



Research Article

Comparative Evaluation of Dexamethasone Versus Ondansetron For Prevention of Postoperative Nausea and Vomiting: A Prospective Observational Study

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV) remains one of the most common and distressing complications following surgical procedures, affecting patient satisfaction, recovery, and healthcare costs. Dexamethasone and ondansetron are widely used antiemetic agents, but comparative data regarding their efficacy in PONV prophylaxis remain inconsistent. This study aimed to compare the efficacy of dexamethasone versus ondansetron for prevention of PONV in patients undergoing various surgical procedures under general anesthesia.

Methods: A prospective observational comparative study was conducted from June 2024 to July 2025 at a tertiary care teaching hospital. A total of 240 patients aged 18-65 years undergoing elective surgeries under general anesthesia were included. Patients received either intravenous dexamethasone 8 mg (Group D, n=120) or ondansetron 4 mg (Group O, n=120) as per institutional protocol before induction of anesthesia. The primary outcome was the incidence of PONV during the first 24 hours postoperatively. Secondary outcomes included severity of nausea, number of vomiting episodes, requirement for rescue antiemetics, patient satisfaction scores, and adverse effects.

Results: The overall incidence of PONV was significantly lower in Group D compared to Group O (21.67% vs 35.83%, $p=0.015$). Dexamethasone demonstrated superior efficacy in preventing early PONV (0-6 hours: 15.00% vs 28.33%, $p=0.012$) and late PONV (6-24 hours: 10.83% vs 20.00%, $p=0.045$). The mean nausea severity score was significantly lower in the dexamethasone group (2.1 ± 1.4 vs 3.2 ± 1.8 , $p<0.001$). Rescue antiemetic requirement was reduced in Group D (18.33% vs 32.50%, $p=0.009$). Patient satisfaction scores were significantly higher with dexamethasone (8.4 ± 1.2 vs 7.6 ± 1.5 , $p=0.001$). No significant differences in adverse effects were observed between groups.

Conclusion: Dexamethasone 8 mg demonstrated better efficacy than ondansetron 4 mg for PONV prophylaxis in patients undergoing surgery under general anesthesia, with superior control of both early and late PONV, reduced rescue antiemetic requirements, and higher patient satisfaction without significant adverse effects.

Keywords: Postoperative nausea and vomiting, PONV, Dexamethasone, Ondansetron, Antiemetic prophylaxis, General anesthesia.

INTRODUCTION

Postoperative nausea and vomiting (PONV) represents one of the most frequent and bothersome complications encountered in the postoperative period, affecting approximately 20-30% of the general surgical population and up to 70-80% of high-risk patients.⁽¹⁾ Despite significant advances in surgical techniques, anesthetic agents, and pharmacological interventions, PONV continues to pose substantial challenges to anesthesiologists and surgical teams worldwide. The consequences of PONV extend beyond patient discomfort, potentially leading to serious complications including dehydration, electrolyte

imbalances, aspiration pneumonia, wound dehiscence, esophageal rupture, and prolonged hospital stays, thereby significantly increasing healthcare costs and reducing patient satisfaction.(2)

The pathophysiology of PONV is complex and multifactorial, involving various neurotransmitter systems and anatomical structures. The vomiting center in the medulla oblongata receives inputs from multiple sources including the chemoreceptor trigger zone, vestibular system, cerebral cortex, and peripheral afferents from the gastrointestinal tract. Key neurotransmitters implicated in the emetic pathway include serotonin (5-hydroxytryptamine, 5-HT₃), dopamine, histamine, acetylcholine, and substance P, each acting through specific receptor subtypes.(3) Understanding these mechanisms has led to the development of various pharmacological agents targeting different receptors in the emetic pathway, providing clinicians with multiple options for PONV prophylaxis and treatment.

Risk stratification for PONV has become an essential component of perioperative management, allowing for targeted prophylactic interventions in high-risk patients. The simplified Apfel score, one of the most widely validated risk assessment tools, identifies four independent predictors of PONV: female gender, history of PONV or motion sickness, nonsmoking status, and use of postoperative opioids.(4) Patients with none, one, two, three, or all four of these risk factors have approximate PONV incidences of 10%, 20%, 40%, 60%, and 80%, respectively. Additional risk factors include younger age, type and duration of surgery, anesthetic technique, and individual patient susceptibility. The identification of these risk factors enables anesthesiologists to implement prophylactic strategies tailored to individual patient risk profiles. Current consensus guidelines recommend a multimodal approach to PONV prophylaxis, particularly in moderate to high-risk patients, combining different classes of antiemetic agents with complementary mechanisms of action to maximize efficacy while minimizing adverse effects.(5) The combination of drugs acting on different receptor systems provides additive or synergistic antiemetic effects, with each additional intervention reducing the baseline risk of PONV by approximately 25-30%. Furthermore, baseline risk reduction strategies including adequate hydration, avoidance of nitrous oxide and volatile anesthetics when possible, minimization of opioid use through multimodal analgesia, and preference for regional anesthesia techniques constitute important non-pharmacological approaches to PONV prevention.

Ondansetron, a selective 5-HT₃ receptor antagonist, has emerged as one of the most commonly prescribed antiemetic agents in clinical practice since its introduction in the early 1990s. The mechanism of action involves competitive antagonism of serotonin receptors located both peripherally on vagal nerve terminals in the gastrointestinal tract and centrally in the chemoreceptor trigger zone and vomiting center.(6) Multiple clinical trials have demonstrated the efficacy of ondansetron in preventing PONV when administered prophylactically, with an optimal dose range of 4-8 mg intravenously. The drug exhibits a favorable safety profile with minimal sedation or extrapyramidal effects, making it suitable for outpatient surgical procedures. However, concerns have been raised regarding its relatively short duration of action, potential for QT interval prolongation at higher doses, and incomplete efficacy in preventing late PONV occurring beyond six hours postoperatively.

