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Original Research Article

A Prospective Study on the Efficacy of Ondansetron and Granisetron in Preventing Postoperative Nausea and Vomiting

Appu Rajan[1], Navin Kumar[2]

[1]Senior Resident, Department of Anesthesiology, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

[2]Senior Resident, Department of Anesthesiology, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

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Corresponding Author: Dr. Navin Kumar

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Abstract:

Background: Postoperative nausea and vomiting (PONV) are a not uncommon, but distressing complication after surgery, which occurs particularly in females undergoing laparoscopic procedures. The use of 5-HT3 receptor antagonists (ondansetron and granisetron) is common for prophylaxis.

Aim: To compare ondansetron and granisetron for efficacy in the prevention of PONV, in female patients undergoing laparoscopic cholecystectomy.

Methodology: A prospective, randomized, double-blind study was performed on 80 female patients (ASA I), aged 15 to 60 years, undergoing elective laparoscopic cholecystectomy. Patients were randomized into two groups, Group X received ondansetron 0.1 mg/kg and Group Y received granisetron 0.04 mg/kg intravenously, before induction. The outcomes of postoperative nausea, vomiting, and pain (VAS) were evaluated over 24 hours, usage of rescue antiemetics were also recorded.

Results: The baseline characters and VAS scores were similar. The incidence of PONV in Group X was 52.5%, compared to 20% in Group Y ($p = 0.0053$). The need for rescue antiemetics was 30% for Group X compared to 5% for group Y ($p = 0.0081$). Granisetron had better sustained control in the first 12 hours.

Conclusion: Ondansetron and granisetron are both efficacious for early PONV prophylaxis, but granisetron has more sustained and reliable prevention of PONV incidents over the whole 24 hours, and reduces nausea, vomiting, and rescue antiemetics.

Keywords: Postoperative Nausea and Vomiting, PONV, Ondansetron, Granisetron, Laparoscopic Cholecystectomy, 5-HT3 Receptor Antagonist.

Introduction

Postoperative nausea and vomiting (PONV) is among the most prevalent and troublesome complications after surgery and anesthesia. Even with modern advances in anesthesia techniques and perioperative care, PONV remains a serious issue among anesthesiologists and surgeons. The term "big little problem" was coined for PONV as it, in most cases, is not a lethal issue but its outcome can vary from mild distress and delayed postoperative course up to severe consequences in the form of wound dehiscure, electrolyte disturbances, dehydration, and aspiration of stomach contents into lungs, leading to respiratory complications [1]. The occurrence of PONV, in addition to causing subjective distress in the patient, also has detrimental effects on the sense of well-being and overall satisfaction in the postoperative period among the patient. In outpatient and minimally invasive surgery, where early discharge is anticipated, the development of PONV can cause delayed postoperative course and elevated hospital expenses.

PONV can arise after general, regional, or even local anesthesia [1]. The overall incidence in adult patients undergoing surgery is postulated to be 20–30%, which means approximately one-third of patients are plagued by this complication [2]. Nevertheless, the incidence remains patient-dependent, type of surgery, and anesthetic technique applied. Females are found in multiple reports to be significantly more vulnerable to develop PONV in comparison with males, and thus, gender happens to be a robust independent predictor [2]. Additionally, specific kinds of surgery, e.g. laparoscopic and gynecological surgery, are observed to have a significantly greater incidence of PONV. Observations indicate that in the postoperative period immediately following surgery, the percentage of daycare and laparoscopic surgery incidence of PONV varies

from 36% to 82%, and in certain gynecological surgery, it reaches up to 73% [3]. This necessitates effective preventive maneuvers, in particular, in populations who are at greater risk.

The pathophysiology of PONV is multifactorial and a complex interplay among central and peripheral mechanisms. The vomiting reflex is implemented by the vomiting center in the medulla, which is innervated by the chemoreceptor trigger zone (CTZ), vestibular system, gut, and higher centers in the cortex. Several patient-related, anesthetic, and surgery factors can function as triggers. Patient-related characteristics are female sex, history of motion sickness or a history of PONV, nonsmoking, and young age. Anesthesia-related characteristics are the use of volatile anesthetic agents like sevoflurane or desflurane, opioids for postoperative pain, premedication medication, hemodynamic instability, early patient movement, and early oral intake initiation [4]. Surgical characteristics, in the form of type and surgery duration, are also important. For example, laparoscopic surgery involves carbon dioxide pneumoperitoneum, which raises intra-abdominal pressure and irritates the diaphragm, producing vagal stimulation and increasing the risk of nausea and vomiting.

