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COMPARING THE EFFECTIVENESS OF DEXAMETHASONE, ONDANSETRON AND METOCLOPRAMIDE IN CONTROLLING POST OPERATIVE NAUSEA AND VOMITING IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract

Background: *The most frequent complication of laparoscopic cholecystectomy is postoperative nausea and vomiting (PONV) that occurs in 30-50% of patients and in up to 70-80% of high risk patients, causing post-operative discomfort, delayed recovery, and higher health care expense. Dexamethasone, ondansetron and metoclopramide are prevalent against PONV prophylaxis even though there are few studies comparing the effectiveness of single drug use which have been done in the Pakistani context.*

Objectives: *The purpose of this study is to compare the effects of the use of dexamethasone, ondansetron and metoclopramide, separately, in preventing PONV among the patients undergoing laparoscopic cholecystectomy under general anaesthesia. It is also aimed at comparing the occurrence and level of the post operative nausea experienced within 24 hours among the three groups.*

Methods: *A prospective, randomized, controlled trial was recruit 150 ASA I-II adult patients (18-65 years of age) presented with elective laparoscopic cholecystectomy at Lady Reading Hospital, Peshawar. The patients was be assigned to three groups (50 each) where they was be given dexamethasone, ondansetron or metoclopramide after induction. The results was focus on the number and extent of PONV (measured through Visual Analog Scale), consumption of rescue anti-emetics, and side effects in 24-hour timeframe. SPSS was be used to analyse the data, and the statistical significance was be determined at $p < 0.05$, using either Chi-square tests, ANOVA or Kruskal-Wallis tests.*

Expected Outcomes: *The research was decide on the most practical and cost-effective antiemetic to treat PONV prophylaxis in the Pakistani population to fill the gap in regional findings and help evidence-based medical practice to achieve protocol relief and perioperative results to improve patient satisfaction levels.*

INTRODUCTION

Postoperative nausea and vomiting (PONV) continue as one of the most recurrent and unpleasant effects after laparoscopic cholecystectomy, greatly affecting patient comfort levels, the process of recovery, and patient satisfaction (1). Regardless of changes to anesthesia and improvements of surgical technologies, the prevalence of PONV amongst general population is 30-50%, and in high-risk patients can be as high as 70-80% (2). PONV is hence an important aspect of postoperative care management (3). A wide range of pharmacological forms such as 5-HT3 antagonist, corticosteroids,

and prokinetic medication had been examined as prophylactic therapies (4, 5). Among them, only dexamethasone, ondansetron, and metoclopramide demonstrated potential in attenuating both the occurrence and intensity of PONV (6). Nevertheless, limited comparative information exists on their relative effectiveness, particularly in regard to laparoscopic cholecystectomy (7,8). This research intends to compare the effectiveness of dexamethasone, ondansetron, and metoclopramide in managing PONV in laparoscopic cholecystectomy patients; under general anesthesia to optimize the use of antiemetic agents to enhance the peri operative outcomes (1).

The last twenty years have seen the development of substantial research worldwide towards the better prevention and management of PONV, especially in patients undergoing laparoscopy. Randomized controlled trials have evaluated the effectiveness of different antiemetic drugs either as a single entity or a combination, around the world. As an example, it has been illustrated that ovendansetron + dexamethasone offers better prophylaxis against PONV than one of the drugs alone (3, 9). International evidence further indicates that dexamethasone monotherapy is not only less cost-intensive, but also effective, thus a much more desirable alternative in both the higher-income and low-income environment (5). Moreover, when metoclopramide and ondansetron are compared in various populations, it was shown that ondansetron is more effective in preventing nausea, whereas both drugs are similar in relation to their effects on vomiting (4). Studies in different countries have also investigated some newer agents like palonosetron, however results have shown that conventional combination therapy such as ondansetron-dexamethasone is equally efficacious (8). Generally, the worldwide results indicate the need to develop antiemetic strategies that are based on evidence and locality availability of such drugs (3).

A number of clinical studies in the wider Asian region have attempted to examine the comparative effectiveness of commonly used antiemetic agents in the management of postoperative nausea and vomiting (PONV) following laparoscopic surgery. The results of various countries like India, China, other Southeast Asian countries have helped in making use of ondansetron alone or ondansetron combined with dexamethasone as useful agents in prophylaxis against PONV. As an example, comparative studies performed between ondansetron and metoclopramide have consistently indicated that ondansetron can effectively decrease the occurrence of postoperative nausea, whereas the two drugs have shown equal effectiveness in suppressing vomiting (4). In another research conducted among the elective patients who underwent laparoscopic cholecystectomy and appendectomy, the results revealed that dexamethasone was very effective compared to the metoclopramide in the prevention of PONV as well as postoperative pain (6). Also, ondansetron in combination with dexamethasone has demonstrated having better antiemetic coverage than using single substances, and the international recommendations are supported by regional practice (3). These studies underline the necessity of the additional comparative trials which focus on the specific population of Asian people and take into account the difference in clinical procedures, genetic peculiarities, and drug availability.

In Pakistan, there has been an increased focus on prevention and management of postoperative nausea and vomiting (PONV), especially in patients with laparoscopic cholecystectomy. Some local studies measured the effectiveness of most common antiemetics, e.g., dexamethasone, ondansetron and metoclopramide. A randomized controlled trial in a tertiary care in Islamabad showed that the rate of PONV was significantly lower in the dexamethasone treatment group as 81.7 percent of patients in the dexamethasone group did not experience nausea or vomiting during postoperative period (1). A local report on comparisons between dexamethasone and ondansetron reported both as equally successful in decreasing incidences of PONV, additionally dexamethasone was found to be a potentially cost-effective alternative (3). Farther, studies comparing dexamethasone in combination with ondansetron to ondansetron alone have found combination therapy superior in the reduction of rescue

antiemetic requirement and improvement of patient outcomes (9). These results are very solid basis to undertake a wider comparative study on all three agents- dexamethasone, ondansetron and metoclopramide, in the local population where cost, availability and clinical effectiveness are also the main deciding factors (6).

Although there are a lot of supporting evidences to the indication of using antiemetics to prevent PONV, there are still several gaps that have to be filled in this body of knowledge. Almost all the existing studies, both at the international and local level have concentrated only on comparing two of the three antiemetics most often used: dexamethasone and ondansetron or ondansetron and metoclopramide, which does not leave much data on the comparisons between the three commonly used agents in a single study. Besides, combination therapies have demonstrated better performance, yet the question is what agent can be actively used in other cases (such as those faced by resource-limited settings where financial constraints are of importance). There are also issues of small sample sizes, short follow-ups, and a limited number of stratification factors (risk factors of the patients related to ASA grade or BMI). Moreover, the results of most of the studies have been analyzed in a localized perspective, thereby excluding large-scale surgical populations or regional differences, and therefore hindering the application of results in large scales in the South Asian context. This study was filling these gaps by directly comparing the efficacy of the three drugs, dexamethasone, ondansetron, and metoclopramide, when used alone, on the management of postoperative nausea and vomiting in patients who underwent laparoscopic cholecystectomy to provide primary, local data on the topic that may guide the practice of local clinicians (12).

Postoperative nausea and vomiting (PONV) significantly affect recovery and patient satisfaction after laparoscopic cholecystectomy. Although antiemetics like dexamethasone, ondansetron, and metoclopramide are widely used, most studies have compared only two agents at a time or focused on combination therapies, leaving a gap in evidence regarding their individual effectiveness. Additionally, limited regional data exists, particularly from Pakistan, to guide cost-effective and clinically appropriate antiemetic choices. This study aims to address these gaps by directly comparing the efficacy of these three commonly used antiemetics in preventing PONV, thereby supporting evidence-based decision-making in local surgical practice (13).

The pathophysiology of postoperative nausea and vomiting (PONV) is explained by the interaction of different brain centers and neurotransmitters that control the vomiting reflex. The main structures involved are the chemoreceptor trigger zone (CTZ) and the vomiting center, both located in the medulla oblongata. The CTZ is sensitive to chemical stimuli in the blood and cerebrospinal fluid because it lies outside the blood–brain barrier. When it is stimulated by anesthetic drugs, opioids, or other emetogenic substances, it activates the vomiting center, which then coordinates the physical act of vomiting. Several neurotransmitters play key roles in this process, including dopamine, serotonin, histamine, and acetylcholine. Among these, serotonin (5-HT_3) and dopamine (D_2) receptors are the most important in initiating nausea and vomiting. Serotonin released from the gastrointestinal tract during surgery stimulates vagal afferents, which send signals to the CTZ and vomiting center, while dopamine acts centrally to trigger emetic responses. This understanding forms the basis for using antiemetic drugs such as ondansetron, a 5-HT_3 receptor antagonist, and metoclopramide, a D_2 receptor antagonist, to prevent and control PONV effectively (14).

The pharmacologic control of postoperative nausea and vomiting (PONV) primarily targets the neurotransmitter receptors involved in the emetic reflex arc, particularly serotonin (5-HT_3), dopamine (D_2), and corticosteroid-mediated pathways. Each class of antiemetic differs in its mechanism of action, onset, and duration, allowing clinicians to tailor prophylaxis and treatment according to patient and surgical risk factors (12).

