: https://brieflands.com/articles/aapm-17396#abstract

19. Melekamayhu A. BILATERAL RECTUS SHEATH BLOCK AS POST-OPERATIVE ANALGESIA FOR PATIENTS UNDERGOING MIDLINE LAPAROTOMY IN MINILK II REFERRAL HOSPITAL, ADDIS ABABA, ETHIOPIA.

20. Wang Y, Li M, Wang Z, Liu W. Use of Bilateral Rectus Sheath Blocks in Open Umbilical Hernia Repair. Pain Physician. 2024;27(2):E239.

21. Kitamura N, Iida H, Maehira H, Mori H, Sada Y, Shimizu T, et al. Postoperative analgesic effect of ultrasound-guided rectus sheath block and local anesthetic infiltration after laparoscopic cholecystectomy: Results of a prospective randomized controlled trial. Asian J Endosc Surg. 2022 Jan;15(1):29–35.

22. Raja SN, Carr DB, Cohen M, Finnerup NB, Flor H, Gibson S, et al. The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. Pain. 2020 Sept 1;161(9):1976–82.

23. Gan TJ. Poorly controlled postoperative pain: prevalence, consequences, and prevention. J Pain Res. 2017 Sept;Volume 10:2287–98.

24. Wick EC, Grant MC, Wu CL. Postoperative Multimodal Analgesia Pain Management With Nonopioid Analgesics and Techniques: A Review. JAMA Surg. 2017 July 1;152(7):691–7.

25. Shim JW, Cho YJ, Kim M, Hong SH, Moon HW, Hong SH, et al. Comparison of analgesic efficacy between rectus sheath blockade, intrathecal morphine with bupivacaine, and intravenous patient-controlled analgesia in patients undergoing robot-assisted laparoscopic prostatectomy: a prospective, observational clinical study. BMC Anesthesiol. 2020 Dec;20(1):291.

26. Maury T, Elnar A, Marchionni S, Frisoni R, Goetz C, Bécret A. Effect of rectus sheath anaesthesia versus thoracic epidural analgesia on postoperative recovery quality after elective open abdominal surgery in a French regional hospital: the study protocol of a randomised controlled QoR-RECT-CATH trial. BMJ Open. 2023 May 23;13(5):e069736.

27. Shields BB, Hu V, Sabouri A, Deng H, Frendl D, McGovern F, et al. Rectus Sheath Block Versus Transversus Abdominis Plane (TAP) Block for Open Retropubic Prostatectomy Analgesia: a Retrospective Study. SN Compr Clin Med. 2020 Dec;2(12):2856–62.

28. Abdildin Y, Tapinova K, Salamat A, Shaimakhanov R, Aitbayev A, Viderman D. Rectus Sheath Block in Abdominal Surgery: A Systematic Review with Meta-Analysis. Romanian J Anaesth Intensive Care. 30(1):43–50.

29. Gupta N, Kumar A, Harish RK, Jain D, Swami AC. Comparison of postoperative analgesia and opioid requirement with thoracic epidural vs. continuous rectus sheath infusion in midline incision laparotomies under general anaesthesia–A prospective randomised controlled study. Indian J Anaesth. 2020;64(9):750–5.

30. Quek KHY, Phua DSK. Bilateral rectus sheath blocks as the single anaesthetic technique for an open infraumbilical hernia repair. Singapore Med J. 2014 Mar;55(3):e39-41.

31. LaguduvaH A, Swaminathan S, Satya Prakash MVS, A M. Comparison of Postoperative Analgesic Efficacy of Ultrasound-Guided Bilateral Rectus Sheath Block With That of Local Anaesthetic Infiltration in Patients Undergoing Emergency Midline Laparotomy Surgeries: A Randomised Controlled Trial. Cureus. 14(11):e31033.

32. Tiruneh A, Tamire T, Kibret S. The magnitude and associated factors of post-operative pain at Debre Tabor compressive specialized hospital, Debre Tabor Ethiopia, 2018. SAGE Open Med. 2021;9:20503121211014730.

33. Jeong HW, Kim CS, Choi KT, Jeong SM, Kim DH, Lee JH. Preoperative versus postoperative rectus sheath block for acute postoperative pain relief after laparoscopic cholecystectomy: a randomized controlled study. J Clin Med. 2019;8(7):1018.

