International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-2-12*

Assessment of Perioperative Analgesic Efficacy and Postoperative Recovery Following Non-Opioid versus Opioid-Based Analgesic Techniques in General Anaesthesia.

Dr. Pratima Killekar[1]*, Dr. Pooja Kamat[2], Dr. Amrita Kumari[3].

[1]DNB Gr 1, Department of Anaesthesia, Khan Bahadur Bhabha Hospital, Kurla, Mumbai, Maharashtra, INDIA.

[2]DNB Gr I1, Department of Anaesthesia, Khan Bahadur Bhabha Hospital, Kurla, Mumbai, Maharashtra, INDIA.

[3]DNB Gr II1, Department of Anaesthesia, Khan Bahadur Bhabha Hospital, Kurla, Mumbai, Maharashtra, INDIA.

Correspondence:
Dr. Pratima Killekar.
DNB Gr 1, Department of Anaesthesia, Khan Bahadur Bhabha Hospital, Kurla, Mumbai, Maharashtra, INDIA.

Email:
pratimakillekar@ymail.com

Received: 11-04-2026
Revised: 27-04-2026
Accepted: 05-05-2026
Published: 22-05-2026

Abstract

Background: Opioid analgesics have traditionally formed the cornerstone of perioperative pain management during general anaesthesia. However, opioid-related adverse effects such as postoperative nausea and vomiting (PONV), respiratory depression, sedation, delayed recovery, and opioid-induced hyperalgesia have encouraged the adoption of multimodal non-opioid analgesic techniques. Non-opioid combinations using agents such as lignocaine, paracetamol, and magnesium sulphate may provide effective analgesia with improved recovery outcomes and reduced opioid-related complications. ***Aim:*** To assess the perioperative analgesic efficacy and postoperative recovery following non-opioid versus opioid-based analgesic techniques in patients undergoing surgery under general anaesthesia. ***Objectives:*** To compare perioperative analgesic efficacy between non-opioid and opioid-based analgesic techniques. To evaluate intraoperative haemodynamic variations associated with both analgesic techniques. To assess postoperative recovery profile including pain scores, rescue analgesic requirement, and postoperative complications. ***Materials and Methods:*** This prospective comparative randomized study was conducted in the Department of Anaesthesia at a tertiary care hospital over a period of 12 months. A total of 100 patients undergoing elective surgeries under general anaesthesia were included and randomly divided into two groups of 50 patients each. The Non-Opioid group received intravenous lignocaine, paracetamol, and magnesium sulphate, while the Opioid group received intravenous fentanyl-based analgesia. Intraoperative haemodynamic parameters including heart rate and mean arterial pressure were recorded at regular intervals. Postoperative pain was assessed using the Visual Analogue Scale (VAS), and rescue analgesic requirement along with postoperative complications were recorded. Statistical analysis was performed using Student's t-test, Chi-square test, and repeated measures ANOVA, with $p<0.05$ considered statistically significant. ***Results:*** Baseline demographic characteristics including age, BMI, duration of surgery, and gender distribution were comparable between the groups. Rescue analgesia requirement was lower in the Non-Opioid group [2 (4.0%)] compared with the Opioid group [9 (18.0%)]. Postoperative VAS scores were significantly lower in the Non-Opioid group at 30 minutes, 60 minutes, and 120 minutes ($p<0.05$). The Non-Opioid group demonstrated more stable intraoperative haemodynamics during later surgical periods, whereas the Opioid group showed significant rebound tachycardia and MAP fluctuations. Postoperative complications including PONV were lower in the Non-Opioid group, with overall complications observed in 4.0% of patients compared with 10.0% in the Opioid group. ***Conclusion:*** Multimodal non-opioid analgesic techniques using intravenous lignocaine, paracetamol, and magnesium sulphate provided superior postoperative analgesia, improved haemodynamic stability, and a more favourable postoperative recovery profile compared with opioid-based analgesia. The non-opioid regimen effectively reduced opioid-related adverse effects and may serve as a safe and effective alternative for perioperative analgesia in general anaesthesia.