Serotonin (5-HT_3) receptor antagonists, such as ondansetron, act by selectively blocking 5-HT_3

receptors located both peripherally on vagal afferent nerves in the gastrointestinal tract and centrally within the chemoreceptor trigger zone (CTZ) and vomiting center of the medulla oblongata. During surgical stress, serotonin is released from enterochromaffin cells of the small intestine and activates these receptors, inducing nausea and vomiting. By preventing this binding, ondansetron effectively inhibits the initiation of the emetic reflex. It is commonly administered at the end of surgery or before the end of anesthesia induction. The onset of action is rapid (within 30 minutes), and its duration typically ranges from 4 to 6 hours, which makes it suitable for early postoperative prophylaxis (Habib & Gan, 2004; Kovac, 2013). However, ondansetron's efficacy decreases for delayed PONV, and it may cause mild side effects such as headache or constipation (15).

Corticosteroids, particularly dexamethasone, have been found to possess strong antiemetic properties despite their primary anti-inflammatory role. The exact mechanism through which dexamethasone prevents PONV is not fully understood, but several hypotheses have been proposed. It may act centrally by inhibiting prostaglandin synthesis, decreasing serotonin release in the gut, and modulating the permeability of the blood–brain barrier (Wang et al., 2000). Dexamethasone is usually given intravenously at induction of anesthesia because it requires time to exert its genomic effects. It has a long duration of action, often lasting more than 24 hours, which makes it particularly effective for the prevention of delayed PONV. Moreover, it is commonly used in combination with 5-HT_3 antagonists, where synergistic effects have been reported, resulting in a significantly lower incidence of PONV than with either drug alone (16).

Dopamine (D_2) receptor antagonists, such as metoclopramide, exert their antiemetic action by blocking dopamine receptors within the CTZ, thereby inhibiting dopaminergic stimulation of the vomiting center. Additionally, metoclopramide enhances gastrointestinal motility by increasing lower esophageal sphincter tone and accelerating gastric emptying, which reduces the likelihood of gastric stasis contributing to nausea (Gan et al., 2014). However, its effectiveness in preventing PONV at conventional doses (10 mg IV) is generally lower than that of 5-HT_3 antagonists or corticosteroids. Higher doses may increase the risk of extrapyramidal side effects, such as dystonia or restlessness, due to central dopamine blockade. The onset of metoclopramide is within 1 to 3 minutes after intravenous administration, but its duration of action is relatively short, approximately 1 to 2 hours (13).

In while ondansetron acts through inhibition of serotonin-mediated emetic signaling and provides rapid but short-term protection, dexamethasone modulates inflammatory and serotonin pathways, offering prolonged coverage. Metoclopramide, though less potent, provides an additional mechanism through dopamine antagonism and prokinetic activity. Combining drugs from different classes is often recommended to enhance efficacy and minimize PONV risk, especially in high-risk surgical cases such as laparoscopic cholecystectomy (14).

This study is important because it can provide useful evidence to improve postoperative management in patients who undergo laparoscopic cholecystectomy. Postoperative nausea and vomiting (PONV) is one of the most uncomfortable and frequent problems after anesthesia, often leading to patient dissatisfaction, delayed recovery, and longer hospital stays. By comparing the effects of dexamethasone, ondansetron, and metoclopramide, this research seeks to determine which drug offers the best balance of effectiveness and safety for preventing PONV in these patients. The results was be valuable for both anesthesia and surgical teams, as they may help improve clinical guidelines and support better choices for preventive treatment. Effective control of PONV can increase patient comfort, allow earlier oral intake, and shorten recovery time. In addition, identifying the most affordable and efficient antiemetic option can help reduce hospital costs while maintaining a high standard of patient care (17).

Postoperative nausea and vomiting (PONV) is one of the most frequent and distressing complications experienced after general anesthesia, with an incidence ranging between 20% and 30% in

general surgical patients and up to 70% in high-risk individuals. It not only causes discomfort but may also lead to serious complications such as dehydration, electrolyte imbalance, aspiration pneumonia, and delayed wound healing. In laparoscopic cholecystectomy, the risk of PONV is particularly high due to factors like pneumoperitoneum, use of volatile anesthetics, and opioid analgesics during and after surgery. Persistent nausea and vomiting after surgery can also delay oral intake and discharge, thereby increasing hospital costs and reducing overall patient satisfaction. Because of these implications, effective prevention and management of PONV remain key priorities in perioperative care (18).

Over the years, several antiemetic drugs have been developed to prevent and manage PONV, targeting different receptor pathways involved in the emetic response. Commonly used agents include ondansetron, a selective 5-HT_3 receptor antagonist; dexamethasone, a corticosteroid with central and peripheral antiemetic properties; and metoclopramide, a dopamine D_2 receptor blocker with additional gastrointestinal prokinetic effects. Each of these agents varies in mechanism, onset, and duration of action, which may influence their clinical effectiveness (Gan et al., 2014). Although ondansetron is widely regarded as a standard antiemetic, several studies have shown that dexamethasone provides comparable efficacy with longer-lasting effects and fewer side reactions. Metoclopramide remains commonly used because of its low cost and additional gastrointestinal benefits, yet its effectiveness is considered moderate compared with newer agents. Therefore, a direct comparison of these drugs in patients undergoing laparoscopic cholecystectomy is essential to determine the most suitable and cost-effective antiemetic for clinical use (19).

Rationale of the study

Postoperative nausea and vomiting (PONV) significantly affect recovery and patient satisfaction after laparoscopic cholecystectomy. Although antiemetics like dexamethasone, ondansetron, and metoclopramide are widely used, most studies have compared only two agents at a time or focused on combination therapies, leaving a gap in evidence regarding their individual effectiveness. Additionally, limited regional data exists, particularly from Pakistan, to guide cost-effective and clinically appropriate antiemetic choices. This study aims to address these gaps by directly comparing the efficacy of these three commonly used antiemetics in preventing PONV, thereby supporting evidence-based decision-making in local surgical practice.

Objectives of the Study

- To compare the effectiveness of dexamethasone, ondansetron, and metoclopramide—administered individually—in preventing postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy under general anaesthesia.
- To determine and compare the incidence and severity of postoperative nausea within 24 hours following laparoscopic cholecystectomy among the three antiemetic groups.

Chapter 2
LITERATURE REVIEW

Postoperative nausea and vomiting (PONV) stand out as one of the most common complications after general anesthesia, especially in the context of laparoscopic surgery such as laparoscopic cholecystectomy. In the broad surgical cohort, estimates put the incidence between 30% and 50%, whereas in high-risk patients it can rise above 70%. PONV not only heightens patient discomfort, but it can also postpone recovery, lengthen hospitalization periods, and raise healthcare expenditures. Consequently, a wide body of research across the globe has been centred on pinpointing effective prophylactic antiemetic strategies. Of all the pharmacologic agents investigated, dexamethasone (a corticosteroid), ondansetron (a 5-HT3 receptor antagonist), and metoclopramide (a dopamine antagonist with prokinetic properties) have become the agents most frequently employed, owing to their wide availability, favorable safety profiles, and straightforward administration. Nevertheless, the available literature has yet to unequivocally determine which agent is superior to the rest,

particularly within specific surgical populations and regional settings.

Garza et al (2015). A double-blind, prospective study in a university hospital in Mexico involved 30 patients with laparoscopic cholecystectomy who were assigned a controlled trial of the efficacy of onlansetron alone compared with a mixture of ondansetron and metoclopramide in the prevention of PONV. Although there have been known-high incidences of PONV following laparoscopy (20-42 percent), the experiment did not reveal a statistically significant difference in nausea, vomiting or patient satisfaction between the two groups. Even the Apfel score, which is a PONV risk prediction tool, was not very accurate. Gender, BMI, smoking, and opioid use were present as risk factors at a similar rate, and the overall efficacy of antiemetic regimens in reducing the occurrence of PONV and avoiding the use of rescue antiemetic supplies was equally high. These results indicate that there is no further benefit by combining metoclopramide with ondansetron in standard prophylaxis of on laparoscopy cholecystectomy.

Chilkoti et al (2025). A randomized double-blind trial compared the efficacy of low-dose (50 ug/kg) and regular-dose (100 ug/kg) ondansetron with each having 8 mg dose of dexamethasone in the prevention of PONV following laparoscopic cholecystectomy. Although early postoperative nausea during the first two hours was significantly greater in the low-dose group (P = 0.002), difference in the rates of vomiting, pain scores and rescue antiemetic or analgesic requirements, and side effects, did not differ significantly between the two groups. This study validated that ondansetron is more useful in the prevention of early PONV whereas dexamethasone is better in prevention of late PONV. The findings show that, when it comes to optimizing dosing ondansetron, the balance between cost-effectiveness and efficacy needs to be considered since ondansetron is more costly than dexamethasone.