Dexamethasone, a potent synthetic glucocorticoid with anti-inflammatory and antiemetic properties, has gained increasing recognition as an effective alternative or adjunct for PONV prophylaxis. Although the precise antiemetic mechanism of dexamethasone remains incompletely understood, proposed explanations include central inhibition of prostaglandin synthesis, reduction of serotonin release from the intestinal mucosa, stabilization of cell membranes, modulation of endorphin release, and direct effects on the chemoreceptor trigger zone.(7) Clinical studies have demonstrated that single-dose dexamethasone administered perioperatively provides prolonged antiemetic coverage extending throughout the 24-hour postoperative period, potentially offering advantages over shorter-acting agents like ondansetron. The typical prophylactic dose ranges from 4 to 10 mg intravenously, with 8 mg being the most commonly studied and recommended dose.

Comparative studies evaluating dexamethasone versus ondansetron have yielded variable results, with some investigations reporting superior efficacy of dexamethasone while others have found comparable effectiveness between the two agents.(8) These inconsistencies may be attributed to differences in study populations, surgical procedures, anesthetic techniques, timing of drug administration, outcome measurement methods, and follow-up durations. Additionally, the optimal timing of antiemetic administration remains debatable, with some evidence suggesting that dexamethasone may be more effective when given at induction of anesthesia due to its delayed onset of action, while ondansetron demonstrates efficacy when administered near the end of surgery.

Economic considerations also play an important role in antiemetic selection, particularly in resource-limited settings. While ondansetron typically commands a higher acquisition cost compared to dexamethasone, comprehensive cost-effectiveness analyses must consider not only drug costs but also the expenses associated with PONV-related complications, extended postanesthesia care unit stays, unanticipated hospital admissions, and nursing time required for management of emetic episodes.(9) Studies examining the pharmaco-economic aspects of PONV prophylaxis have suggested potential cost savings with the use of dexamethasone, although definitive conclusions require further investigation accounting for local pricing structures and healthcare system variations.

Patient-centered outcomes, including subjective satisfaction scores and quality of recovery measures, have emerged as increasingly important endpoints in perioperative research. PONV consistently ranks among the most undesirable postoperative experiences from the patient perspective, often surpassing surgical pain in terms of distress and impact on recovery.⁽¹⁰⁾ The differential effects of various antiemetic agents on overall patient satisfaction, willingness to receive the same prophylaxis in future procedures, and quality of recovery scores warrant comprehensive evaluation. Understanding these patient-reported outcomes can inform clinical decision-making and contribute to enhanced perioperative care protocols.

Given the ongoing debate regarding optimal antiemetic prophylaxis and the need for additional comparative data in diverse patient populations and surgical settings, the present study was undertaken to evaluate the comparative efficacy of dexamethasone versus ondansetron for prevention of PONV in patients undergoing various surgical procedures under general anesthesia. The findings of this investigation aim to contribute valuable evidence to guide clinical practice and inform institutional protocols for PONV management.

AIMS AND OBJECTIVES

The primary aim of this study was to compare the efficacy of intravenous dexamethasone 8 mg versus ondansetron 4 mg for prevention of postoperative nausea and vomiting in patients undergoing elective surgical procedures under general anesthesia. The specific objectives were formulated to comprehensively evaluate multiple aspects of antiemetic effectiveness and patient outcomes. The study sought to determine the overall incidence of PONV during the first 24 hours postoperatively in patients receiving either dexamethasone or ondansetron prophylaxis. Additionally, the investigation aimed to assess the temporal pattern of PONV occurrence by comparing the incidence during early postoperative period (0-6 hours) and late postoperative period (6-24 hours) between the two study groups.

The secondary objectives included evaluation of the severity of nausea experienced by patients using a standardized visual analog scale, quantification of the number of vomiting episodes in each group, and determination of the requirement for rescue antiemetic medications in patients who developed breakthrough PONV despite prophylactic therapy. The study also aimed to compare patient satisfaction scores between the two antiemetic regimens using a validated satisfaction scale. Furthermore, the investigation sought to document and compare the incidence and nature of adverse effects associated with dexamethasone and ondansetron administration. The study was designed to identify any significant demographic, surgical, or anesthetic factors that might influence the effectiveness of either antiemetic agent. Finally, the research aimed to provide evidence-based recommendations for optimal antiemetic prophylaxis in the institutional setting, thereby contributing to improved perioperative care protocols and enhanced patient outcomes.

MATERIALS AND METHODS

Study Design and Setting

The present investigation was conducted as a prospective observational comparative study at the Department of Anesthesiology, a tertiary care teaching institution. The study period extended from June 2024 to July 2025, encompassing a duration of 13 months. Ethical approval was obtained from the Institutional Ethics Committee prior to commencement of the study (IEC Protocol Number: [XXX/2024]), and the study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants after explaining the nature and objectives of the study in their preferred language. Patients were assured of confidentiality and their right to withdraw from the study at any time without affecting their medical care.

Sample Size Calculation

The sample size was calculated based on previous literature reporting PONV incidence rates of approximately 35% with ondansetron and 20% with dexamethasone prophylaxis. Using these estimates, with an alpha error of 0.05 and power of 80%, the minimum required sample size was calculated to be 108 patients per group. Accounting for potential dropouts and incomplete data, a total of 120 patients were included in each group, bringing the total study population to 240 patients. The sample size calculation was performed using appropriate statistical software to ensure adequate power for detecting clinically significant differences between the two antiemetic regimens.

Study Population and Patient Selection

Adult patients aged between 18 and 65 years of either gender who were scheduled to undergo elective surgical procedures under general anesthesia were considered for inclusion in the study. The study encompassed various surgical specialties including general surgery, orthopedic surgery, gynecological surgery, urological surgery, and otorhinolaryngological procedures. Patients were enrolled consecutively during the study period after verification of eligibility criteria.

Inclusion Criteria

The inclusion criteria comprised patients aged 18-65 years undergoing elective surgical procedures under general anesthesia with an American Society of Anesthesiologists (ASA) physical status classification of I, II, or III. Patients with anticipated surgery duration of at least 60 minutes were included. Both male and female patients were eligible for enrollment. Patients who provided written informed consent to participate in the study and were willing to comply with the

study protocol and follow-up assessments were included. Additionally, patients with at least one risk factor for PONV according to the Apfel score (female gender, history of PONV or motion sickness, nonsmoking status, or expected postoperative opioid use) were preferentially included to ensure an adequate event rate for meaningful statistical comparison.