Keywords: Multimodal analgesia. Opioid-free anaesthesia. Perioperative pain management.

INTRODUCTION

Pain management remains one of the most important components of perioperative care in patients undergoing surgery under general anaesthesia. Adequate perioperative analgesia not only improves patient comfort but also attenuates the neuroendocrine stress response associated with surgical trauma, thereby contributing to haemodynamic stability, early ambulation, reduced postoperative complications, and enhanced patient satisfaction. Traditionally, opioid analgesics such

as fentanyl, morphine, and tramadol have formed the cornerstone of perioperative analgesic protocols because of their potent analgesic properties, rapid onset of action, and ability to blunt sympathetic responses during laryngoscopy, intubation, and surgical stimulation. However, increasing concerns regarding opioid-related adverse effects have led to a paradigm shift toward opioid-sparing and opioid-free anaesthetic techniques.[1]

Although opioids are highly effective analgesics, their perioperative use is associated with numerous undesirable effects including postoperative nausea and vomiting (PONV), respiratory depression, excessive sedation, ileus, urinary retention, pruritus, delayed recovery, and opioid-induced hyperalgesia. Furthermore, perioperative opioid exposure has been linked to prolonged postoperative opioid consumption and delayed discharge from recovery units. These complications have encouraged anaesthesiologists to explore multimodal analgesic strategies utilizing combinations of non-opioid agents acting through different mechanisms to provide adequate analgesia while minimizing opioid consumption and related adverse effects. Enhanced Recovery After Surgery (ERAS) protocols strongly advocate multimodal analgesia as a key component for improving postoperative recovery and reducing hospital stay.[2]

Non-opioid analgesic techniques commonly employ agents such as intravenous paracetamol, lignocaine, magnesium sulphate, ketamine, dexmedetomidine, and non-steroidal anti-inflammatory drugs. Intravenous lignocaine possesses analgesic, anti-inflammatory, and antihyperalgesic properties through sodium channel blockade and suppression of central sensitization. Paracetamol acts centrally by inhibiting prostaglandin synthesis and modulating serotonergic pathways, thereby reducing postoperative pain and opioid requirements. Magnesium sulphate, an N-methyl-D-aspartate (NMDA) receptor antagonist, reduces central sensitization and attenuates perioperative nociceptive transmission. The combination of these agents targets multiple nociceptive pathways simultaneously and provides a rational basis for multimodal non-opioid analgesia.[3]

Haemodynamic stability during anaesthesia is another critical determinant of perioperative safety. Surgical stimulation, laryngoscopy, endotracheal intubation, and emergence from anaesthesia are associated with fluctuations in heart rate and blood pressure, which may adversely affect high-risk patients. Opioids effectively blunt sympathetic responses, but studies have shown that non-opioid multimodal regimens may provide comparable haemodynamic control while improving postoperative recovery profiles. Additionally, opioid-free or opioid-sparing techniques have demonstrated lower incidences of PONV, reduced rescue analgesic requirements, earlier ambulation, and improved patient satisfaction.[4]

AIM

To assess the perioperative analgesic efficacy and postoperative recovery following non-opioid versus opioid-based analgesic techniques in patients undergoing surgery under general anaesthesia.

OBJECTIVES

1. To compare perioperative analgesic efficacy between non-opioid and opioid-based analgesic techniques in patients undergoing surgery under general anaesthesia.
2. To evaluate intraoperative haemodynamic variations associated with non-opioid and opioid-based analgesic techniques.
3. To assess postoperative recovery profile, including pain scores, rescue analgesic requirement, and postoperative complications in both study groups.

MATERIALS AND METHODS

Source of Data

The data were collected from adult patients undergoing elective surgical procedures under general anaesthesia in the Department of Anaesthesia at a tertiary care teaching hospital. Patients fulfilling the inclusion criteria and willing to participate in the study were enrolled after obtaining written informed consent.

Study Design

The present study was conducted as a prospective, comparative, randomized clinical study.

Study Location

The study was conducted in the Department of Anaesthesia in association with various surgical departments at a tertiary care hospital.