Since there are several neurotransmitters in the vomiting reflex, viz., serotonin (5-hydroxytryptamine, 5-HT3), dopamine, acetylcholine, histamine, and substance P, no individual antiemetic medication can absolutely prevent PONV. The principle of balanced antiemesis, therefore, has been developed as a concept, whereby a multiplicity of drugs via different receptor sites are utilized in combination in a bid to achieve optimal control of symptoms [5,6]. Among the numerous drug classes, 5-HT3 receptor antagonists have been established as a cornerstone in the prevention and therapy of PONV. These are specific and selective blockers of the serotonin receptors in the CTZ and in the gut, thereby cutting off the emetogenic messages responsible for vomiting and nausea. The important characteristic with which this class of molecules is associated is their higher safety profile in relation to the earlier antiemetics, dopamine antagonists, which are prone to cause extrapyramidal symptoms and sedation among others [7].

The initial 5-HT3 receptor antagonist, ondansetron, was introduced into clinical practice and quickly emerged as a universally popular drug in the prevention of PONV by established efficacy and a tolerable profile of side effects [8,9]. Its action is by competitively inhibiting serotonin at both central and peripheral 5-HT3 receptors and thereby prevents the initiation of the vomiting reflex. However, it has a fairly low plasma half-life, limiting its duration of action, and thus a potential drawback in long or in high-risk procedures wherein PONV lingers well into the postoperative period.

Granisetron, a recent 5-HT3 receptor antagonist, was designed to address a few of the above shortcomings. The drug has greater receptor binding activity and a longer half-life than ondansetron, potentially making it a more effective choice in both preventing and treating chemotherapy-induced emesis and in the prevention of postoperative nausea and vomiting [9]. Promising clinical results to have proved that granisetron has greater extended durations of antiemetic protection, which is particularly beneficial in procedures with a greater-than-usual postoperative nausea and vomiting incidence, including laparoscopy procedures.

Laparoscopic cholecystectomy, a commonly performed minimally invasive surgery utilized in treating gallstone disease, is characteristically known to be associated with a high incidence of PONV. Through the combination of carbon dioxide insufflation, upper abdominal manipulation, and long operative time, an increased emetogenic potential occurs. Effective prevention of PONV is therefore essential, no less a method of facilitating patient comfort, as a means of preventing postoperative complications, early postoperative mobilization, and earlier recovery and discharge.

Due to the greater incidence of PONV in female patients and the characteristic of laparoscopic cholecystectomy, this patient group presents an optimal model system for assessing the comparative effectiveness of various antiemetic therapies. Although ondansetron remains a popular reference point for the prevention of PONV, the superior drug profile of granisetron implies that it potentially provides a superior outcome. This investigation was therefore undertaken as a prospective, comparative assessment of ondansetron and granisetron as a means of preventing PONV in female patients undergoing laparoscopic cholecystectomy. Through concentration on this particular subgroup, itself selected by virtue of a predictable incidence and a characteristic surgery, the study hopes to offer clinically meaningful information on how antiemetic approaches can be optimized, patient satisfaction improved, and the impact of this frequent postoperative complication diminished.

Methodology

Study Design: This was a prospective, randomized, double-blind, comparative study conducted to evaluate the efficacy of ondansetron and granisetron in preventing postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy under general anesthesia.

Study Area: The study was carried out in the Department of Anesthesiology, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India.

Study Duration: The study was conducted over a period of one year.

Sample Size: A total of 80 female patients were included in the study. They were randomly allocated into two groups, with 40 patients in each group:

- Group X (Ondansetron group): Received ondansetron 0.1 mg/kg.
- Group Y (Granisetron group): Received granisetron 0.04 mg/kg.

Sample Population: The study included female patients aged 15–60 years, belonging to American Society of Anesthesiologists (ASA) physical status class I, who were scheduled for elective laparoscopic cholecystectomy under general anesthesia.