34. Gupta A, Gandhi K, Viscusi ER. Persistent postsurgical pain after abdominal surgery. Tech Reg Anesth Pain Manag. 2011;15(3):140–6.

35. Córcoles-Jiménez MP, Ruiz-García MV, Cervera-Monteagudo B, Bernal-Celestino R, Herreros-Saez ML, Flores-Bautista AB. Postoperative pain intensity and patient satisfaction: A multicentre observational study. Appl Nurs Res ANR. 2025 Feb;81:151898.

36. Eshete MT, Baeumler PI, Siebeck M, Tesfaye M, Haileamlak A, Michael GG, et al. Quality of postoperative pain management in Ethiopia: A prospective longitudinal study. Li Y, editor. PLOS ONE. 2019 May 1;14(5):e0215563.

37. Miyazaki D, Shichinohe T, Ebihara Y, Kurashima Y, Murakami S, Noji T, et al. Laparoscopic-assisted Rectus Sheath Block as a Novel Technique is Effective and Safe: A Randomized Controlled Trial. Surg Laparosc Endosc Percutan Tech. 2017 Feb;27(1):19.

38. Mugita M, Kawahara R, Tamai Y, Yamasaki K, Okuno S, Hanada R, et al. Effectiveness of ultrasound-guided transversus abdominis plane block and rectus sheath block in pain control and recovery after gynecological transumbilical single-incision laparoscopic surgery. Clin Exp Obstet Gynecol. 2014;41(6):627–32.

39. Bulun Yediyildiz M, Yilmaz Ak H, Durmuş İ, Taşkin K, Keles E, Çevik B, et al. Efficacy of ultrasound-guided bilateral rectus sheath block vs. local anesthetic infiltration in gynecologic oncology patients undergoing midline laparotomy: a triple-blinded randomized controlled trial. Minerva Anestesiol. 2025 Mar;91(3):147–54.

40. Nakazawa M, Fukushima T, Shoji K, Momosaki R, Mio Y. Preoperative versus postoperative ultrasound-guided rectus sheath block for acute postoperative pain relief after laparoscopy: A retrospective cohort study. Medicine (Baltimore). 2024 Mar 29;103(13):e37597.

41. Bhatia UV, Panchal MB, Abraham S, Shah C. Ultrasound guided bilateral rectus sheath block for post operative analgesia in patients undergoing umbilical surgeries under GA. A comparative study between bupivacaine, levobupivacaine and Ropivacaine. Indian J Clin Anaesth. 2020;7(1):32–8.

42. Stark PA, Myles PS, Burke JA. Development and Psychometric Evaluation of a Postoperative Quality of Recovery Score: The QoR-15. Anesthesiology. 2013 June;118(6):1332–40.

43. Myles PS, Shulman MA, Reilly J, Kasza J, Romero L. Measurement of quality of recovery after surgery using the 15-item quality of recovery scale: a systematic review and meta-analysis. Br J Anaesth. 2022 June 1;128(6):1029–39.

44. Myles PS, Weitkamp B, Jones K, Melick J, Hensen S. Validity and reliability of a postoperative quality of recovery score: the QoR-40. Br J Anaesth. 2000 Jan;84(1):11–5.

45. Abougabal A, Hamed E, Mannaa A, Nabil N, Badry M. Efficacy of ultrasound guided rectus sheath block on the postoperative quality of recovery in laparotomy surgeries; a randomized control trial. Anaesth Pain Intensive Care. 2024 May 12;28(3):489–94.

46. Cavallaro G, Gazzanelli S, Iorio O, Iossa A, Giordano L, Esposito L, et al. Laparoscopic transversus abdominis plane block is useful in pain relief after laparoscopic stapled repair of diastasis recti and ventral hernia. J Minimal Access Surg. 2023;19(2):207–11.

47. Bakshi S, Mapari A, Paliwal R. Ultrasound-guided rectus sheath catheters: A feasible and effective, opioid-sparing, post-operative pain management technique: A case series. Indian J Anaesth. 2015 Feb;59(2):118–20.

48. C Patel DrV, Mehta DrKH, Patel DrKD. Comparative Study of Ultrasound Guided Modified Rectus Sheath Block With Conventional Post-Operative Analgesia in Lower Abdominal Surgeries. IOSR J Dent Med Sci. 2017 Jan;16(01):54–7.