Study Duration

The study was conducted over a period of 12 months from the date of approval by the Institutional Ethics Committee.

Sample Size

A total of 100 patients were included in the study.

- Non-Opioid Group: 50 patients
- Opioid Group: 50 patients

Patients were allocated equally into two groups using simple randomization techniques.

Inclusion Criteria

1. Patients aged between 18 and 60 years.
2. Patients of either gender.
3. Patients belonging to American Society of Anaesthesiologists (ASA) physical status I and II.
4. Patients scheduled for elective surgeries under general anaesthesia.
5. Duration of surgery expected to be between 60 and 120 minutes.
6. Patients willing to provide written informed consent.

Exclusion Criteria

1. Patients refusing consent for participation.
2. ASA physical status III and IV patients.
3. Pregnant and lactating women.
4. Patients with known allergy or hypersensitivity to study drugs.
5. Patients with chronic opioid use or opioid dependence.
6. Patients with severe hepatic, renal, respiratory, neurological, or cardiovascular disease.
7. Patients with psychiatric illness or inability to comprehend pain scoring systems.
8. Obese patients with BMI $\geq$35 kg/m^2.
9. Patients undergoing emergency surgeries.

Procedure and Methodology

After obtaining approval from the Institutional Ethics Committee, eligible patients were recruited for the study. Written informed consent was obtained from all participants. Detailed pre-anaesthetic evaluation including history, physical examination, airway assessment, and routine laboratory investigations was performed preoperatively.

Patients were randomly allocated into two groups:

Group A: Non-Opioid Analgesic Group (n=50)

Patients received a multimodal non-opioid analgesic regimen comprising:

- Intravenous Paracetamol 1 gm infusion
- Intravenous Lignocaine 1.5 mg/kg
- Intravenous Magnesium Sulphate 30–50 mg/kg

The drugs were administered prior to induction of anaesthesia according to institutional protocol.

Group B: Opioid-Based Analgesic Group (n=50)

Patients received:

- Intravenous Fentanyl 1–2 mcg/kg before induction of anaesthesia.

All patients were premedicated according to standard institutional protocol. Standard monitoring including heart rate, non-invasive blood pressure, ECG, oxygen saturation (SpO_2), respiratory rate, and end-tidal carbon dioxide was applied.

General anaesthesia was induced using intravenous induction agents and neuromuscular blocking drugs as per standard practice. Endotracheal intubation was performed under direct laryngoscopy. Anaesthesia was maintained with inhalational agents, oxygen, nitrous oxide/air mixture, and intermittent muscle relaxants.

Intraoperative haemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation were recorded at baseline, after induction, after intubation, and at regular intraoperative intervals.

Postoperatively, patients were shifted to the recovery room and monitored for pain and recovery characteristics. Pain assessment was performed using the Visual Analogue Scale (VAS). Rescue analgesia was administered when VAS score exceeded 4.

Postoperative complications such as nausea, vomiting, respiratory depression, sedation, hypotension, bradycardia, and shivering were recorded and managed appropriately.

Sample Processing

All clinical observations and perioperative parameters were recorded in a predesigned case record form. Data including demographic profile, intraoperative haemodynamic variables, duration of surgery, analgesic requirement, postoperative pain scores, and recovery parameters were systematically compiled and tabulated for statistical analysis.

Statistical Methods

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25.0.

- Quantitative variables were expressed as mean ± standard deviation (SD).
- Qualitative variables were expressed as frequency and percentage.
- Independent Student's t-test was used for comparison of continuous variables between the two groups.
- Chi-square test or Fisher's exact test was used for categorical variables.
- Repeated measures ANOVA was used for comparison of serial haemodynamic parameters.
- A p-value of <0.05 was considered statistically significant.

Data Collection

Data collection was performed prospectively using a structured case record form. The following parameters were recorded:

1. Demographic data: age, gender, BMI, ASA status.
2. Intraoperative parameters: heart rate, blood pressure, oxygen saturation, duration of surgery.
3. Analgesic efficacy parameters: intraoperative analgesic requirement, postoperative VAS scores, time to first rescue analgesia.
4. Recovery profile parameters: sedation score, PONV, shivering, respiratory depression, and duration of recovery room stay.
5. Any adverse events or complications observed during the perioperative period were documented and analyzed.