Rehman et al (2023). in a randomized controlled study conducted in Pakistan assessed the effectiveness of intravenous dexamethasone in preventing postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy. Among 120 patients, those who received dexamethasone showed a significantly lower incidence of PONV (81.7%) compared to the control group (56.7%) (P = 0.003). The study reinforced dexamethasone's role as a cost-effective, single-dose prophylactic agent with minimal side effects. While the results align with previous research, the study highlighted the need for further investigations into optimal dosing, combination therapies, and long-term outcomes, noting limitations such as its single-center design.

Leksowski et al. (2006) in a randomized study involving 210 patients undergoing laparoscopic cholecystectomy compared the effectiveness of ondansetron, metoclopramide, dexamethasone, and their combinations in preventing postoperative nausea and vomiting (PONV). The study found that antiemetic administration significantly reduced PONV, with the ondansetron-dexamethasone combination being most effective. Higher PONV incidence was observed in menstruating women and patients with a history of motion sickness or prior PONV, while factors like age, BMI, smoking, and surgery duration showed no significant impact. The results highlight the superiority of combination therapy over monotherapy and emphasize the importance of tailoring PONV prophylaxis to individual risk factors

In summary, postoperative nausea and vomiting (PONV) remain significant challenges in patients undergoing laparoscopic cholecystectomy. Multiple studies have evaluated the efficacy of various antiemetic regimens—including ondansetron, metoclopramide, and dexamethasone—either alone or in combination. While dual therapy often shows comparable effectiveness to monotherapy, and low-dose strategies may offer cost benefits, no single regimen has demonstrated clear superiority across all outcomes. The evidence emphasizes the importance of individualized prophylaxis based on patient risk factors, drug availability, and institutional protocols. Continued research is essential to optimize antiemetic strategies, enhance recovery, and improve overall patient satisfaction in the perioperative setting.

A comparative cross-sectional study was conducted

by (Nazemroaya et al., 2023) at the Department of Surgery, Civil Hospital Karachi, from June 2021 to March 2022 to evaluate the effectiveness of dexamethasone versus ondansetron in preventing postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy. The study included patients aged 18 to 70 years scheduled for elective surgery under general anesthesia, excluding those on preoperative antiemetics or corticosteroids, pregnant women, and individuals with liver or kidney dysfunction. Patients were divided into two groups: Group A received 8 mg of intravenous dexamethasone, and Group B received 4 mg of intravenous ondansetron. Postoperative monitoring recorded episodes of nausea, vomiting, and the need for additional antiemetics. Out of 259 patients—129 in the dexamethasone group and 130 in the ondansetron group—both medications were found to be similarly effective in controlling nausea, with 73.85% and 65.89% of patients respectively reporting no nausea (P = 0.162). However, ondansetron demonstrated superior efficacy in preventing vomiting, with 91.54% of patients remaining vomiting-free compared to 79.07% in the dexamethasone group (P = 0.004). In conclusion, both dexamethasone and ondansetron effectively reduce postoperative nausea and vomiting after laparoscopic cholecystectomy, though ondansetron provides better prevention of vomiting in this patient population. These findings are consistent with previous randomized controlled trials and meta-analyses demonstrating the comparable efficacy of these agents in PONV prophylaxis, with some studies highlighting ondansetron's advantage in reducing vomiting episodes.

A study [Bano et al., 2023] double-blind randomized controlled clinical trial was conducted in the Department of Anesthesiology, Surgical Intensive Care Unit, and Pain Management at Dow University of Health Sciences and Civil Hospital, Karachi, from March to September 2007, to compare the efficacy of a combination of dexamethasone and ondansetron versus dexamethasone alone for the prevention of postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy. The study enrolled 100 male and female patients aged 20 to 50 years with ASA physical status I or II, scheduled for elective laparoscopic cholecystectomy under general anesthesia. Participants were randomly allocated into two groups: Group A received dexamethasone (2 ml) plus ondansetron 4 mg (2 ml) in separate syringes, while Group B received dexamethasone 8 mg (2 ml) combined with 2 ml of normal saline as placebo, administered just before anesthesia induction. The anesthetic technique was standardized for all patients. For the first 24 hours postoperatively, the presence or absence of nausea and vomiting was assessed by an anesthetist blinded to patient allocation, and rescue antiemetic therapy (metoclopramide 10 mg intravenously) was given if nausea persisted for over 15 minutes or if retching or vomiting occurred. The results indicated that the combination therapy group experienced a significantly lower frequency of postoperative nausea and vomiting compared to the dexamethasone alone group (p=0.035), and the need for rescue antiemetics was notably less in the combination group (p=0.022). Minor side effects, such as peri-anal itching, were observed in two patients in the combination group and one in the dexamethasone group; no other adverse effects like headaches or flushing were reported. This study concludes that the combined prophylactic use of dexamethasone and ondansetron is more effective than dexamethasone alone in reducing postoperative nausea and vomiting in laparoscopic cholecystectomy patients, thus improving postoperative recovery and patient comfort. These findings align with existing literature demonstrating the benefit of combining these antiemetic agents to maximize efficacy in PONV prevention.

Study is done by (Maitra et al., 2016) his Postoperative nausea and vomiting (PONV) represent common and distressing complications following laparoscopic surgeries, often exceeding the discomfort caused by postoperative pain. The prophylactic use of antiemetics such as ondansetron, a selective 5-HT3 receptor antagonist, and dexamethasone, a corticosteroid with anti-inflammatory and antiemetic properties,

has become standard clinical practice. Despite their widespread use, direct comparisons of the efficacy of these two agents had not been thoroughly evaluated until recent years. A meta-analysis incorporating data from seven randomized controlled trials comprising 592 patients undergoing laparoscopic procedures demonstrated that dexamethasone significantly reduces the incidence of postoperative nausea within the first 4 to 6 hours compared to ondansetron ($p = 0.04$; odds ratio 0.49, 95% confidence interval 0.24–0.98), although the incidence of nausea equalizes at 24 hours postoperatively. Furthermore, both agents were found to have comparable efficacy in preventing postoperative vomiting during the early (4–6 hours) and late (up to 24 hours) postoperative periods. It is important to recognize the clinical variability across the studies analyzed, necessitating cautious interpretation of these findings. The superiority of dexamethasone in mitigating early postoperative nausea may be attributed to its longer duration of action and anti-inflammatory effects, while ondansetron remains effective for acute management of emetic episodes. Ultimately, the evidence supports the use of both agents for PONV prevention, with consideration of individual patient factors and potential benefits of combination therapy to enhance prophylactic outcomes in laparoscopic surgery patients. This comprehensive evaluation aligns with existing research and underpins therapeutic decisions aiming to improve patient comfort and reduce postoperative complications associated with nausea and vomiting.

Postoperative nausea and vomiting (Rehman et al., 2023) (PONV) remain frequent and distressing complications following laparoscopic cholecystectomy, often adversely affecting patient recovery and satisfaction. Prophylactic administration of antiemetic drugs such as dexamethasone and ondansetron has become widely accepted due to their proven efficacy in reducing PONV incidence. Numerous randomized controlled trials and meta-analyses have compared the effectiveness of these agents, both as monotherapy and in combination with other drugs. Current evidence indicates that dexamethasone is at least as effective as ondansetron in preventing PONV, with some studies showing superior reduction of nausea within the first 4 to 6 hours post-surgery, while both drugs perform similarly in controlling vomiting up to 24 hours postoperatively. Preoperative intravenous dexamethasone administration not only decreases the incidence of PONV but also reduces the need for rescue antiemetics, contributing to enhanced postoperative comfort and faster recovery. The anti-inflammatory and longer-lasting effects of dexamethasone provide a plausible mechanism for its sustained antiemetic activity. Additionally, combination therapies that target different receptor sites have shown increased efficacy over single agents in managing PONV. Despite these positive findings, some heterogeneity exists among clinical trials regarding dosing and timing protocols, underscoring the need for further large-scale studies to refine optimal antiemetic strategies. Nevertheless, dexamethasone remains a cost-effective and reliable option for PONV prophylaxis in laparoscopic cholecystectomy patients. Future research should focus on the comparative effectiveness of different combination regimens and the long-term safety profile of corticosteroids.

This study [Khubzan et al., 2025] aimed to identify the most effective drug for preventing postoperative nausea and vomiting (PONV) following laparoscopic cholecystectomy by comparing ondansetron and granisetron. Conducted according to PRISMA guidelines, a comprehensive search of databases including Google Scholar, PubMed, Web of Science, and Ovid MEDLINE up to November 2024 was performed to identify relevant studies. Primary outcomes assessed were the incidence of PONV at 0–12 and 0–24 hours post-surgery, while secondary measures included the need for rescue antiemetics and the occurrence of adverse effects. In total, 21 studies involving 1,539 patients met inclusion criteria, with 17 studies qualifying for meta-analysis. Results demonstrated that granisetron was significantly more effective than ondansetron in reducing nausea (15.2% vs. 25.4%; risk ratio [RR] = 1.67, $p = 0.0001$) and

vomiting (10.3% vs. 18%; RR = 1.73, p = 0.001) during the first 12 hours after surgery. At 24 hours, granisetron continued to show superiority with lower nausea (21.8% vs. 38.5%) and vomiting rates (13.4% vs. 23.3%). Patients receiving granisetron also required fewer rescue antiemetics (10.7% vs. 23.1%; RR = 2.14, p < 0.0001) and experienced fewer adverse effects (p = 0.04). Collectively, these findings suggest that granisetron provides superior and more sustained prophylaxis against PONV compared to ondansetron in patients undergoing laparoscopic cholecystectomy. Granisetron's longer half-life and higher receptor affinity may contribute to its enhanced efficacy and tolerability. However, further research is warranted to assess cost-effectiveness and to optimize dosing regimens in diverse patient populations. This evidence supports considering granisetron as the preferred antiemetic agent for PONV prophylaxis in this surgical context, improving patient comfort and postoperative outcomes.