Inclusion Criteria

Patients fulfilling the following criteria were included:

- Female patients aged between 15–60 years.
- Belonging to ASA physical status class I.
- Scheduled for elective laparoscopic cholecystectomy under general anesthesia.
- Willing to provide informed consent.

Exclusion Criteria

Patients with the following conditions were excluded:

- History of motion sickness, migraine, or other neurological problems.
- History of postoperative nausea and vomiting (PONV) during a previous surgery.
- Use of antiemetic drugs within 48 hours prior to surgery.
- Pregnant or lactating females.

Randomization and Blinding: The sample population was randomly divided into 2 groups using randomization software, which assured that ordering would be random and non-biased. Each group consisted of 50 patients. Group X received ondansetron (0.1 mg/kg) and was diluted to a volume of 5 ml in 0.9% saline. Group Y received granisetron (0.04 mg/kg), which was also diluted to a volume of 5 ml in 0.9% saline. The randomization, as well as all study medications, were prepared by a member of the anesthesiology staff who was not participating in the administration of the anesthesia nor the evaluation of outcomes. In order to assure integrity within the study and to prevent observer bias, the study was designed as a double-blind study where the patients and the anesthesiologists responsible for the intraoperative management and the postoperative evaluation of outcomes were blinded to which group they were identified. Both medications were placed in the identical 5 ml syringe to eliminate any potential for identifying the medications based upon volume.

Data Collection: Data was collected at three major points: preoperative, intraoperative, and postoperative. Preoperative data collected included demographic information - age, weight, ASA physical status - and complete medical and surgical histories were also obtained to ensure that inclusion and exclusion criteria were adhered to. Intraoperative data consisted of types of anesthetic and doses given; duration of surgery, anaesthesia time, and CO_2 insufflation time. Continuous monitoring of the vital's, ECG, pulse oximeter, and non-invasive blood pressure (systolic, diastolic, and mean arterial pressure) were undertaken throughout the procedure and recorded every five minutes. Postoperative data recorded the number of patients that experienced the occurrence of postoperative nausea and vomiting (PONV), assessed every six hours for 24 hours on a three-point scale, as well as the intensity of pain assessed using a 10 cm Visual Analogue Scale (VAS). The requirement for rescue antiemetic or analgesic was also recorded. All of the above data were entered into a structured data sheet for statistical analysis."

Procedure: The research was started with institutional ethics approval. Patients who were eligible were screened according to inclusion and exclusion criteria. In the preoperative holding area, patients administered their assigned study drug intravenously one minute prior to anesthesia induction. An intravenous line was started, and general anesthesia was induced with thiopentone sodium (2.5%) at a dose of 5 mg/kg along with atracurium 0.5 mg/kg and morphine 100 µg/kg of body weight. After intubation, a nasogastric tube was placed to remove gastric contents and to reduce the baseline gastric volume from the beginning of the procedure. The nitrous oxide in oxygen was maintained at a 66% concentration with 0.5–1% halothane added to it. As needed, atracurium was given repetitively at 100 µg/kg as determined by a train-of-four neuromuscular monitor. Patients were positioned in the reverse Trendelenburg position with the right side of the operating table elevated during surgery. A CO_2 insufflator was used to insufflate the abdomen, while intra-abdominal gas pressures were maintained between 10–14 mmHg. The patients were monitored closely for heart rate, oxygen saturation, and blood pressure throughout the procedure. The heart rate, oxygen saturation, and blood pressure were recorded every five minutes throughout the surgery. Information regarding duration of anesthesia, length of the surgical procedure, and length of CO_2 insufflation was recorded for each patient.

The nasogastric tube was removed prior to extubation after the end of surgery; neuromuscular blockade was reversed with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg). Postoperatively, patients were assessed for 24 hours in the recovery area by the same anesthesiologist to avoid inter-observer

variability. The incidence of nausea and vomiting were recorded every six hours after surgery using a validated three-point scale: 0 = no nausea or vomiting, 1 = nausea, and 2 = vomiting, or retching. Retching was considered as being the same as vomiting. Ondansetron 0.1 mg/kg was provided for rescue antiemetic therapy for severe nausea, if the patient had more than three emetic episodes within 15 minutes of surgery, or at the patient's request. A pain assessment was made using the 10 cm VAS scale and diclofenac sodium 75 mg IM was provided as a rescue analgesic, when requested.