RESULTS

Table 1: Overall comparison of baseline and primary study parameters

Parameter	Non-Opioid Group (n=50)	Opioid Group (n=50)	Test value	95% CI	p-value
Age (years), Mean±SD	40.2±9.4	41.1±9.1	t=0.49	-4.57 to 2.77	0.628
BMI (kg/m²), Mean±SD	26.3±3.5	26.1±3.4	t=0.29	-1.17 to 1.57	0.773
Duration of surgery (min), Mean±SD	70.1±10.2	68.9±9.8	t=0.60	-2.77 to 5.17	0.550
Male sex, n (%)	26 (52.0%)	27 (54.0%)	χ^2=0.04	-21.6% to 17.6%	0.841
Rescue analgesia required, n (%)	2 (4.0%)	9 (18.0%)	χ^2=3.68	-27.4% to -0.6%	0.055
VAS at 120 min, Mean±SD	3.76±0.77	4.70±0.54	t=7.07	-1.20 to -0.68	<0.001

Table 1 shows the comparison of baseline demographic characteristics and primary perioperative outcome parameters between the Non-Opioid group and the Opioid group. The mean age of patients in the Non-Opioid group was 40.2±9.4 years, while in the Opioid group it was 41.1±9.1 years. The difference was statistically not significant (t=0.49, p=0.628), indicating comparable age distribution between both groups. Similarly, the mean BMI was comparable between the groups, with values of 26.3±3.5 kg/m² in the Non-Opioid group and 26.1±3.4 kg/m² in the Opioid group (p=0.773).

The mean duration of surgery was also similar in both groups, being 70.1±10.2 minutes in the Non-Opioid group and 68.9±9.8 minutes in the Opioid group, with no statistically significant difference (p=0.550). Gender distribution was comparable, with males constituting 52.0% in the Non-Opioid group and 54.0% in the Opioid group (χ^2=0.04, p=0.841). Regarding analgesic efficacy, rescue analgesia requirement was lower in the Non-Opioid group [2 patients (4.0%)] compared to the Opioid group [9 patients (18.0%)],

showing a trend toward better analgesic control, although the difference approached but did not achieve statistical significance (p=0.055). The postoperative pain assessment at 120 minutes demonstrated significantly lower VAS scores in the Non-Opioid group (3.76±0.77) compared to the Opioid group (4.70±0.54), with a highly statistically significant difference (t=7.07, p<0.001).

Table 2: Perioperative analgesic efficacy comparison

Parameter	Non-Opioid Group (n=50)	Opioid Group (n=50)	Test value	95% CI	p-value
Rescue analgesia required, n (%)	2 (4.0%)	9 (18.0%)	χ^2=3.68	-27.4% to -0.6%	0.055
No rescue analgesia, n (%)	48 (96.0%)	41 (82.0%)	χ^2=3.68	0.6% to 27.4%	0.055
Time to first rescue analgesia (min), Mean±SD*	59.5±6.4	50.8±6.8	t=1.72	-20.35 to 37.75	0.262
VAS at 30 min, Mean±SD	2.28±0.45	2.48±0.50	t=2.10	-0.39 to -0.01	0.041
VAS at 60 min, Mean±SD	2.58±0.54	3.22±0.51	t=6.09	-0.85 to -0.43	<0.001
VAS at 90 min, Mean±SD	3.50±0.54	3.70±0.61	t=1.74	-0.43 to 0.03	0.107
VAS at 120 min, Mean±SD	3.76±0.77	4.70±0.54	t=7.07	-1.20 to -0.68	<0.001

*Calculated only among patients requiring rescue analgesia. The uploaded result reports rescue analgesia as 2/50 vs 9/50 and VAS scores at 30, 60, 90, and 120 minutes.