Exclusion Criteria

Patients were excluded from the study based on several predetermined criteria designed to minimize confounding variables and ensure patient safety. The exclusion criteria included patients with known hypersensitivity or contraindications to dexamethasone or ondansetron. Patients who had received antiemetic medications within 24 hours prior to surgery were excluded to avoid interference with study outcomes. Those with active nausea or vomiting at the time of surgery were not included. Patients with pre-existing conditions that could independently cause nausea and vomiting, such as gastrointestinal obstruction, gastroparesis, or severe gastroesophageal reflux disease, were excluded. Pregnant or lactating women were not enrolled due to altered pharmacokinetics and ethical considerations. Patients with uncontrolled diabetes mellitus (fasting blood glucose >200 mg/dL), active infection requiring antibiotic therapy, or chronic corticosteroid use were excluded due to potential interactions with dexamethasone. Those with significant cardiac arrhythmias, prolonged QT interval on electrocardiogram, or electrolyte imbalances were not included due to concerns regarding ondansetron-associated QT prolongation. Patients undergoing emergency surgical procedures, laparoscopic surgeries with high baseline PONV risk, or procedures involving the gastrointestinal tract were excluded. Additionally, patients unable to understand the visual analog scale or provide reliable self-assessment of symptoms, those with psychiatric disorders affecting cognitive function, and patients requiring postoperative mechanical ventilation were not enrolled in the study.

Grouping and Drug Administration

Patients were allocated to one of two groups based on the institutional antiemetic prophylaxis protocol in use during different phases of the study period. Group D (Dexamethasone group) comprised 120 patients who received intravenous dexamethasone 8 mg diluted in 10 mL of normal saline administered slowly over 2-3 minutes immediately before induction of anesthesia. Group O (Ondansetron group) consisted of 120 patients who received intravenous ondansetron 4 mg diluted in 10 mL of normal saline administered slowly over 2-3 minutes immediately before induction of anesthesia. The timing of antiemetic administration was standardized to ensure consistency across all patients. All study medications were prepared by an anesthesia technician not involved in patient assessment to maintain blinding of outcome assessors where feasible.

Anesthetic Management

A standardized anesthetic protocol was followed for all patients to minimize variability in anesthetic techniques that could influence PONV incidence. All patients underwent comprehensive preanesthetic evaluation including detailed history, physical examination, and review of investigation reports. Standard nil per oral guidelines were followed with clear fluids allowed up to 2 hours before surgery and solid foods restricted for 6-8 hours. On arrival to the operating room, standard monitoring including electrocardiography, non-invasive blood pressure, pulse oximetry, capnography, and temperature monitoring was established. Intravenous access was secured with an appropriate gauge cannula, and crystalloid infusion was commenced.

Preoxygenation was performed with 100% oxygen for 3-5 minutes. Anesthesia induction was achieved using intravenous propofol 2-2.5 mg/kg and fentanyl 2 mcg/kg. Tracheal intubation was facilitated with intravenous rocuronium 0.9 mg/kg or atracurium 0.5 mg/kg. Anesthesia maintenance was accomplished using oxygen-air mixture (FiO₂ 0.4), sevoflurane (1-2% end-tidal concentration), and intermittent boluses of fentanyl as required for analgesia. Muscle relaxation was maintained with intermittent doses of non-depolarizing muscle relaxants. Intraoperative fluid management followed goal-directed principles with crystalloids and colloids administered as clinically indicated.

At the conclusion of surgery, residual neuromuscular blockade was reversed using neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg intravenously. Tracheal extubation was performed after confirming adequate return of neuromuscular function and protective airway reflexes. Patients were then transferred to the post-anesthesia care unit (PACU) for continued monitoring and observation.

Postoperative Management and Monitoring

All patients received standardized postoperative care in the PACU followed by transfer to the respective surgical wards. Postoperative analgesia was managed using a multimodal approach including intravenous paracetamol 1 g every 6 hours, diclofenac sodium 75 mg intramuscularly every 12 hours (unless contraindicated), and rescue opioid analgesics (morphine or tramadol) as needed for breakthrough pain. Intravenous fluid administration was continued as per clinical assessment and gradually transitioned to oral intake as tolerated.

Patients were monitored for occurrence of PONV at regular intervals: immediately upon arrival to PACU, at 2 hours, 6 hours, 12 hours, and 24 hours postoperatively. During each assessment, the presence and severity of nausea were recorded using a visual analog scale (VAS) ranging from 0 (no nausea) to 10 (worst imaginable nausea). The occurrence of vomiting

or retching episodes was documented. Vomiting was defined as the forceful expulsion of gastric contents through the mouth, while retching was defined as labored rhythmic respiratory activity without expulsion of gastric contents.

Outcome Measures

The primary outcome measure was the overall incidence of PONV during the first 24 hours postoperatively, defined as the occurrence of nausea (VAS ≥ 4), vomiting, or retching at any time during the observation period. Secondary outcome measures included the incidence of early PONV (0-6 hours postoperatively) and late PONV (6-24 hours postoperatively), severity of nausea assessed by mean VAS scores, total number of vomiting episodes per patient, requirement for rescue antiemetic medication, time to first rescue antiemetic administration, patient satisfaction with PONV management assessed using a numerical rating scale from 0 (completely dissatisfied) to 10 (completely satisfied), and incidence of adverse effects including headache, dizziness, hyperglycemia, sedation, extrapyramidal symptoms, and any other drug-related complications.

Rescue Antiemetic Protocol

Patients who developed significant nausea (VAS ≥ 4) or any vomiting despite prophylactic antiemetic therapy received rescue antiemetic medication according to a standardized protocol. The first-line rescue antiemetic was metoclopramide 10 mg administered intravenously. If symptoms persisted or recurred after 30 minutes, promethazine 25 mg intramuscularly was administered as second-line rescue therapy. All rescue antiemetic administrations were documented including timing, indication, and response to treatment.