Postoperative [Kumar J et al., 2024] nausea and vomiting (PONV) are among the most common and troublesome complications following laparoscopic surgeries, significantly impacting patient comfort and recovery. Recent systematic reviews and meta-analyses have compared the efficacy and safety profiles of palonosetron and ondansetron, both selective 5-HT3 receptor antagonists widely used for PONV prophylaxis. A comprehensive review of twenty-one randomized controlled trials, involving over 2,000 patients, reveals that palonosetron is more effective than ondansetron in reducing the incidence of nausea and vomiting across various postoperative time intervals, ranging from immediate recovery (0-2 hours) through to 24 hours post-surgery. The superiority of palonosetron is particularly notable when administered prior to intubation and in conjunction with isoflurane anesthesia. Moreover, palonosetron's longer half-life and stronger receptor affinity are believed to confer prolonged antiemetic effects, necessitating less frequent dosing compared to ondansetron. Safety assessments indicate that both drugs share similar profiles, with headache, dizziness, constipation, and drowsiness reported as the most common adverse events, but neither exhibits serious safety concerns. Furthermore, patients treated with palonosetron require fewer rescue antiemetic interventions, enhancing overall postoperative recovery experience. Despite these encouraging findings, further investigations are required to better understand the cardiac safety (notably QT interval effects) and cost-effectiveness of palonosetron in different surgical populations. Incorporating such evidence-based insights into clinical practice may optimize PONV management strategies, improving outcomes for patients undergoing laparoscopic procedures and potentially facilitating faster discharge and enhanced recovery protocols. This growing body of literature underscores palonosetron as a promising and effective alternative to ondansetron for routine prophylaxis against PONV.

This study [Nazemroaya B et al., 2022] aimed to evaluate and compare the impact of intraperitoneal (IP) versus intravenous (IV) administration of dexamethasone on postoperative nausea and vomiting (PONV) and postoperative pain (POP) in patients undergoing laparoscopic cholecystectomy. In a prospective, randomized, double-blind clinical trial, 86 adult patients classified as ASA I-II were allocated into three groups: IP dexamethasone (n=29), IV dexamethasone (n=29), and control (n=28). Their clinical outcomes were monitored over the first 24 hours post-surgery, including incidence and severity of PONV and POP, consumption of rescue antiemetics, and hemodynamic stability. Results demonstrated no significant difference in the incidence of nausea and vomiting between the IP and IV groups within 24 hours; however, the severity of nausea was significantly lower in patients receiving IP dexamethasone (P = 0.001). Additionally, pain severity assessed by visual analog scale scores was significantly reduced in the IP group (P = 0.02). No hemodynamic compromises were observed among the groups, indicating comparable safety profiles of the two administration routes. These findings suggest that while both IP and IV dexamethasone effectively prevent PONV in laparoscopic cholecystectomy, IP administration confers added benefits in reducing nausea severity and postoperative pain.

This may be attributed to the localized anti-inflammatory and analgesic effects provided by direct intraperitoneal delivery of dexamethasone. Previous studies corroborate these results, highlighting the efficacy of dexamethasone in reducing PONV and analgesic requirements when administered via various routes, with the intraperitoneal route offering enhanced postoperative comfort and recovery. Further research should explore the mechanism underlying these differences and optimize dosing regimens to maximize patient outcomes after laparoscopic surgery.

Postoperative (Apfel et al., 2012) nausea and vomiting (PONV) remains one of the most frequent and distressing complications following laparoscopic cholecystectomy (LC), despite advances in anesthetic and surgical techniques. It has been estimated that the incidence of PONV after LC can reach up to 60–70% in the absence of prophylactic measures. Multiple pharmacologic agents have been evaluated to minimize its occurrence, including serotonin (5-HT_3) receptor antagonists, corticosteroids, dopamine receptor antagonists, antihistamines, and neurokinin-1 receptor antagonists. However, the optimal antiemetic regimen for LC remains under investigation, with most evidence supporting dexamethasone and ondansetron as the most effective options either alone or in combination. Metoclopramide, a dopamine D_2 receptor antagonist, has also been extensively studied for PONV prophylaxis due to its low cost and additional prokinetic effects that accelerate gastric emptying. However, its efficacy as a single agent has been shown to be modest compared with newer antiemetics such as ondansetron. High doses may lead to extrapyramidal side effects, which limit its routine use as monotherapy. For this reason, metoclopramide is often considered a suitable adjunctive or second-line agent rather than a primary prophylactic choice.

A large network meta-analysis conducted by Sharma et al. (2020) comprehensively evaluated various pharmacological agents used to reduce PONV in patients undergoing LC. This analysis included ninety randomized clinical trials assessing a wide range of antiemetic drugs. The primary outcome was the number of patients without PONV at 24 hours postoperatively, while secondary outcomes included the incidence of nausea and vomiting at 6 and 24 hours and any associated adverse effects. The researchers applied random-effects modelling to generate mixed treatment comparisons and used trial sequential analysis to assess the sufficiency of the existing evidence base. Additionally, the surface under the cumulative ranking curve (SUCRA) was calculated to identify the most effective interventions among all tested agents. The findings revealed that several drugs—including metoclopramide, gabapentin, dixyrazine, ondansetron, granisetron, dexamethasone, tropisetron, droperidol, and haloperidol—significantly reduced the risk of PONV compared with placebo. Among the combination therapies, dexamethasone plus a serotonin receptor antagonist demonstrated the highest probability of being the most effective regimen for preventing PONV. Specifically, combinations such as droperidol/dexamethasone, granisetron/dexamethasone, and palonosetron/dexamethasone ranked among the top interventions. However, when assessing the quality of the evidence, only dexamethasone and ondansetron as single agents were supported by moderate-quality evidence, indicating consistent efficacy and safety for clinical use. These findings align with earlier studies that highlighted the strong antiemetic effect of both ondansetron and dexamethasone. Ondansetron, a selective 5-HT_3 receptor antagonist, acts centrally on the chemoreceptor trigger zone and peripherally on vagal afferents in the gastrointestinal tract, thereby preventing serotonin-mediated emetic signaling. Dexamethasone, on the other hand, exhibits its antiemetic action through a combination of central inhibition of prostaglandin synthesis and reduction of inflammation-related stimuli that can activate vomiting pathways. In addition to its longer duration of action, dexamethasone is also noted for enhancing patient comfort and reducing postoperative fatigue, making it particularly beneficial in ambulatory surgical settings.

The clinical (Gan et al., 2014) implication of the network meta-analysis is significant, as it highlights the relative ranking of various antiemetics and

their combinations. The combined use of dexamethasone with a 5-HT_3 antagonist not only reduces the risk of PONV more effectively but also decreases the need for rescue antiemetics postoperatively. The synergy between these agents arises from their complementary mechanisms—dexamethasone providing long-term suppression of inflammatory and central emetic triggers, and ondansetron offering rapid blockade of serotonin-induced vomiting signals. This combination has therefore become a preferred prophylactic strategy, particularly for patients at high risk of PONV after laparoscopic procedures. Although the overall evidence supports the superiority of dexamethasone and ondansetron, the authors of the meta-analysis advised caution in interpretation. The moderate quality of the evidence and limited head-to-head comparisons between different antiemetic combinations suggest that further randomized controlled trials are warranted to establish optimal dosing regimens and confirm safety profiles across diverse patient populations. Moreover, factors such as anesthetic techniques, intraoperative opioid use, and patient-related risk factors (e.g., female sex, history of motion sickness, non-smoking status) can also influence PONV incidence and should be considered in future studies.

Chapter 3
METHODOLOGY

3.1. Research Design:
prospective, randomized, controlled.

3.2. Clinical Settings
The study was be conducted at a tertiary care lady reading hospital Peshawar

3.3. Sample Size
The sample size per group (n) can be estimated using this formula for comparing two proportions:

$n=(Z\alpha/2+Z\beta)2\times[p1(1-p1)+p2(1-p2)](p1-p2)2n=(p1-p2)2(Z\alpha/2+Z\beta)2\times[p1(1-p1)+p2(1-p2)]$

The total sample size for this randomized controlled trial was calculated to be approximately **150** patients, with 50 patients allocated to each of the three groups (dexamethasone, ondansetron, and metoclopramide). This sample size ensures 80% power to detect a medium effect size (Cohen's f=0.25f=0.25) at a significance level of 0.05 using one-way ANOVA for comparison of antiemetic efficacy among groups. This number also accounts for practical feasibility and allows for moderate dropout.