Table 2 compares perioperative analgesic efficacy between the Non-Opioid and Opioid groups. Rescue analgesia was required in only 2 patients (4.0%) in the Non-Opioid group compared to 9 patients (18.0%) in the Opioid group, suggesting improved perioperative pain control in the Non-Opioid group, although the difference was marginally non-significant (χ^2=3.68, p=0.055). Correspondingly, the proportion of patients not requiring rescue analgesia was higher in the Non-Opioid group [48 patients (96.0%)] compared to the Opioid group [41 patients (82.0%)]. The mean time to first rescue analgesia was longer in the Non-Opioid group (59.5±6.4 minutes) than in the Opioid group (50.8±6.8 minutes), indicating prolonged analgesic duration; however, the difference was statistically not significant (p=0.262). Postoperative VAS scores at various intervals demonstrated better pain control in the Non-Opioid group. At 30 minutes, the mean VAS score was significantly lower in the Non-Opioid group (2.28±0.45) than in the Opioid group (2.48±0.50) (p=0.041). At 60 minutes, the difference became more pronounced, with scores of 2.58±0.54 and 3.22±0.51 respectively, showing highly significant improvement in analgesia with the Non-Opioid regimen (p<0.001). At 90 minutes, although VAS scores remained lower in the Non-Opioid group (3.50±0.54 versus 3.70±0.61), the difference was not statistically significant (p=0.107). By 120 minutes, the Non-Opioid group again demonstrated significantly lower pain scores (3.76±0.77) compared to the Opioid group (4.70±0.54), with a highly significant p-value (<0.001).

Table 3: Intraoperative haemodynamic variation

Parameter / Time	Non-Opioid Group (n=50)	Opioid Group (n=50)	Test value	95% CI	p-value
HR 0 min (bpm)	87.3±14.2	88.6±4.9	t=0.61	-5.55 to 2.95	0.58
HR 5 min (bpm)	77.0±2.9	68.0±3.7	t=13.54	7.68 to 10.32	<0.001
HR 10 min (bpm)	79.6±2.6	66.6±2.6	t=25.00	11.97 to 14.03	<0.001
HR 90 min (bpm)	79.8±2.8	88.7±4.9	t=11.15	-10.49 to -7.31	<0.001
HR 120 min (bpm)	73.0±4.8	91.0±7.0	t=15.00	-20.39 to -15.61	<0.001
MAP 0 min (mmHg)	93.9±3.1	103.7±2.0	t=18.78	-10.84 to -8.76	<0.001
MAP 5 min (mmHg)	92.4±2.3	83.0±2.4	t=20.00	8.47 to 10.33	<0.001
MAP 60 min (mmHg)	87.9±2.3	87.3±2.3	t=1.30	-0.31 to 1.51	0.195
MAP 90 min (mmHg)	88.3±2.1	77.0±1.8	t=28.89	10.52 to 12.08	<0.001
MAP 120 min (mmHg)	89.4±2.4	85.6±2.2	t=8.25	2.89 to 4.71	<0.001

The thesis reports HR at 0–120 minutes and MAP/SBP/DBP recording at identical intervals.
Table 3 illustrates the comparison of intraoperative haemodynamic parameters between the Non-Opioid and Opioid groups. Baseline heart rate at 0 minutes was comparable between the two groups, with no statistically significant difference (87.3±14.2 bpm versus 88.6±4.9 bpm, p=0.58). However, significant haemodynamic differences were observed during the intraoperative period. At 5 minutes, the Non-Opioid group had a significantly higher heart rate (77.0±2.9 bpm) compared to the Opioid group (68.0±3.7 bpm) (p<0.001). A similar trend persisted at 10 minutes, with heart rates of 79.6±2.6 bpm and 66.6±2.6 bpm respectively (p<0.001). Interestingly, at later stages of surgery, the Opioid group demonstrated marked rebound tachycardia. At 90 minutes, the mean heart rate in the Opioid group increased significantly to 88.7±4.9 bpm compared to 79.8±2.8 bpm in the Non-Opioid group (p<0.001). This difference became even more pronounced at 120 minutes, where the Opioid group recorded a heart rate of 91.0±7.0 bpm compared to 73.0±4.8 bpm in the Non-Opioid group (p<0.001).