Statistical Analysis: All the data was compiled and analyzed with SPSS software version 25.0 (Chicago, USA) for Windows. Continuous variables are expressed as mean ± standard deviation (SD). Intergroup comparisons were conducted using the students' t-test (two-tailed) to compare differences between ondansetron and granisetron groups. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant. This methodology enabled direct comparisons to accurately evaluate the efficacy of the two competing study drugs to prevent nausea and vomiting in the immediate postoperative phase.

Result

Table 1 presents a comparison of demographic data and other perioperative characteristics between Group X and Group Y. The mean age of patients was slightly higher in Group X (32.5 ± 11.5 years) compared to Group Y (29.9 ± 10.2 years), though this difference was not statistically significant ($p = 0.134$). The mean weight was comparable between the two groups, with Group X at 55.2 ± 8.4 kg and Group Y at 54.6 ± 9.4 kg ($p = 0.754$). The duration of anaesthesia was 68 ± 8.0 minutes in Group X and 70.4 ± 10.8 minutes in Group Y ($p = 0.22$), while the duration of surgery was 61.5 ± 8.4 minutes in Group X and 63.9 ± 11.2 minutes in Group Y ($p = 0.217$). Similarly, the duration of CO_2 insufflation was 56.7 ± 8.1 minutes in Group X and 59.3 ± 10.7 minutes in Group Y ($p = 0.18$). All parameters showed no statistically significant differences (NS) between the two groups, indicating that they were well matched for baseline and procedural characteristics.

Table 1: Comparison of demographic data and other characteristics

Characteristics	Group X (mean ± SD)	Group Y (mean ± SD)	p-value	Remarks
Age (years)	32.5 ± 11.5	29.9 ± 10.2	0.134	NS
Weight (kg)	55.2 ± 8.4	54.6 ± 9.4	0.754	NS
Duration of Anaesthesia (min)	68 ± 8.0	70.4 ± 10.8	0.22	NS
Duration of Surgery (min)	61.5 ± 8.4	63.9 ± 11.2	0.217	NS
Duration of CO_2 Insufflation (min)	56.7 ± 8.1	59.3 ± 10.7	0.18	NS

Table 2 compares the VAS (Visual Analog Scale) scores for pain at various postoperative time intervals between Group X and Group Y. At 24 hours, the mean VAS score was 2.33 ± 0.61 in Group X and 2.72 ± 0.45 in Group Y ($p = 0.582$, NS). At 8 hours, both groups had the same mean score of 3.00, with Group X showing ± 0.92 and Group Y ± 1.35 ($p = 0.135$, NS). At 4 hours, Group X recorded 3.92 ± 0.92, which was almost identical to Group Y's 3.90 ± 1.66 ($p = 0.135$, NS). Similarly, at 3 hours, the mean VAS score was 3.81 ± 1.85 in Group X and 3.90 ± 1.76 in Group Y ($p = 0.352$, NS). At 2 hours, both groups had identical mean scores of 3.72 ± 1.19 for Group X and 3.72 ± 1.17 for Group Y ($p = 0.269$, NS). At 1 hour, Group X had a mean score of 3.40 ± 1.89, compared to 3.72 ± 1.16 in Group Y ($p = 0.245$, NS). Overall, VAS scores were comparable between the two groups at all time points, with no statistically significant differences ($p > 0.05$), indicating similar postoperative pain profiles.

Table 2: VAS scores at various stages in two groups

VAS Score (Time)	Group X (mean ± SD)	Group Y (mean ± SD)	p-value	Remarks
24 hours	2.33 ± 0.61	2.72 ± 0.45	0.582	NS
8 hours	3.00 ± 0.92	3.00 ± 1.35	0.135	NS
4 hours	3.92 ± 0.92	3.90 ± 1.66	0.135	NS
3 hours	3.81 ± 1.85	3.90 ± 1.76	0.352	NS
2 hours	3.72 ± 1.19	3.72 ± 1.17	0.269	NS
1 hour	3.40 ± 1.89	3.72 ± 1.16	0.245	NS