3.4. Sampling Technique
Sample Randomization.

3.5. Duration of Study
The duration of study was be 04 months.

3.6. Selection Criteria
3.6.1. Inclusion Criteria
- Adult patients aged 18–65 years.
- ASA physical status I or II.
- Scheduled for elective laparoscopic cholecystectomy under general anesthesia.
- Wasing to provide informed consent.

3.6.2. Exclusion Criteria
- Known allergy or contraindication to dexamethasone, ondansetron, or metoclopramide.
- History of motion sickness or severe PONV requiring multiple antiemetics.
- Patients who received antiemetics or steroids within 24 hours before surgery.
- Pregnant or lactating women.
- Patients with significant hepatic, renal, or cardiac dysfunction.

ASA classification Flow chart:

Classification	Description
ASA 1	Healthy patients
ASA 2	Mild to moderate systemic disease caused by the surgical condition or by other pathological processes, and medically well controlled
ASA 3	Severe disease process which limits activity but is not incapacitating
ASA 4	Severe incapacitating disease process that is a constant threat to life
ASA 5	Moribund patient not expected to survive 24 hours with or without an operation
ASA 6	Declared brain-dead patient whose organs are being removed for donor purposes

3.7. Ethical Consideration

Ethical approval was be sought before starting the study through the Institutional Review Board (IRB) or Ethics Committee of the research site, to assure that the study is ethical by national and international conventions on human research. All the participants were be provided with adequate information regarding the purpose of the study, the methods that was be applied, potential benefits, and any anticipated risk, and informed consent was be sought to enable them make a free voluntary choice on whether or not to take part in the study and has a right to withdraw at no cost. The maintenance of confidentiality was be closely observed by the coding of the data of the participants, and all the records was be stored in a trusted place to avoid the invalid access of the data. The interventions include popular antiemetic medications with solid safety histories and a low risk of ill effects to the subjects; however, in case of severe adverse outcomes, they were be managed accordingly and monitored in time. The research was complied with the principles of beneficence, non-maleficence, autonomy, and justice where welfare of participants is maximized, harm is held to minimum and decisions by the participants are voluntary and informed, and the selection of subjects is equitable. There was also be no undue influence or coercion and work was also be done ethically in order to observe integrity, transparency and respect to the participants in the research in the current subject research under the provisions of the Declaration of Helsinki and the local regulations.

3.8. Data Collection Procedure

The process of data collection in this study was be highly standardized in order to have a proper and consistent data collection. Informed consent was be taken and demographic information including age, sex, weight, height, medical history including comorbidities, history of motion sickness, smoking status, and previous instances of postoperative nausea and vomiting (PONV) was be documented through an interview-based questionnaire. The physical status provided by the American Society of Anesthesiologists was be entered as well as the baseline vital signs before the anesthetic process. The kind of antiemetic, its dose, and time of administration of the antiemetic, immediately after induction of anesthesia, was also be closely noted as soon as the patients have been randomly assigned to one of the three groups of the study dexamethasone, ondansetron, or metoclopramide. Possible intraoperative data; the anesthesia technique, the

time of the operation, the use of intraoperative medications including opioids and any complications, was be noted by reviewing anesthesia records. After the operation, they were be observed thoroughly during the initial 24 hours and the frequency and intensity of nausea was be assessed according to a validated numerical scale (such as the Visual Analog Scale or VAS) at specified times (such as 0-2 hours, 2-6 hours, and 6-24 hours). Any incidences of vomiting, their frequency, and time was be reported and rescue antiemetics required and the time was be noted. Also, any side effect that may be attributed to the antiemetic drug was be noted down. All the collected data shall be recorded in prepared, structured data collection files with the codes of the patient identifiers replaced in order to maintain the confidentiality. These forms were be locked up either in cabinets or electronically in locked files to be accessed by the research team only. Direct patient interview or phone calls as follow-ups may be undertaken in case it is applicable after 24 to 72 hours after surgery until some delayed events of PONV are captured. To ensure data quality, data collection would be done by trained personnel through standardized procedures and there would be regular review with any discrepancy being rectified on time by the principal investigator. The comprehensive plan was ensuring the collection of valid data that can be used to compare the accuracies of dexamethasone, ondansetron, and metoclopramide in preventing PONV after a laparoscopic cholecystectomy process

Data Analysis

Statistical software was be used in analyzing the data of this study like SPSS which was allow proper interpretation of data collected. At first, means and standard deviations was be calculated as demographic and clinical baseline characteristics in the study groups are summarized by descriptive statistics, and percentages with frequencies was be generated of categorical variables. The Chi-square or Fisher exact test was be used to analyze categorical data when it is necessary to compare the incidence of postoperative nausea and vomiting (PONV) related to the three groups: dexamethasone, ondansetron, and metoclopramide. On the variables, which are continuous, e.g., the severity of the nausea measured on the Visual Analog Scale (VAS) group differences was be calculated through the analysis of variance (ANOVA) or Kruskal-Wallis test in case of data distribution. The need of rescue antiemetics and drug side effects was also be compared based on proper statistical tests. The minimum p-level to be considered statistical significance was be below 0.05. Also, a multivariate analysis can be performed to adjust any possible confounders such as age, gender, BMI, or ASA class, to determine whether there exists an independent impact of the antiemetic agents on the outcomes of PONV. All data was be given in tabular and graphical form to help in interpretation and making well-evidenced ideas.

RESULTS:

Table 1: Age Group Frequency Table

This table describes the age distribution of the study participants. The largest proportion of patients belonged to the 18–29 years age group (33.33%), followed by 30–39 years (26.67%) and 40–49 years (20%). Participants aged 50–59 years and 60 years and above each constituted 10% of the sample. Overall, the results indicate that the majority of the study population was younger than 40 years, suggesting that middle-aged and young adults formed the core demographic of the study population.

Age Group	Frequency	Percentage (%)
18–29	50	33.33%
30–39	40	26.67%
40–49	30	20.00%
50–59	15	10.00%

60+	15	10.00%
Total	**150**	**100.00%**

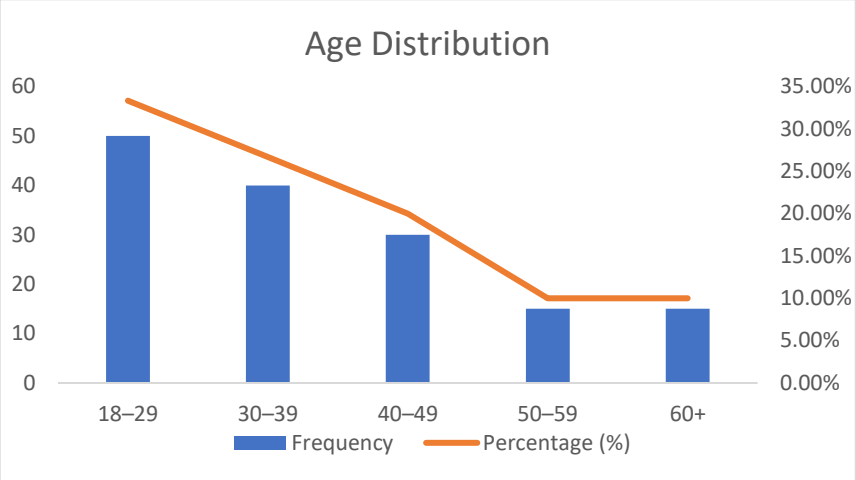
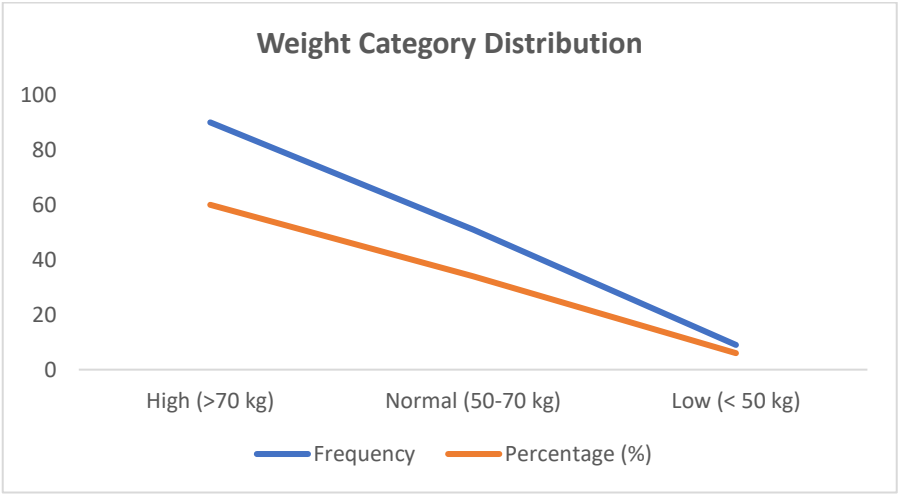


Table 2: Weight Category Frequency

The weight distribution shows that 60% of participants had a high body weight (>70 kg), while 34% fell within the normal weight range (50–70 kg). Only 6% of participants were under 50 kg. This indicates that a substantial proportion of the study population had higher body weight, which may have clinical relevance in anesthesia-related outcomes and postoperative complications

Weight Category	**Frequency**	**Percentage (%)**
High (>70 kg)	90	60
Normal (50-70 kg)	51	34
Low (< 50 kg)	9	6
Total	**150**	**100.00%**



This table presents the BMI classification of participants. Half of the participants (50.68%) were classified as overweight, while 33.78% were obese. Only 13.51% had a normal BMI, and a very small proportion (2.03%) were underweight. These findings show a predominance of elevated BMI among the study population, highlighting obesity and overweight as common characteristics in the sample.