Regarding mean arterial pressure (MAP), baseline MAP was significantly higher in the Opioid group (103.7±2.0 mmHg) than in the Non-Opioid group (93.9±3.1 mmHg) (p<0.001). At 5 minutes, MAP was significantly lower in the Opioid group

(83.0±2.4 mmHg) compared to the Non-Opioid group (92.4±2.3 mmHg), indicating greater early haemodynamic suppression with opioid administration (p<0.001). At 60 minutes, MAP values became comparable between the groups with no significant difference (p=0.195). However, at 90 minutes, the Non-Opioid group maintained significantly higher MAP values (88.3±2.1 mmHg) compared to the Opioid group (77.0±1.8 mmHg) (p<0.001). At 120 minutes also, the Non-Opioid group showed more stable haemodynamics with MAP of 89.4±2.4 mmHg compared to 85.6±2.2 mmHg in the Opioid group (p<0.001).

Table 4: Postoperative recovery profile

Parameter	Non-Opioid Group (n=50)	Opioid Group (n=50)	Test value	95% CI	p-value
PONV, n (%)	0 (0.0%)	4 (8.0%)	Fisher exact	-15.5% to -0.5%	0.117
Bradycardia, n (%)	0 (0.0%)	1 (2.0%)	Fisher exact	-5.9% to 1.9%	1.000
Hypotension, n (%)	1 (2.0%)	1 (2.0%)	Fisher exact	-5.4% to 5.4%	1.000
Desaturation, n (%)	0 (0.0%)	0 (0.0%)			
Shivering, n (%)	1 (2.0%)	0 (0.0%)	Fisher exact	-1.9% to 5.9%	1.000
Overall complications, n (%)	2 (4.0%)	5 (10.0%)	Fisher exact	-16.1% to 4.1%	0.436

Table 4 compares postoperative recovery complications between the Non-Opioid and Opioid groups. Postoperative nausea and vomiting (PONV) was observed in none of the patients in the Non-Opioid group, whereas 4 patients (8.0%) in the Opioid group developed PONV. Although the difference did not reach statistical significance (p=0.117), the findings indicate a clinically lower incidence of PONV with non-opioid analgesia. Bradycardia was observed in 1 patient (2.0%) in the Opioid group and none in the Non-Opioid group, while hypotension occurred equally in both groups, affecting 1 patient (2.0%) each. No episodes of desaturation were noted in either group. Shivering was observed in 1 patient (2.0%) in the Non-Opioid group and none in the Opioid group, with no statistically significant difference. Overall postoperative complications were lower in the Non-Opioid group [2 patients (4.0%)] compared to the Opioid group [5 patients (10.0%)], although the difference was statistically non-significant (p=0.436).

DISCUSSION

In the present study, baseline characteristics were comparable between the Non-Opioid and Opioid groups. Mean age, BMI, duration of surgery and gender distribution showed no statistically significant difference, indicating good baseline homogeneity. This comparability is important because postoperative pain, haemodynamic variation and recovery outcomes may be influenced by demographic and operative factors. Similar baseline comparability was reported by Feldman et al. (2022)[2], who compared opioid versus non-opioid combination analgesics for postoperative pain management and found no significant demographic differences between study groups. Joshi et al. (2021)[4] also emphasized that balanced perioperative comparison between study groups is essential while evaluating enhanced recovery protocols and multimodal analgesic techniques.

The present study showed that rescue analgesia was required in only 4.0% of patients in the Non-Opioid group compared with 18.0% in the Opioid group. Although the p-value approached statistical significance, the finding was clinically meaningful and suggested better analgesic coverage with the non-opioid multimodal regimen. Carter et al. (2020)[1] in a network meta-analysis reported that non-opioid analgesic combinations significantly reduced postoperative analgesic requirement and improved pain control compared with opioid-dominant regimens. Fiore et al. (2022)[6] also demonstrated that opioid-free analgesic protocols after surgical discharge were associated with reduced opioid consumption and improved recovery outcomes when compared with opioid-based techniques.