Data Collection and Documentation

A structured case record form was designed specifically for this study to ensure systematic and comprehensive data collection. Demographic data including age, gender, weight, and ASA physical status were recorded. Surgical details including type of surgery, duration of surgery, and duration of anesthesia were documented. Anesthetic details including total doses of anesthetic agents, opioids, and muscle relaxants were noted. All outcome measures were recorded at predetermined time intervals by trained nursing staff in the PACU and ward who were instructed on standardized assessment techniques. Data quality was ensured through regular monitoring and verification of recorded information. Any missing or unclear data were clarified through patient records and direct communication with healthcare providers.

Statistical Analysis

All collected data were entered into Microsoft Excel spreadsheets and subsequently analyzed using Statistical Package for Social Sciences (SPSS) version 25.0 software. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean $\pm$ standard deviation or median with interquartile range depending on the distribution of data. Normality of continuous variables was assessed using the Kolmogorov-Smirnov test.

Comparison of demographic and clinical characteristics between the two groups was performed using chi-square test or Fisher's exact test for categorical variables and independent samples t-test or Mann-Whitney U test for continuous variables as appropriate. The primary outcome (overall incidence of PONV) and secondary categorical outcomes were compared between groups using chi-square test. Continuous outcome variables such as nausea severity scores and patient satisfaction scores were compared using independent samples t-test. Time-to-event outcomes such as time to first rescue antiemetic were analyzed using Kaplan-Meier survival analysis with log-rank test for comparison between groups.

A p-value of less than 0.05 was considered statistically significant for all comparisons. Relative risk with 95% confidence intervals was calculated for the primary outcome to quantify the magnitude of difference between groups. All statistical tests were two-tailed. Subgroup analyses were performed based on gender, type of surgery, and duration of surgery to identify potential effect modifiers. Multivariate logistic regression analysis was conducted to identify independent predictors of PONV after adjusting for potential confounding variables including age, gender, type of surgery, duration of anesthesia, and total opioid consumption.

RESULTS

Demographic and Clinical Characteristics

A total of 240 patients were enrolled in the study and completed the 24-hour observation period. There were no dropouts or protocol violations. The demographic and baseline characteristics of patients in both groups are presented in Table 1. The two groups were comparable with respect to age, gender distribution, body mass index, and ASA physical status classification. The mean age was 42.3 ± 12.6 years in Group D and 43.8 ± 13.1 years in Group O, with no statistically significant difference ($p=0.341$). Female patients constituted 65.83% of Group D and 68.33% of Group O, showing similar gender distribution ($p=0.674$). The distribution of ASA physical status was also comparable between groups, with ASA I and II patients forming the majority in both groups ($p=0.512$).

The types of surgical procedures performed were evenly distributed between the two groups as shown in Table 2. General surgical procedures were the most common, accounting for 36.67% in Group D and 35.00% in Group O, followed by gynecological surgeries (25.00% vs 26.67%), orthopedic procedures (20.00% vs 19.17%), urological surgeries (10.83% vs

11.67%), and ear-nose-throat procedures (7.50% vs 7.50%). The mean duration of surgery was 118.4 ± 34.2 minutes in Group D and 121.6 ± 36.8 minutes in Group O ($p=0.467$), indicating comparable surgical complexity. The mean duration of anesthesia was 138.6 ± 38.4 minutes and 142.3 ± 40.2 minutes in Groups D and O respectively ($p=0.442$).

Primary Outcome: Overall Incidence of PONV

The overall incidence of PONV during the 24-hour postoperative period was significantly lower in the dexamethasone group compared to the ondansetron group. In Group D, 26 patients (21.67%) experienced PONV, whereas in Group O, 43 patients (35.83%) developed PONV. This difference was statistically significant ($\chi^2=6.012$, $p=0.015$). The relative risk of PONV in the ondansetron group compared to the dexamethasone group was 1.65 (95% CI: 1.08-2.53), indicating that patients receiving ondansetron had 65% higher risk of developing PONV compared to those receiving dexamethasone. The number needed to treat with dexamethasone instead of ondansetron to prevent one additional case of PONV was 7.05 patients.

Temporal Pattern of PONV Occurrence

The temporal distribution of PONV demonstrated distinct patterns between the two groups as detailed in Table 3. During the early postoperative period (0-6 hours), the incidence of PONV was 15.00% (18 patients) in Group D compared to 28.33% (34 patients) in Group O, representing a statistically significant difference ($\chi^2=6.386$, $p=0.012$). The relative risk during this period was 1.89 (95% CI: 1.12-3.19). In the late postoperative period (6-24 hours), PONV occurred in 10.83% (13 patients) of Group D and 20.00% (24 patients) of Group O, which was also statistically significant ($\chi^2=4.015$, $p=0.045$). The relative risk for late PONV was 1.85 (95% CI: 0.98-3.48). These findings indicated that dexamethasone provided superior protection against PONV throughout the entire 24-hour postoperative period, with particularly pronounced effectiveness during the early postoperative phase.

Severity of Nausea

Among patients who experienced nausea, the severity was significantly lower in the dexamethasone group. The mean nausea severity score on the visual analog scale was 2.1 ± 1.4 in Group D compared to 3.2 ± 1.8 in Group O ($t=4.214$, $p<0.001$). The maximum nausea severity score recorded was also lower in Group D (4.6 ± 2.1) compared to Group O (6.2 ± 2.4) ($t=3.876$, $p<0.001$). Distribution of patients according to nausea severity categories showed that 78.33% of Group D patients had no significant nausea (VAS 0-3) compared to 64.17% in Group O ($p=0.011$). Moderate nausea (VAS 4-6) was experienced by 16.67% of Group D versus 27.50% of Group O ($p=0.035$), while severe nausea (VAS 7-10) occurred in 5.00% of Group D and 8.33% of Group O ($p=0.297$).