BMI Category	Frequency	Percentage (%)
Overweight: BMI 25–29.9	75	50.68
Obese: BMI ≥ 30	50	33.78
Normal: BMI 18.5–24.9	20	13.51
Underweight: BMI < 18.5	3	2.03
Total	**150**	**100.00%**

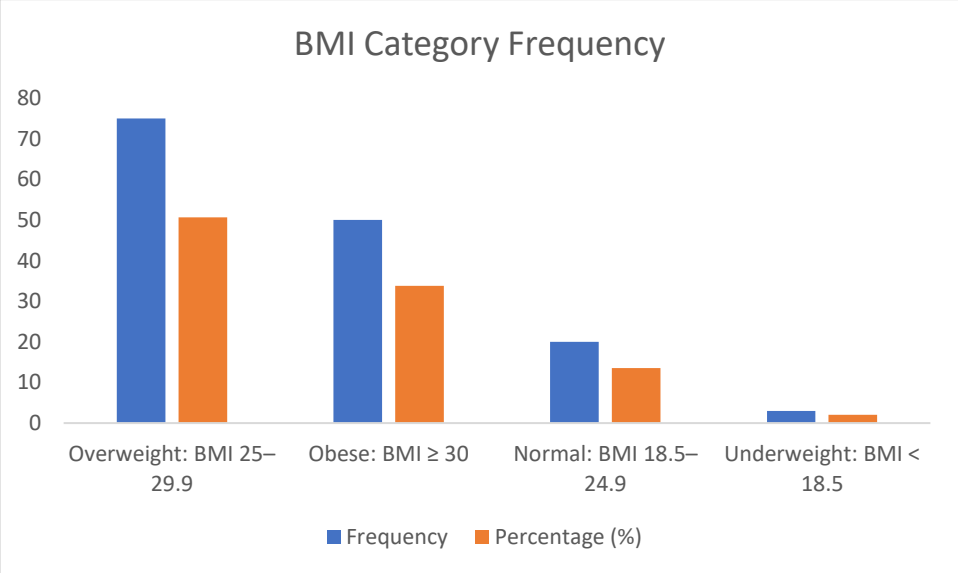


Table 4: Demographic Summary Table (for **Age**, **Weight**, and **BMI**)

This table summarizes the central tendency and variability of age, weight, and BMI. The mean age of participants was 36.46 ± 11.67 years, with ages ranging from 14 to 90 years. The mean body weight was 70.63 ± 12.77 kg, indicating moderate variability across participants. The mean BMI was 28.24 ± 4.58 kg/m², which falls within the overweight range. The percentile values further confirm that more than half of the participants had BMI values above the normal range, reinforcing the high prevalence of overweight and obesity in the study group.

Variable	Mean	Standard Deviation	Min	Max	25th Percentile	50th Percentile (Median)	75th Percentile
Age (years)	36.46	11.67	14	90	29.25	35	44.75
Weight (kg)	70.63	12.77	35	96	60	70	80
BMI (kg/m²)	28.24	4.58	15.1	48.8	25.83	28.44	30.34

Table 5: Gender Frequency Table:
The gender distribution reveals a clear female predominance. Females constituted 75.33% of the study population, while males accounted for 24.67%. This unequal distribution suggests that females were more frequently represented in the study, which may influence the observed outcomes related to postoperative nausea and vomiting

Gender	**Frequency**	**Percentage** (%)
Female	113	75.33
Male	37	24.67
Total	**150**	**100.00%**

According to ASA classification, 53.33% of participants were ASA I, indicating healthy patients, while 43.33% were ASA II, reflecting patients with mild systemic disease. Only 3.33% belonged to ASA III. Overall, the majority of participants had low anesthetic risk, suggesting a relatively stable surgical population

ASA Classification	**Frequency**	**Percentage** (%)
I	80	53.33
II	65	43.33
III	5	3.33
Total	**150**	**100.00%**

Participants were equally distributed among the three treatment groups. Dexamethasone, Ondansetron, and Metoclopramide were each administered to 50 patients (33.33%). This equal allocation ensures comparability between groups and strengthens the validity of treatment-related comparisons.

Assigned Treatment	**Frequency**	**Percentage** (%)
Dexamethasone	50	33.33
Ondansetron	50	33.33
Metoclopramide	50	33.33
Total	**150**	**100.00%**

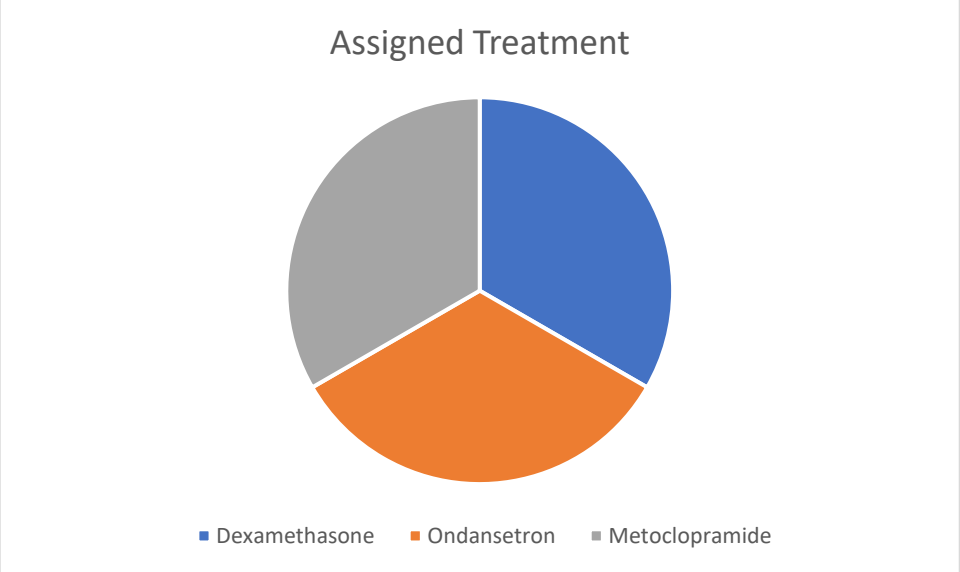


Table 6: Summary Table:
This table compares nausea, vomiting, severity scores, and complications across treatment groups at different time intervals. Metoclopramide showed higher nausea severity and vomiting episodes, particularly at 1 hour and 24 hours postoperatively, along with complications such as prolonged and delayed recovery. Dexamethasone demonstrated moderate control of nausea and vomiting but was associated with adverse effects such as dizziness and delayed recovery. Ondansetron showed complete absence of nausea and vomiting at all time intervals, with no reported adverse events or complications. Overall, Ondansetron appeared to be the most effective and safest antiemetic among the three treatments

Treatment	Time Interval	Nausea (Yes/No)	Vomiting (Yes/No)	Number of Vomiting Episodes - Mean (Std)	Nausea Severity Score - Mean (Std)	Adverse event	Complications
Ondansetron	1 Hour	0/50	0/50	0 (0.00)	0 (0.00)	Nill	Nill
	6 Hours	0/50	0/50	0 (0.00)	0 (0.00)		
	24 Hours	0/520	0/50	0 (0.00)	0 (0.00)		
Metoclopramide	1 Hour	50/0	50/0	4.30 (1.40)	0.20 (1.41)	Prolonged recovery: 12 Headache: 2	Delayed Recovery: 50
	6 Hours	1/ 49	50/0	4.14 (0.97)	2.00 (0.00)		
	24 Hours	50/0	50/0	1.70 (1.04)	6.76 (1.25)		
Dexamethasone	1 Hour	1/49	0/50	0.03 (0.00)	0 (0.00)	Dizziness: 46	Delayed Recovery: 50
	6 Hours	50/0	0/50	0 (0.00)	2.7 (1.11)		
	24 Hours	9/41	50/0	2.00 (0.00)	0.48 (1.07)		

Table 7: Nausea Occurrence (Yes/No) by Treatment Group

The chi-square analysis showed statistically significant differences in nausea occurrence among treatment groups at all time intervals (0–1 hour, 1–6 hours, and 6–24 hours) with p-values < 0.05. This indicates that the type of antiemetic treatment significantly influenced postoperative nausea outcomes

Time Interval	Chi-Square Value	p-value	Significance
1 Hour	145.63	0.0023	Significant
6 Hours	145.63	0.0023	Significant
24 Hours	119.07	0.0013	Significant

Table 8: Vomiting Occurrence (Yes/No) by Treatment Group

Similarly, vomiting occurrence differed significantly across treatment groups at all postoperative time intervals. The statistically significant p-values confirm that vomiting control was strongly dependent on the antiemetic used, with Ondansetron demonstrating superior effectiveness