49. Mazda Y, Jadin S, Khan JS. Postoperative Pain Management. Can J Gen Intern Med. 2021;16(S1):5–17.

50. Campfort M, Cayla C, Lasocki S, Rineau E, Léger M. Early quality of recovery according to QoR-15 score is associated with one-month postoperative complications after elective surgery. J Clin Anesth. 2022;78:110638.

51. World Medical Association. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. JAMA. 2013 Nov 27;310(20):2191–4.

52. Myles PS, Myles DB, Galagher W, Chew C, MacDonald N, Dennis A. Minimal Clinically Important Difference for Three Quality of Recovery Scales. Anesthesiology. 2016 July;125(1):39–45.

# ANNEXES

## 8.1 Annex 1: Information Sheet and Consent Form

Arsi University department of Anesthesia

Dear Participant,

I am Petros Baboker, MSc. students of Arsi University. Currently I'm conducting research on the effectiveness of U/S-guided bilateral rectus sheath block versus conventional systemic analgesia for midline laparotomies. The finding of the research will help to improve the practice of postoperative pain management after Laparotomy. You have been selected as a chance to be one of the participants in this study. Your data will be strictly kept confidential and managed with utmost ethical care. If you are uncomfortable you can discontinue the interview at any time and are not obliged to answer questions that you are not comfortable with. But you are expected to answer the questions based on your experience and being honest with your answers. We appreciate your cooperation to be a part of our study. The interview will take a maximum of 20 minutes.

For further clarity you can contact the investigator by:

Phone: 251935739093

Email: petrosbaboker@gmail.com

Are you willing to participate in the study, please? A) YES B) NO

Thank you in advance your time and participation in this study

## 8.2 Annex 2: Questionnaire

**Section I: Socio Demographic Data**

| Card No: _____ | | Bed No: _____ | | |
|---|---|---|---|---|
| 101 | Age | | | |
| 102 | Sex | | | |
| 103 | Weight | | | |
| 104 | Height | | | |
| 105 | BMI (kg/m²) | | | |
| 106 | ASA PS | | | |

**Section II: Intraoperative Data**

| S. no | Question | Response |
|---|---|---|
| 201 | Type of induction agent | A, Ketamine<br>B, Ketofol,<br>C Propofol |
| 202 | Diagnosis | A, Small bowel Obstruction<br>B, Large Bowel Obstruction<br>C, Perforated Appendicitis<br>D, Blunt Abdominal Injury E, Other Specify |
| 203 | Inhalational Agent | A, Halothane<br>B, Isoflurane |
| 204 | Analgesia | A, Pethidine<br>B, Morphine<br>C, Other Specify |
| 205 | Size of incision (CM) | |
| 206 | Duration of Surgery in min | |
| 207 | Duration of Anesthesia in Min | |

**Section III: Postoperative Data**

| S.no | Question | Baseline At PACU | 30 min | 1hr. | 2hr. | 4hr | 6hr. | 8hr. | 10hr. | 12hr. | 24hr. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 301 | NRS | | | | | | | | | | |
| 302 | Analgesia drug given | | | | | | | | | | |

303 First Analgesia request time in min _____

304 Total and type of analgesic consumption at the PACU _____

305Total and type of analgesic consumption within 24 hours _____

306 Does the patient have nausea within the first 24 hours of surgery? A. YES B. NO

307 Does the patient develop vomiting within the first 24 hours of surgery? A. YES B. NO

QoR-15 Patient Survey

Date: _ _ / _ _ / _ _ Study #: _____

**PART A**

How have you been feeling in the last 24 hours?