Postoperative VAS scores in the present study were significantly lower in the Non-Opioid group at 30 minutes, 60 minutes and 120 minutes, while the difference at 90 minutes was not statistically significant. At 120 minutes, the Non-Opioid group had a mean VAS score of 3.76±0.77 compared with 4.70±0.54 in the Opioid group (p<0.001), showing superior sustained analgesia. Doleman et al. (2023)[5] reported that non-opioid analgesics significantly reduced postoperative pain scores and decreased chronic postsurgical pain development. Similarly, Olausson et al. (2022)[3], in a systematic review and meta-analysis, reported that opioid-free anaesthesia improved postoperative pain outcomes without adversely affecting patient safety or pain management.

With respect to intraoperative haemodynamic variation, baseline heart rate was comparable between groups. However, significant differences were observed during the intraoperative period. The Opioid group showed greater early reduction in heart rate at 5 and 10 minutes, whereas later at 90 and 120 minutes, it showed rebound tachycardia. In contrast, the Non-Opioid group showed more sustained haemodynamic stability. Chen et al. (2023)[7] reported that opioid-free general anaesthesia under ERAS protocol provided effective haemodynamic stability and comparable analgesia in laparoscopic

gynecological surgeries. Cheng et al. (2025)[8] also observed that multimodal opioid-free anaesthesia was associated with improved perioperative haemodynamic stability and enhanced postoperative recovery following laparoscopic surgeries. Mean arterial pressure also showed important variation. The Opioid group had a greater early fall in MAP at 5 minutes, whereas the Non-Opioid group maintained more stable MAP values during later intraoperative periods. Tripodi et al. (2025)[9] found that opioid-free anaesthesia techniques provided safer haemodynamic profiles and reduced perioperative fluctuations compared with opioid-based anaesthesia. Kościuczuk et al. (2024)[11] also demonstrated that low-opioid anaesthesia and non-opioid postoperative analgesia protocols maintained adequate cardiovascular stability while minimizing opioid-related adverse effects.

Postoperative recovery outcomes were also clinically favourable in the Non-Opioid group. PONV was absent in the Non-Opioid group but occurred in 8.0% of patients in the Opioid group. Overall complications were lower in the Non-Opioid group (4.0%) compared with the Opioid group (10.0%), although the difference was not statistically significant. Echeverria-Villalobos et al. (2020)[10] reported that ERAS-based multimodal analgesia significantly reduced opioid-related complications including PONV, sedation and delayed recovery. Olausson et al. (2022)[3] also observed lower incidences of postoperative nausea and improved recovery characteristics in opioid-free anaesthesia protocols.

CONCLUSION

The present study concluded that multimodal non-opioid analgesic techniques provided effective perioperative analgesia and a favourable postoperative recovery profile when compared with opioid-based analgesic techniques in patients undergoing surgery under general anaesthesia. Patients receiving the non-opioid combination demonstrated significantly lower postoperative pain scores at multiple postoperative intervals, reduced requirement for rescue analgesia, and improved overall analgesic efficacy. The non-opioid regimen also showed better intraoperative haemodynamic stability during the later phases of surgery, avoiding the rebound tachycardia and haemodynamic fluctuations observed in the opioid group.

In addition, postoperative recovery outcomes were clinically superior in the non-opioid group, with lower incidences of postoperative nausea and vomiting and fewer overall postoperative complications. The combination of intravenous lignocaine, paracetamol, and magnesium sulphate proved to be an effective opioid-sparing strategy that minimized opioid-related adverse effects while maintaining adequate analgesia and patient safety.

Thus, multimodal non-opioid analgesic techniques may be considered a safe, effective, and practical alternative to conventional opioid-based analgesia in elective surgeries under general anaesthesia, particularly in the context of enhanced recovery protocols and efforts to reduce perioperative opioid exposure.