Time Interval	Chi-Square Value	p-value	Significance
1 Hour	300	0.0108	Significant
6 Hours	145.63	0.0023	Significant
24 Hours	150	0.0023	Significant

Table 9: ANOVA

ANOVA revealed significant differences in nausea severity scores among the three treatment groups at all assessed time intervals. The high F-values and significant p-values indicate that treatment choice had a strong effect on postoperative nausea severity, further supporting the superiority of Ondansetron

Time Interval	F-value	p-value	Significance
1 Hour	125.05	0.0019	Significant
6 Hours	238.52	0.0070	Significant
24 Hours	782.74	0.0042	Significant

Table 10: Chi Square of Rescue Antiemetic Use by Treatment Group

No statistically significant differences were observed in rescue antiemetic use among the treatment groups. This suggests that additional antiemetic requirements were comparable across all groups

Treatment Group	Chi-Square Value	p-value	Degrees of Freedom	Significance
Dexamethasone	0	1	0	Not-Significant
Ondansetron	0	1	0	Not-Significant
Metoclopramide	0	1	0	Not-Significant

Table 11: Logistic Regression Results (Nausea Occurrence):

0-1 Hour Nausea:

Logistic regression analysis showed that age, gender, ASA classification, and BMI were not statistically significant predictors of nausea at any postoperative time interval ($p > 0.05$). However, BMI and ASA II status showed a trend toward increased risk, although this did not reach statistical significance

Variable	Coefficient (Coef.)	Standard Error (Std. Err.)	z-value	p-value
Intercept	-21.369	21387.32	-0.001	0.9992
Sex (Female)	18.886	21387.32	0.000883	0.9993
ASA Classification II	0.653	0.3759	1.739	0.0821
Age	-0.011	0.0168	-0.651	0.5148
BMI	0.069	0.0403	1.72	0.0855

1-6 Hours Nausea

Variable	Coefficient (Coef.)	Standard Error (Std. Err.)	z-value	p-value
Intercept	-24.781	132742.3	-0.00019	0.9999
Sex (Female)	22.868	132742.3	0.000172	0.9999
ASA Classification II	0.241	0.3624	0.667	0.505
Age	-0.0168	0.0162	-1.04	0.2978
BMI	0.0675	0.0394	1.72	0.0859

6-24 Hours Nausea:

Variable	Coefficient (Coef.)	Standard Error (Std. Err.)	z-value	p-value
Intercept	-24.781	132742.3	-0.00019	0.9999
Sex (Female)	22.868	132742.3	0.000172	0.9999
ASA Classification II	0.241	0.3624	0.667	0.505
Age	-0.0168	0.0162	-1.04	0.2978
BMI	0.0675	0.0394	1.72	0.0859

Table 12: Chi-Square Test for Side Effects (Adverse Events) by Treatment Group

The chi-square test demonstrated a statistically significant association between treatment group and adverse effects ($p < 0.001$). This indicates that the occurrence of side effects varied significantly among the three antiemetic drugs, with Ondansetron showing the most favorable safety profile

Statistic	Value
Chi-Square Value	150
p-value	0.00026
Degrees of Freedom	2
Expected Frequencies	16.67 (for each treatment group and outcome)

DISCUSSION

Postoperative nausea and vomiting (PONV) continue to be among the most frequent complications encountered after anesthesia, often leading to patient discomfort, delayed recovery, and prolonged hospital stay. The present study

evaluated and compared the effectiveness of ondansetron, dexamethasone, and metoclopramide in the prevention of PONV over different postoperative time intervals, while also examining the influence of demographic and clinical variables (14).

The study population predominantly consisted of young and middle-aged adults, with a mean age in the mid-thirties. Although younger age has previously been associated with a higher incidence of PONV, the findings of this study did not demonstrate a statistically significant relationship between age and postoperative nausea. This suggests that when effective prophylactic antiemetics are administered, age alone may not be a decisive risk factor (15,20). Female patients formed the majority of the study sample. Female gender has been consistently reported in the literature as a strong predictor of PONV due to hormonal and physiological differences. However, despite the higher proportion of female participants, gender was not found to significantly influence nausea occurrence in the regression analysis. This may indicate that appropriate antiemetic prophylaxis can reduce the impact of gender-related susceptibility (23,24).

Most participants were classified as overweight or obese, with the mean BMI falling within the overweight range. While elevated BMI has been suggested as a potential contributor to PONV, the present study did not find BMI to be a statistically significant predictor (17). Nonetheless, a positive trend was observed, indicating that higher BMI may still play a contributory role rather than acting as an independent risk factor. The majority of patients belonged to ASA physical status I and II, reflecting a generally low-risk surgical population. This homogeneity in ASA classification minimized confounding effects related to severe systemic illness and allowed a clearer comparison of antiemetic efficacy (25,26).

Clear differences were observed among the three antiemetic agents evaluated. Ondansetron demonstrated complete effectiveness, with no reported cases of nausea or vomiting at any postoperative interval. This consistent efficacy highlights its strong antiemetic action and supports its established role as a first-line agent for PONV prevention (27). Dexamethasone showed partial effectiveness, particularly in the early postoperative period. However, nausea was observed at later intervals, and a notable number of patients experienced adverse effects such as dizziness and delayed recovery. These findings suggest that while dexamethasone may be beneficial, its antiemetic effect may be limited when used as a single agent (18). Metoclopramide was the least effective drug in this study. Patients receiving metoclopramide experienced higher nausea severity scores and more frequent vomiting episodes, especially during the early and late postoperative periods. Additionally, prolonged and delayed recovery was more common in this group, indicating a less favorable efficacy and safety profile (28,29).

The chi-square analyses confirmed statistically significant differences in both nausea and vomiting among the treatment groups at all postoperative intervals. These results emphasize that the choice of antiemetic agent has a significant impact on postoperative outcomes (19,30). The ANOVA findings further supported this conclusion by demonstrating significant differences in nausea severity scores across the three drugs. Interestingly, no significant difference was observed in the use of rescue antiemetics among the groups. This may be attributed to standardized postoperative care protocols or timely clinical intervention, which may have reduced the need for additional medication despite differences in primary prophylaxis (32).

Adverse event analysis revealed a significant association between treatment type and side effects. Ondansetron was associated with an excellent safety profile, with no reported complications. In contrast, dexamethasone and metoclopramide were linked with several adverse effects, including dizziness, headache, and delayed recovery (33). These findings underscore the importance of considering not only efficacy but also safety when selecting an antiemetic agent. In summary, the findings of this study demonstrate that ondansetron is superior to dexamethasone and metoclopramide in preventing postoperative nausea and vomiting, offering both high efficacy

and minimal adverse effects (35). Dexamethasone may provide moderate benefit but appears less effective when used alone, while metoclopramide shows limited effectiveness and a higher complication rate. These results support the preferential use of ondansetron for PONV prophylaxis in routine surgical practice.

CONCLUSION

Postoperative nausea and vomiting remain significant challenges in perioperative care, with direct implications for patient comfort, recovery quality, and healthcare efficiency. The present study evaluated and compared the effectiveness of ondansetron, dexamethasone, and metoclopramide in the prevention of postoperative nausea and vomiting at different postoperative time intervals. The findings clearly demonstrate that ondansetron was the most effective antiemetic agent, providing complete prevention of nausea and vomiting throughout the postoperative period without any observed adverse effects. Dexamethasone showed moderate efficacy, particularly in the early postoperative phase, but was associated with delayed recovery and dizziness in a considerable number of patients. Metoclopramide was the least effective agent, with higher nausea severity scores, more frequent vomiting episodes, and a greater incidence of prolonged recovery.

Statistical analyses confirmed significant differences in nausea and vomiting outcomes among the treatment groups, indicating that the choice of antiemetic plays a crucial role in postoperative symptom control. Demographic variables such as age, gender, BMI, and ASA classification did not independently predict nausea occurrence, suggesting that effective pharmacological prophylaxis may override individual risk factors. Overall, the results support the preferential use of ondansetron as a first-line agent for the prevention of postoperative nausea and vomiting due to its superior efficacy and favorable safety profile.

STUDY LIMITATIONS

- The study was conducted at a single center, which may limit the generalizability of the findings to other clinical settings or populations.
- The sample size, although adequate for comparison, may not have been sufficient to detect subtle associations between demographic variables and nausea occurrence.
- Only three antiemetic agents were evaluated; combination therapies and newer agents were not included in the analysis.
- The study focused primarily on short-term postoperative outcomes, and long-term effects were not assessed.
- Subjective assessment of nausea severity may have introduced response bias despite the use of standardized scoring methods.

RECOMMENDATIONS

- Ondansetron should be considered the preferred prophylactic antiemetic for patients undergoing surgery due to its high efficacy and minimal adverse effects.
- Future studies should include larger, multicenter samples to enhance the external validity of the findings.
- Comparative evaluation of combination antiemetic therapies is recommended to determine whether synergistic effects further reduce PONV.
- Long-term follow-up studies should be conducted to assess sustained outcomes and delayed adverse effects.
- Further research should explore individualized antiemetic strategies based on patient-specific risk profiles to optimize postoperative care.