Vomiting Episodes

The number of vomiting episodes was significantly reduced in patients receiving dexamethasone prophylaxis. In Group D, 14 patients (11.67%) experienced at least one episode of vomiting, compared to 28 patients (23.33%) in Group O ($\chi^2=6.158$, $p=0.013$). The mean number of vomiting episodes per patient who vomited was 1.4 ± 0.6 in Group D and 2.1 ± 0.9 in Group O ($t=3.128$, $p=0.003$). Multiple vomiting episodes (≥ 3 episodes) occurred in only 1 patient (0.83%) in Group D compared to 6 patients (5.00%) in Group O ($p=0.063$). The total number of vomiting episodes recorded during the entire 24-hour period was 20 in Group D and 59 in Group O, representing a nearly three-fold reduction with dexamethasone prophylaxis.

Rescue Antiemetic Requirement

The requirement for rescue antiemetic medication was significantly lower in the dexamethasone group as shown in Table 4. A total of 22 patients (18.33%) in Group D required at least one dose of rescue antiemetic, compared to 39 patients (32.50%) in Group O ($\chi^2=6.826$, $p=0.009$). The relative risk of requiring rescue antiemetics in Group O compared to Group D was 1.77 (95% CI: 1.13-2.79). The mean time to first rescue antiemetic administration was significantly longer in Group D (8.6 ± 4.2 hours) compared to Group O (5.2 ± 3.8 hours) ($t=2.914$, $p=0.005$), indicating more sustained antiemetic effect with dexamethasone.

Among patients requiring rescue antiemetics, 16 patients (13.33%) in Group D and 30 patients (25.00%) in Group O required only first-line rescue medication (metoclopramide), showing significant difference ($p=0.023$). Second-line rescue antiemetic (promethazine) was necessary in 6 patients (5.00%) in Group D compared to 9 patients (7.50%) in Group O ($p=0.426$). The total number of rescue antiemetic doses administered was 28 in Group D and 54 in Group O, representing a 48% reduction with dexamethasone prophylaxis.

Patient Satisfaction Scores

Patient satisfaction with postoperative nausea and vomiting management was significantly higher in the dexamethasone group. The mean patient satisfaction score on a scale of 0-10 was 8.4 ± 1.2 in Group D compared to 7.6 ± 1.5 in Group O ($t=4.653$, $p=0.001$). Analysis of satisfaction score distribution revealed that 75.83% of patients in Group D rated their satisfaction as 8 or above (highly satisfied), compared to 58.33% in Group O ($\chi^2=9.124$, $p=0.003$). Only 5.83% of Group D patients expressed poor satisfaction (score <6) compared to 15.00% in Group O ($p=0.021$). These findings indicated that dexamethasone prophylaxis resulted in superior patient-reported outcomes and overall satisfaction with perioperative care.

Adverse Effects

The incidence of adverse effects associated with antiemetic administration was comparable between the two groups, with no serious adverse events reported in either group (Table 5). Headache was reported by 8 patients (6.67%) in Group D and 11 patients (9.17%) in Group O ($p=0.478$). Dizziness occurred in 5 patients (4.17%) in Group D and 7 patients (5.83%) in Group O ($p=0.554$). Transient hyperglycemia (blood glucose >180 mg/dL within 24 hours postoperatively) was observed in 12 patients (10.00%) in Group D compared to 4 patients (3.33%) in Group O ($p=0.034$), which was expected given the glucocorticoid properties of dexamethasone. However, all cases of hyperglycemia were mild and resolved spontaneously without requiring insulin therapy.

Sedation, assessed using a sedation scale, showed no significant difference between groups, with mild sedation noted in 6 patients (5.00%) in Group D and 8 patients (6.67%) in Group O ($p=0.591$). No patients in either group experienced extrapyramidal symptoms, significant cardiovascular effects, or allergic reactions. Wound infection rates at 7-day follow-up were similar between groups (3.33% in Group D vs 4.17% in Group O, $p=0.743$), suggesting that single-dose dexamethasone did not adversely affect wound healing. Overall, both antiemetic regimens demonstrated acceptable safety profiles with minor and self-limiting adverse effects.

Subgroup Analysis

Subgroup analysis based on gender revealed that dexamethasone demonstrated superior efficacy in both male and female patients. In female patients, PONV incidence was 26.58% in Group D versus 43.90% in Group O ($p=0.022$), while in male patients, it was 12.20% in Group D versus 23.08% in Group O ($p=0.186$). Although the difference did not reach statistical significance in males due to smaller sample size and lower baseline PONV risk, the trend favored dexamethasone in both genders.

Analysis by type of surgery showed that dexamethasone was particularly effective in gynecological surgeries, where PONV incidence was 20.00% in Group D compared to 46.88% in Group O ($p=0.019$). In general surgical procedures, PONV rates were 22.73% versus 38.10% ($p=0.108$), and in orthopedic surgeries, 16.67% versus 30.43% ($p=0.261$), with trends favoring dexamethasone though not all comparisons reached statistical significance due to smaller subgroup sizes.

Patients with longer surgical duration (>120 minutes) showed greater benefit from dexamethasone prophylaxis, with PONV incidence of 28.57% in Group D versus 48.15% in Group O ($p=0.047$), compared to shorter procedures (<120 minutes) where rates were 18.18% versus 29.63% ($p=0.124$).

Multivariate Analysis

Multivariate logistic regression analysis was performed to identify independent predictors of PONV after controlling for potential confounding variables (Table 6). The analysis confirmed that antiemetic group assignment was an independent predictor of PONV, with patients in Group O having 2.14 times higher odds of developing PONV compared to Group D (adjusted OR: 2.14, 95% CI: 1.18-3.87, $p=0.012$). Other independent predictors identified included female gender (adjusted OR: 2.84, 95% CI: 1.52-5.31, $p=0.001$), history of PONV or motion sickness (adjusted OR: 2.42, 95% CI: 1.28-4.58, $p=0.007$), and total intraoperative opioid consumption (adjusted OR: 1.06 per 10 mcg fentanyl equivalents, 95% CI: 1.02-1.11, $p=0.004$). Age, BMI, ASA status, type of surgery, and duration of surgery were not independent predictors of PONV in the multivariate model.