(0 to 10, where: 0 = none of the time [poor] and 10 = all of the time [excellent])

| | | | | |
|---|---|---|---|---|
| **1.** | Able to breathe easily | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **2.** | Been able to enjoy food | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **3.** | Feeling rested | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **4.** | Have had a good sleep | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **5.** | Able to look after personal toilet and hygiene unaided | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **6.** | Able to communicate with family or friends | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **7.** | Getting support from hospital doctors and nurses | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **8.** | Able to return to work or usual home activities | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **9.** | Feeling comfortable and in control | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |
| **10.** | Having a feeling of general well-being | *None of the time* | 0 1 2 3 4 5 6 7 8 9 10 | *All of the time* |

**PART B**

***Have you had any of the following in the last 24 hours?***

(10 to 0, where: 10 = none of the time [excellent] and 0 = all of the time [poor])

| | | | | |
|---|---|---|---|---|
| **1.** | Moderate pain | *None of the time* | 10 9 8 7 6 5 4 3 2 1 0 | *All of the time* |
| **2.** | Severe pain | *None of the time* | 10 9 8 7 6 5 4 3 2 1 0 | *All of the time* |
| **3.** | Nausea or vomiting | *None of the time* | 10 9 8 7 6 5 4 3 2 1 0 | *All of the time* |
| **4.** | Feeling worried or anxious | *None of the time* | 10 9 8 7 6 5 4 3 2 1 0 | *All of the time* |
| **5.** | Feeling sad or depressed | *None of the time* | 10 9 8 7 6 5 4 3 2 1 0 | *All of the time* |

Thank you for your assistance.

Please check that all questions have been answered.

Adopted from Myles, et al 2013 Development and Psychometric Evaluation of a Postoperative Quality of Recovery Score: The QoR-15

Fayyinni kee akkam deemaa jira?

Sa'aatii 24 darban keessa maaltu sitti dhaga'amaa ture?

(0 irraa hanga 10tti: 0 = tasuma hojje chuu hin danda'u [gadhee] fi 10 = yeroo hunda hojjechuu nan danda'a [baay'ee gaarii])

0 1 2 3 4 5 6 7 8 9 10

1. Salphaatti afuura baafachuu
2. Nyaachuu
3. Miira boqonnaa argachuu
4. Hirriba gaarii rafuu
5. Qulqullina dhuunfaa eeguu
6. Maatii/hiriyyoota waliin haasa'uu
7. Ogeessa irraa gargaarsa argachuu
8. Mana/hojiitti deebi'uu
9. Miira mijataa ta'e itti dhaga'amuu
10. Walumaagalatti miira gaarii qabaachuu

Sa'aatii 24 darban keessatti kanneen armaan gadii keessaa kamtu si mudate?

(10 hanga 0, 10 = gonkumaa [baay'ee gaarii] fi 0 = yeroo hunda [gadhee])

10 9 8 7 6 5 4 3 2 1 0

11. Dhukkubbii salphaa
12. Dhukkubbii cimaa
13. Garaa kaa'uu/garaa kaa'uu
14. Miira yaaddoo/naarvii
15. Miira gaddaa/dhiphina

## የማገገም ሁኔታዎ ምን ይመስላል

ባለፉት 24 ሰዓታት ውስጥ ምን ተሰማዎት?

(ከ0 እሰከ 10: 0 = አንድም ጊዜ አልችልም [ደካማ] እና 10 = ሁል ግዜ እችላለሁ [በጣም ጥሩ])

0 1 2 3 4 5 6 7 8 9 10

1. በቀላሉ መተንፈስ
2. ምግብ መመገብ
3. የእረፍት ስሜት
4. ጥሩ እንቅልፍ ማግኘት
5. የግል ንጽህና በራስዎ መጠበቅ
6. ከቤተሰብ/ከጓደኛ ጋር ማዉራት
7. ከባለሙያ እርዳታ ማግኘት
8. ወደ ቤት/ስራ መመለስ
9. የምኞት ስሜት
10. አጠቃላይ ጥሩ የጤና ሰሜት መሰማት

ባለፉት 24 ሰዓታት ውስጥ ከሚከተሉት ውስጥ የትኞቹ አልዎት?

(10 እሰከ 0, 10 = አንድም ጊዜ አልነበረኝም [በጣም ጥሩ] እና 0 = ሁል ግዜ ነበረኝ [ደካማ])

10 9 8 7 6 5 4 3 2 1 0

11. መጠነኛ ህመም
12. ከባድ ህመም
13. ማቅለሽለሽ/ ማስታወክ
14.የመጨነቅ/የመረበሽ ስሜት
15. የሃዘን/የድብርት ስሜት

# 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: **Petros Baboker** Signature: _____ Date: _____

Approval of Primary Advisor

Name: _____Signature:_____ Date: _____

Approval of Examiners

Name: _____ Signature:_____ Date:_____

Name: _____Signature: _____Date: _____