Author's Declaration

Zulfiqar Ali Regd. No. **SU91-MSAHW-S24-052** declare that the contents of my research synopsis entitled **comparing the effectiveness of dexamethasone, ondansetron and metoclopramide in controlling post operative nausea and vomiting in patients undergoing laparoscopic cholecystectomy** are based on my own research findings and have not been taken

from any other work except the references and has not been published before.

REFERENCES

Chilkoti GT, Nandanan J, Saxena AK, Seth V, Kaur N, Maurya P. Low dose ondansetron with dexamethasone for prophylaxis of postoperative nausea and vomiting following laparoscopic cholecystectomy—A randomized double-blind study. Journal of Anaesthesiology Clinical Pharmacology. 2025;41(1):84–9.

Ali My, Uddin R, islam A, Kamal M, Islam Smr, Shafiqur Rahman A. Post operative nausea and vomiting after laparoscopic cholecystectomy: comparison of prophylactic effect of dexamethasone with ondansetron.

Chattopadhyay S, Biswas A, Ferdows SS, Bhowmik DK, Dey S, Biswas B. Comparison of Ondansetron, Dexamethasone and Ondansetron Plus Dexamethasone For The Prevention of Post-operative Nausea and Vomiting after Laparoscopic Cholecystectomy. Indian Journal of Clinical Anaesthesia. 2016;3(3):459.

Shafaee Y, Isazadehfar K, Entezariasl M, Shahbazzadegan B, Nourani Z, Shafaee Y. The Comparative Study of Ondansetron and Metoclopramide Effects in Reducing Nausea and Vomiting After Laparoscopic Cholecystectomy. Vol. 55, Acta Med Iran. 2017

Siddiqui MA, Hafeez I, Ahmed Khan M, Qayoom A, Mallhi AI, Soomro A uddin. Preoperative Ondansetron and Dexamethasone in the Avoidance of Nausea and Vomiting after Cholecystectomy: A randomized controlled trial. International Journal of Current Research and Review. 2022;14(06):110–4

Al-Radeef MY, Abood SJ, Abdulsahib WK, Hamad SO. Comparing the effect of dexamethasone, normal saline, and metoclopramide on prevention of postoperative nausea, vomiting and pain in patient undergoing laparoscopic

Isazadehfar K, Entezariasl M, Fahim S. Comparing the Effect of Ondansetron and Dexamethasone in Reducing Nausea and Vomiting Following Laparoscopic Cholecystectomy.

Chandra Besra DK. Comparative Study of Palonosetron versus Ondansetron-Dexamethasone Combination for Prevention of Post-Operative Nausea and Vomiting in Patient Posted for Laparoscopic Cholecystectomy under General Anaesthesia. Journal of Medical Science And clinical Research [Internet]. 2020 Mar 25;08(03). Available from: http://jmscr.igmpublication.org/v8-i3/102%20jmscr.pdf

Munir AA, Zareen A, Rana S. Study of efficacy of combination of dexamethasone and ondansetron versus ondansetron alone using SAMBA guidelines for postoperative nausea and vomiting in laparoscopic cholecystectomy. The Professional Medical Journal. 2020 Aug 7;27(09):1839–44.

Leksowski K, Peryga P, Szyca R. Ondansetron, metoclopramid, dexamethason, and their combinations compared for the prevention of postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy: A prospective randomized study. Surgical Endoscopy and Other Interventional Techniques. 2006 Jun;20(6):878–82.

Atiq ur Rehman, Rizwan Aziz, Tahira Hameed, Sohaib Haider, Arrham Hai, Shaharyar Ahsan. Efficacy of dexamethasone in prevention of postoperative nausea and vomiting in laparoscopic cholecystectomy. The Professional Medical Journal. 2023 Oct 5;30(10):1241–6.

Habib AS, Gan TJ. Evidence-based management of postoperative nausea and vomiting: a review. Can J Anaesth. 2004;51(4):326–341.

Kovac AL. Update on the management of postoperative nausea and vomiting. Drugs. 2013;73(14):1525–1547.

Wang JJ, Ho ST, Tzeng JI, Tang CS. The effect of timing of dexamethasone administration on its efficacy as a prophylactic antiemetic for postoperative nausea and vomiting. Anesth Analg. 2000;91(1):136–139.

De Oliveira GS Jr, Castro-Alves LJ, Ahmad S, Kendall MC, McCarthy RJ. Dexamethasone to prevent postoperative nausea and vomiting: an updated meta-analysis of randomized controlled trials. Anesth Analg. 2013;116(1):58–74.

Gan TJ, Diemunsch P, Habib AS, Kovac A, Kranke P, Meyer TA, et al. Consensus guidelines for the management of postoperative nausea and vomiting. Anesth Analg. 2014;118(1):85–113.

Apfel CC, Heidrich FM, Jukar-Rao S, Jalota L, Hornuss C, Whelan RP, et al. Evidence-based analysis of risk factors for postoperative nausea and vomiting. Br J Anaesth. 2012;109(5):742–753

Jain V, Prakash S, Bharti N, Singh DK. Efficacy of dexamethasone, ondansetron, and their combination for prevention of postoperative nausea and vomiting after laparoscopic cholecystectomy. J Anaesthesiol Clin Pharmacol. 2016;32(4):453–457.

Kovac AL. Update on the management of postoperative nausea and vomiting. Drugs. 2013;73(14):1525–1547.

Qasemi F, Aini T, Ali W, Dost W, Rasully MQ, Anwari M, Dost W, Zaheer R, Dost R, Talpur AS. The Effectiveness of Ondansetron and Dexamethasone in Preventing Postoperative Nausea and Vomiting After Laparoscopic Cholecystectomy. Cureus. 2023 Apr 11;15(4):e37419.

Bano F, Zafar S, Aftab S, Haider S. Dexamethasone plus ondansetron for prevention of postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy: a comparison with dexamethasone alone. J Coll Physicians Surg Pak. 2008 May 18;18(5):265-9.

Maitra S, Som A, Baidya DK, Bhattacharjee S. Comparison of ondansetron and dexamethasone for prophylaxis of postoperative nausea and vomiting in patients undergoing laparoscopic surgeries: a meta-analysis of randomized controlled trials. Anesthesiology research and practice. 2016;2016(1):7089454.

Khubzan WD, Albagieh MH, Nathif RA, Alshamrani WM, Alharbi NS, Sharahili RA, Alsaeed NM, Mahfouz MM. Comparison between ondansetron and granisetron in preventing nausea and vomiting after laparoscopic cholecystectomy: A systematic review and meta-analysis. Saudi Med J. 2025 Jul;46(7):721-734.

Kumar J, Alagarsamy R, Lal B, Rai AJ, Joshi R, Karna ST, Shakti P, Verma DK, Yadav V, Goel P, Yunus M. Comparison of efficacy and safety between palonosetron and ondansetron to prevent postoperative nausea and vomiting in patients undergoing laparoscopic surgery: a systematic review and meta-analysis. Journal of Minimally Invasive Surgery. 2024 Dec 15;27(4):202.

Nazemroaya B, Keleidari B, Arabzadeh A, Honarmand A. Comparison of intraperitoneal versus intravenous dexamethasone on postoperative pain, nausea, and vomiting after laparoscopic cholecystectomy. Anesthesiology and pain medicine. 2022 Apr 30;12(2):e122203.

Apfel CC, Läärä E, Koivuranta M, Greim CA, Roewer N. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. Anesthesiology. 1999;91(3):693–700.

Gan TJ, Diemunsch P, Habib AS, Kovac A, Kranke P, Meyer TA, et al. Consensus guidelines for the management of postoperative nausea and vomiting. Anesth Analg. 2014;118(1):85–113.

Watcha MF, White PF. Postoperative nausea and vomiting: its etiology, treatment, and prevention. Anesthesiology. 1992;77(1):162–184.

Kovac AL. Prevention and treatment of postoperative nausea and vomiting. Drugs. 2000;59(2):213–243.

Kranke P, Eberhart LHJ. Possibilities and limitations in the pharmacological management of postoperative nausea and vomiting. Eur J Anaesthesiol. 2011;28(11):758–765.

Henzi I, Walder B, Tramèr MR. Dexamethasone for the prevention of postoperative nausea and vomiting: a quantitative systematic review. Anesth Analg. 2000;90(1):186–194.

Tramèr MR, Moore RA, Reynolds DJ, McQuay HJ. A quantitative systematic review of ondansetron in treatment of established postoperative nausea and vomiting. BMJ. 1997;314(7099):1088–1092.

Habib AS, Gan TJ. Combination therapy for postoperative nausea and vomiting — a more effective prophylaxis? Ambulatory Anesthesia. 2001;92(6):180–186.

Scuderi PE, James RL, Harris L, Mims GR. Antiemetic prophylaxis does not improve outcomes after outpatient surgery when compared to symptomatic treatment. Anesthesiology. 1999;90(2):360–371.

Palazzo MGA, Strunin L. Anaesthesia and emesis. I: Etiology. Can Anaesth Soc J. 1984;31(2):178–187.