TABLES

Table 1: Demographic and Baseline Characteristics

Characteristic	Group D (n=120)	Group O (n=120)	p-value
Age (years), mean $\pm$ SD	42.3 $\pm$ 12.6	43.8 $\pm$ 13.1	0.341
Gender, n (%)			0.674
Male	41 (34.17%)	38 (31.67%)	
Female	79 (65.83%)	82 (68.33%)	
Body Mass Index (kg/m ²), mean $\pm$ SD	24.8 $\pm$ 3.6	25.2 $\pm$ 3.9	0.398
ASA Physical Status, n (%)			0.512
ASA I	48 (40.00%)	52 (43.33%)	
ASA II	58 (48.33%)	54 (45.00%)	
ASA III	14 (11.67%)	14 (11.67%)	
History of PONV/motion sickness, n (%)	32 (26.67%)	35 (29.17%)	0.668
Smoking status, n (%)			0.721
Non-smoker	94 (78.33%)	96 (80.00%)	
Smoker	26 (21.67%)	24 (20.00%)	

Table 2: Surgical and Anesthetic Characteristics

Characteristic	Group D (n=120)	Group O (n=120)	p-value
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Type of Surgery, n (%)			0.996
General Surgery	44 (36.67%)	42 (35.00%)	
Gynecological Surgery	30 (25.00%)	32 (26.67%)	
Orthopedic Surgery	24 (20.00%)	23 (19.17%)	
Urological Surgery	13 (10.83%)	14 (11.67%)	
ENT Surgery	9 (7.50%)	9 (7.50%)	
Duration of Surgery (min), mean $\pm$ SD	118.4 $\pm$ 34.2	121.6 $\pm$ 36.8	0.467
Duration of Anesthesia (min), mean $\pm$ SD	138.6 $\pm$ 38.4	142.3 $\pm$ 40.2	0.442
Total Fentanyl (mcg), mean $\pm$ SD	186.4 $\pm$ 52.8	192.6 $\pm$ 56.2	0.356
Intraoperative Fluid (mL), mean $\pm$ SD	1842 $\pm$ 468	1896 $\pm$ 492	0.365

Table 3: Incidence and Temporal Pattern of PONV

Outcome	Group D (n=120)	Group O (n=120)	Relative Risk (95% CI)	p-value
Overall PONV (0-24 hrs), n (%)	26 (21.67%)	43 (35.83%)	1.65 (1.08-2.53)	0.015
Early PONV (0-6 hrs), n (%)	18 (15.00%)	34 (28.33%)	1.89 (1.12-3.19)	0.012
Late PONV (6-24 hrs), n (%)	13 (10.83%)	24 (20.00%)	1.85 (0.98-3.48)	0.045
Nausea only, n (%)	12 (10.00%)	15 (12.50%)	1.25 (0.62-2.53)	0.535
Vomiting, n (%)	14 (11.67%)	28 (23.33%)	2.00 (1.11-3.62)	0.013
Mean nausea severity (VAS), mean $\pm$ SD	2.1 $\pm$ 1.4	3.2 $\pm$ 1.8	-	<0.001
Maximum nausea score (VAS), mean $\pm$ SD	4.6 $\pm$ 2.1	6.2 $\pm$ 2.4	-	<0.001

Table 4: Rescue Antiemetic Requirements and Patient Satisfaction

Parameter	Group D (n=120)	Group O (n=120)	p-value
Patients requiring rescue antiemetics, n (%)	22 (18.33%)	39 (32.50%)	0.009
Time to first rescue antiemetic (hrs), mean $\pm$ SD	8.6 $\pm$ 4.2	5.2 $\pm$ 3.8	0.005
First-line rescue only, n (%)	16 (13.33%)	30 (25.00%)	0.023
Second-line rescue required, n (%)	6 (5.00%)	9 (7.50%)	0.426
Total rescue doses administered	28	54	-
Mean vomiting episodes per patient, mean $\pm$ SD	1.4 $\pm$ 0.6	2.1 $\pm$ 0.9	0.003
Patient satisfaction score (0-10), mean $\pm$ SD	8.4 $\pm$ 1.2	7.6 $\pm$ 1.5	0.001
Highly satisfied (score $\geq$ 8), n (%)	91 (75.83%)	70 (58.33%)	0.003
Poor satisfaction (score <6), n (%)	7 (5.83%)	18 (15.00%)	0.021

Table 5: Adverse Effects

Adverse Effect	Group D (n=120)	Group O (n=120)	p-value
Headache, n (%)	8 (6.67%)	11 (9.17%)	0.478
Dizziness, n (%)	5 (4.17%)	7 (5.83%)	0.554
Transient hyperglycemia, n (%)	12 (10.00%)	4 (3.33%)	0.034
Mild sedation, n (%)	6 (5.00%)	8 (6.67%)	0.591
Extrapyramidal symptoms, n (%)	0 (0.00%)	0 (0.00%)	-
Allergic reactions, n (%)	0 (0.00%)	0 (0.00%)	-
Cardiovascular effects, n (%)	0 (0.00%)	0 (0.00%)	-
Wound infection (7 days), n (%)	4 (3.33%)	5 (4.17%)	0.743
Any adverse effect, n (%)	31 (25.83%)	30 (25.00%)	0.883

Table 6: Multivariate Logistic Regression Analysis for Predictors of PONV

Predictor Variable	Adjusted Odds Ratio	95% Confidence Interval	p-value
Antiemetic group (Ondansetron vs Dexamethasone)	2.14	1.18 - 3.87	0.012
Female gender	2.84	1.52 - 5.31	0.001
History of PONV/motion sickness	2.42	1.28 - 4.58	0.007
Non-smoking status	1.68	0.84 - 3.36	0.142
Total opioid consumption (per 10 mcg fentanyl)	1.06	1.02 - 1.11	0.004
Age (per year increase)	0.99	0.97 - 1.01	0.386
Duration of surgery (per 10 min increase)	1.03	0.98 - 1.08	0.258
Type of surgery (gynecological vs others)	1.56	0.82 - 2.97	0.173

DISCUSSION

The present prospective observational study compared the efficacy of dexamethasone 8 mg versus ondansetron 4 mg for prevention of postoperative nausea and vomiting in patients undergoing various surgical procedures under general anesthesia. The findings demonstrated significantly superior antiemetic efficacy of dexamethasone across multiple outcome measures including overall PONV incidence, temporal pattern of occurrence, nausea severity, vomiting episodes, rescue antiemetic requirements, and patient satisfaction scores. These results contribute valuable evidence to the ongoing discussion regarding optimal antiemetic prophylaxis strategies in perioperative care and have important implications for clinical practice and institutional protocol development.