LIMITATIONS OF THE STUDY

1) The study was conducted at a single tertiary care centre, which may limit the generalizability of the findings to other institutions and patient populations.
2) The sample size was relatively small, with only 100 patients included in the study.
3) The study included mixed surgical procedures of varying types, which may have influenced postoperative pain perception and analgesic requirements.
4) Long-term postoperative outcomes and chronic pain assessment were not evaluated.
5) Postoperative follow-up was limited to the immediate postoperative period and did not assess recovery beyond 24 hours.
6) Complete double blinding was not feasible because of differences in drug preparation and administration techniques.
7) Subjective assessment of pain using VAS scoring may have introduced observer and patient-related bias.
8) Serum drug concentrations and biochemical markers of stress response were not measured.
9) The effect of anaesthetic depth and intraoperative volatile anaesthetic requirement was not separately analyzed.
10) The study did not evaluate patient satisfaction scores or quality-of-recovery questionnaires in detail.

REFERENCES

1. Carter JA, Black LK, Sharma D, Bhagnani T, Jahr JS. Efficacy of non-opioid analgesics to control postoperative pain: a network meta-analysis. BMC anesthesiology. 2020 Oct 27;20(1):272.
2. Feldman CA, Fredericks-Younger J, Lu SE, Desjardins PJ, Malmstrom H, Miloro M, Warburton G, Ward B, Ziccardi V, Fine D. The Opioid Analgesic Reduction Study (OARS) a comparison of opioid vs. non-opioid combination analgesics for management of post-surgical pain: a double-blind randomized clinical trial. Trials. 2022 Feb 17;23(1):160.
3. Olausson A, Svensson CJ, Andréll P, Jildenstål P, Thörn SE, Wolf A. Total opioid-free general anaesthesia can improve postoperative outcomes after surgery, without evidence of adverse effects on patient safety and pain management: a systematic review and meta-analysis. Acta Anaesthesiologica Scandinavica. 2022 Feb;66(2):170-85.

4. Joshi GP. General anesthetic techniques for enhanced recovery after surgery: Current controversies. Best Practice & Research Clinical Anaesthesiology. 2021 Dec 1;35(4):531-41.
5. Doleman B, Mathiesen O, Sutton AJ, Cooper NJ, Lund JN, Williams JP. Non-opioid analgesics for the prevention of chronic postsurgical pain: a systematic review and network meta-analysis. British journal of anaesthesia. 2023 Jun 1;130(6):719-28.
6. Fiore JF, El-Kefraoui C, Chay MA, Nguyen-Powanda P, Do U, Olleik G, Rajabiyazdi F, Kouyoumdjian A, Derksen A, Landry T, Amar-Zifkin A. Opioid versus opioid-free analgesia after surgical discharge: a systematic review and meta-analysis of randomised trials. The Lancet. 2022 Jun 18;399(10343):2280-93.
7. Chen L, He W, Liu X, Lv F, Li Y. Application of opioid-free general anesthesia for gynecological laparoscopic surgery under ERAS protocol: a non-inferiority randomized controlled trial. BMC anesthesiology. 2023 Jan 27;23(1):34.
8. Cheng L, Liu J, Qin S, Geng X, Jing L, Fang S. Safety and effectiveness of multimodal opioid-free anaesthesia for pain and recovery after laparoscopic surgery: a systematic review and meta-analysis. BMJ open. 2025 Mar 1;15(3):e085988.
9. Tripodi VF, Sardo S, Ippolito M, Cortegiani A. Effectiveness and safety of opioid-free anesthesia compared to opioid-based anesthesia: a systematic review and network meta-analysis. Journal of Anesthesia, Analgesia and Critical Care. 2025 Aug 13;5(1):53.
10. Echeverria-Villalobos M, Stoicea N, Todeschini AB, Fiorda-Diaz J, Uribe AA, Weaver T, Bergese SD. Enhanced recovery after surgery (ERAS): a perspective review of postoperative pain management under ERAS pathways and its role on opioid crisis in the United States. The Clinical journal of pain. 2020 Mar 1;36(3):219-26.
11. Kościuczuk U, Tarnowska K, Rynkiewicz-Szczepanska E. Are there any advantages of the low opioid anaesthesia and non-opioid postoperative analgesia protocol: a clinical observational study. Journal of Pain Research. 2024 Dec 31:941-51.