The overall incidence of PONV observed in the present study was 21.67% in the dexamethasone group and 35.83% in the ondansetron group, representing a 39.5% relative risk reduction with dexamethasone prophylaxis.(11) These findings are consistent with several previously published studies that have demonstrated superior or equivalent efficacy of dexamethasone compared to ondansetron. A meta-analysis by De Oliveira et al. including 60 randomized controlled trials found that dexamethasone was associated with reduced PONV incidence compared to placebo, with effects lasting up to 24 hours postoperatively.(12) Similarly, Wang et al. in their network meta-analysis comparing various antiemetic agents reported that dexamethasone ranked among the most effective interventions for PONV prevention, particularly for late-phase PONV beyond six hours.(13) The present study corroborates these findings while providing additional real-world observational data from clinical practice settings.

The temporal analysis of PONV occurrence in the current investigation revealed that dexamethasone provided superior protection during both early (0-6 hours) and late (6-24 hours) postoperative periods, though the difference was more pronounced during the early phase. The sustained antiemetic effect of dexamethasone extending throughout the 24-hour period represents a significant clinical advantage over ondansetron, which exhibits a relatively shorter duration of action.(14) This prolonged efficacy may be attributed to dexamethasone's longer elimination half-life of approximately 3-4 hours compared to ondansetron's 3-5 hours, as well as its multiple proposed mechanisms of action including anti-inflammatory effects that may persist beyond measurable plasma concentrations. Apfel et al. in their comprehensive review emphasized the importance of sustained antiemetic coverage, particularly for ambulatory surgery patients who may experience PONV after discharge from hospital facilities.(15)

Several investigators have attempted to elucidate the optimal timing of dexamethasone administration for maximum antiemetic efficacy. While some studies have advocated for administration at induction of anesthesia due to dexamethasone's delayed onset of action, others have found comparable effectiveness when given at the end of surgery.(16) In the present study, dexamethasone was administered immediately before induction of anesthesia, which likely contributed to its effectiveness during the early postoperative period when PONV incidence is typically highest. The mechanism underlying dexamethasone's antiemetic properties involves inhibition of prostaglandin synthesis, modulation of neurotransmitter release, and reduction of inflammatory mediators that may contribute to postoperative nausea.(17) These pleiotropic effects distinguish dexamethasone from ondansetron's more specific 5-HT₃ receptor antagonism and may explain the observed differences in clinical efficacy.

The significantly lower nausea severity scores observed in dexamethasone-treated patients represent an important patient-centered outcome that extends beyond simple dichotomous classification of PONV presence or absence. Patients in the dexamethasone group reported mean nausea severity of 2.1 on a 10-point scale compared to 3.2 in the ondansetron group, a difference that likely translates into meaningful improvement in subjective comfort and recovery experience.(18) This finding aligns with quality of recovery research emphasizing that even mild to moderate nausea can significantly impact patient satisfaction and willingness to undergo repeat procedures. The reduced incidence of vomiting observed with dexamethasone prophylaxis (11.67% vs 23.33%) carries particular clinical significance, as vomiting represents a more severe and potentially dangerous manifestation of PONV associated with risk of aspiration, wound complications, and psychological distress.

The reduced requirement for rescue antiemetic medications in the dexamethasone group (18.33% vs 32.50%) offers both clinical and economic advantages. From a clinical perspective, the need for additional antiemetic interventions indicates prophylaxis failure and exposes patients to potential adverse effects of multiple drug classes. From an economic standpoint, rescue antiemetic administration increases nursing workload, prolongs post-anesthesia care unit stays, and adds to medication costs.(19) The longer time to first rescue antiemetic in the dexamethasone group (8.6 hours vs 5.2 hours) further demonstrates the sustained effectiveness of dexamethasone throughout the vulnerable early postoperative period when PONV risk is greatest.

Patient satisfaction scores showed statistically and clinically significant improvement with dexamethasone prophylaxis, with mean scores of 8.4 versus 7.6 on a 10-point scale. This difference, while numerically modest, reflects the cumulative impact of reduced PONV incidence, lower nausea severity, fewer vomiting episodes, and decreased need for rescue interventions. Contemporary perioperative care increasingly emphasizes patient-reported outcomes and experience measures as essential quality indicators complementing traditional clinical endpoints.(20) The correlation between

effective PONV management and overall patient satisfaction has been consistently demonstrated across multiple surgical populations and represents a key driver of hospital consumer assessment scores and institutional reputation.

Regarding safety and adverse effects, both dexamethasone and ondansetron demonstrated acceptable tolerability profiles consistent with extensive previous literature. The higher incidence of transient hyperglycemia in the dexamethasone group (10.00% vs 3.33%) was anticipated given the glucocorticoid properties of the medication, though all cases were mild and self-limiting without requiring insulin therapy.(21) This finding warrants consideration in patients with diabetes mellitus or impaired glucose tolerance, though current evidence suggests that single prophylactic doses of dexamethasone rarely cause clinically significant hyperglycemia in most patient populations. The theoretical concern regarding impaired wound healing with corticosteroid administration was not supported by wound infection rates at seven-day follow-up, which were comparable between groups. Multiple systematic reviews have consistently demonstrated that single-dose perioperative dexamethasone does not increase infection risk or compromise wound healing.(22)

Subgroup analyses provided insights into potential effect modifiers and patient populations most likely to benefit from dexamethasone prophylaxis. Female patients, who inherently face higher baseline PONV risk, demonstrated particularly marked benefit from dexamethasone compared to ondansetron. Similarly, gynecological surgery patients showed pronounced risk reduction with dexamethasone prophylaxis, which may be attributed to the additional anti-inflammatory effects of corticosteroids reducing surgical trauma-related inflammatory mediators that contribute to nausea.(23) Patients undergoing longer surgical procedures (>120 minutes) also derived greater benefit from dexamethasone's sustained antiemetic coverage extending throughout prolonged recovery periods.

The multivariate logistic regression analysis confirmed that antiemetic selection remained an independent predictor of PONV even after controlling for established risk factors including female gender, history of PONV or motion sickness, and opioid consumption. This finding strengthens the validity of observed differences between dexamethasone and ondansetron efficacy and suggests that the choice of prophylactic antiemetic agent represents a modifiable risk factor that clinicians can leverage to optimize patient outcomes. The identification of female gender and prior PONV history as independent predictors reinforces the importance of the Apfel risk score in guiding targeted prophylaxis strategies.(24)

Comparison with contrasting evidence in the literature reveals that not all studies have demonstrated superiority of dexamethasone over ondansetron. Some investigations have reported equivalent efficacy between these agents, particularly when higher doses of ondansetron (8 mg) were employed.(25) Methodological differences including patient selection criteria, surgical populations studied, timing and dosing of antiemetics, outcome assessment methods, and statistical power may contribute to heterogeneity in published results. A network meta-analysis by Carlisle and Stevenson suggested that differences between various antiemetic agents may be modest in magnitude and that combinations of drugs targeting multiple receptor systems provide optimal prophylaxis in high-risk patients.(26) The present study's use of standard clinical doses (dexamethasone 8 mg and ondansetron 4 mg) reflects common institutional practice patterns and provides pragmatic evidence applicable to typical clinical scenarios.

Cost-effectiveness considerations favor dexamethasone in most healthcare settings due to lower acquisition costs compared to ondansetron, though comprehensive pharmacoeconomic analyses must account for all downstream costs including rescue medications, extended recovery times, and unanticipated hospital admissions.(27) In resource-limited environments, the combination of superior efficacy and lower cost positions dexamethasone as a particularly attractive prophylactic option. However, the optimal antiemetic strategy likely varies based on individual patient risk profiles, with moderate-risk patients potentially benefiting from single-agent prophylaxis and high-risk patients requiring multimodal approaches combining dexamethasone with ondansetron or other complementary agents.

The present study possesses several strengths including prospective design, adequate sample size with statistical power to detect clinically meaningful differences, standardized anesthetic protocols minimizing confounding variables, systematic outcome assessment at multiple time points, comprehensive evaluation of both efficacy and safety endpoints, and multivariate analysis controlling for established PONV risk factors. However, certain limitations warrant acknowledgment. The observational nature of the study without randomized allocation introduces potential selection bias, though the comparable baseline characteristics between groups mitigate this concern. The single-center design may limit generalizability to institutions with different patient demographics, surgical case mixes, or anesthetic practices. The study did not evaluate combination prophylaxis strategies that may provide synergistic benefits. Long-term outcomes beyond 24 hours and quality of recovery measures were not systematically assessed. Finally, the study did not include pharmacoeconomic analysis quantifying cost-effectiveness from healthcare system and societal perspectives.

Future research directions should include multicenter randomized controlled trials with larger sample sizes to definitively establish comparative efficacy across diverse populations and surgical specialties. Investigations examining optimal dosing regimens for both dexamethasone and ondansetron, timing of administration relative to surgical phases, and identification of patient subgroups most likely to benefit from specific antiemetic strategies would enhance evidence-based decision making. Studies evaluating combination prophylaxis incorporating dexamethasone, ondansetron, and additional agents

such as aprepitant or transdermal scopolamine in ultra-high-risk patients would address an important clinical question. Pharmacogenomic research exploring genetic polymorphisms affecting antiemetic metabolism and receptor function may enable personalized prophylaxis strategies. Finally, comprehensive cost-effectiveness analyses incorporating quality-adjusted life years and healthcare resource utilization would provide valuable information for policy makers and institutional formulary committees.

CONCLUSION

The present prospective observational study demonstrated that prophylactic administration of intravenous dexamethasone 8 mg was significantly more effective than ondansetron 4 mg in preventing postoperative nausea and vomiting in patients undergoing various surgical procedures under general anesthesia. Dexamethasone provided superior antiemetic coverage throughout the entire 24-hour postoperative period, with particularly pronounced effectiveness during the early postoperative phase (0-6 hours) when PONV incidence is typically highest. Patients receiving dexamethasone experienced lower overall PONV incidence (21.67% vs 35.83%), reduced nausea severity, fewer vomiting episodes, decreased requirement for rescue antiemetic medications, and significantly higher patient satisfaction scores compared to those receiving ondansetron. Both antiemetic agents demonstrated acceptable safety profiles, with transient hyperglycemia being the only adverse effect more common with dexamethasone, though all cases were mild and self-limiting without requiring therapeutic intervention.

The findings of this investigation have important clinical implications for perioperative care protocols and institutional antiemetic prophylaxis strategies. Dexamethasone represents a highly effective, safe, and cost-efficient option for PONV prevention in surgical patients receiving general anesthesia. The prolonged duration of antiemetic action extending throughout the 24-hour postoperative period offers particular advantages for both inpatient and ambulatory surgical populations. The superior efficacy demonstrated across multiple outcome measures, combined with lower acquisition cost compared to ondansetron, positions dexamethasone as a preferred first-line prophylactic agent for moderate-risk patients. High-risk patients with multiple PONV risk factors may benefit from multimodal prophylaxis combining dexamethasone with ondansetron or other complementary antiemetic agents to maximize efficacy through synergistic mechanisms.

Healthcare providers should consider incorporating these findings into evidence-based PONV management protocols, with dexamethasone recommended as the primary prophylactic agent for most surgical patients unless specific contraindications exist. Future research should focus on identifying optimal combination prophylaxis strategies for ultra-high-risk populations, determining the most cost-effective approaches to PONV prevention across different healthcare settings, and exploring personalized antiemetic selection based on individual patient characteristics and genetic factors. The continued emphasis on patient-centered outcomes and quality of recovery measures will further refine perioperative care standards and enhance overall surgical experience for patients.

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