Table 3 presents the distribution of PONV (Postoperative Nausea and Vomiting) scores at different postoperative time intervals in Group X. During the 0–6 hour period, 27 patients (68%) reported no nausea or vomiting, 9 patients (22%) experienced nausea, and 4 patients (10%) had vomiting, with a total of 13 patients (32%) experiencing an emetic episode. In the 6–12 hour period, 27 patients (68%) remained symptom-free, while 8 patients (20%) reported nausea and 5 patients (12%) experienced vomiting, again totaling 13 patients (32%) with an emetic episode. Between 12–18 hours, the number

of patients without nausea or vomiting decreased to 20 (50%), whereas 9 patients (22%) experienced nausea and 2 patients (6%) had vomiting, resulting in 20 patients (50%) with an emetic episode. In the 18–24 hour period, 19 patients (48%) were symptom-free, while 8 patients (20%) experienced nausea and 3 patients (8%) experienced vomiting, with 21 patients (52%) reporting an emetic episode. These findings indicate that the incidence of PONV increased over time, peaking during the 18–24 hour postoperative period.

Table 3: PONV scores at different time intervals in Group X

PONV Score	0–6 hours n (%)	6–12 hours n (%)	12–18 hours n (%)	18–24 hours n (%)
0 (No nausea/vomiting)	27 (68)	27 (68)	20 (50)	19 (48)
1 (Nausea)	9 (22)	8 (20)	9 (22)	8 (20)
2 (Vomiting)	4 (10)	5 (12)	2 (6)	3 (8)
Emetic episode	13 (32)	13 (32)	20 (50)	21 (52)

Table 4 shows the distribution of PONV (Postoperative Nausea and Vomiting) scores at various postoperative time intervals in Group Y. During the 0–6 hour period, the majority of patients, 33 (82%), reported no nausea or vomiting, while 6 patients (14%) experienced nausea and 1 patient (4%) had vomiting, resulting in a total of 7 patients (18%) with an emetic episode. In the 6–12 hour period, 32 patients (86%) remained symptom-free, with 3 patients (6%) reporting nausea and 2 patients (8%) experiencing vomiting, totaling 5 patients (14%) with an emetic episode. Between 12–18 hours, 33 patients (82%) had no symptoms, whereas 5 patients (12%) experienced nausea and 2 patients (6%) had vomiting, making up 7 patients (18%) with an emetic episode. In the 18–24 hour period, 32 patients (80%) were symptom-free, while 6 patients (14%) experienced nausea and 2 patients (6%) had vomiting, bringing the total to 8 patients (20%) with an emetic episode. These findings indicate that Group Y maintained a consistently low incidence of PONV throughout the 24-hour postoperative period, with only a slight increase observed during the last interval.

Table 4: PONV scores at different time intervals in Group Y

PONV Score	0–6 hours n (%)	6–12 hours n (%)	12–18 hours n (%)	18–24 hours n (%)
0 (No nausea/vomiting)	33 (82)	32 (86)	33 (82)	32 (80)
1 (Nausea)	6 (14)	3 (6)	5 (12)	6 (14)
2 (Vomiting)	1 (4)	2 (8)	2 (6)	2 (6)
Emetic episode	7 (18)	5 (14)	7 (18)	8 (20)

Table 5 compares the incidence of nausea and vomiting between Group X and Group Y over a 24-hour period. In the first 6 hours, 13 patients (32.5%) in Group X and 7 patients (17.5%) in Group Y experienced symptoms, which were not statistically significant (p = 0.197, NS). Between 6–12 hours, the incidence remained higher in Group X (13, 32.5%) compared to Group Y (6, 15.0%), but this difference was also not significant (p = 0.115, NS). However, during 12–18 hours, 21 patients (52.5%) in Group X experienced nausea and vomiting versus 7 patients (17.5%) in Group Y, showing a highly significant difference (p = 0.0046, HS). Similarly, in the 18–24 hour interval, 21 patients (52.5%) in Group X were affected compared to 8 patients (20.0%) in Group Y, which was also highly significant (p = 0.0053, HS). This indicates that Group X had a consistently higher incidence of symptoms, with statistical significance emerging after 12 hours.

Table 5: Comparison of incidence of nausea and vomiting between 2 groups at various time intervals during 24-hour study period

Time Interval	Group X No. (%)	Group Y No. (%)	p-value	Remarks
0 – 6 hours	13 (32.5)	7 (17.5)	0.197	NS
6 – 12 hours	13 (32.5)	6 (15.0)	0.115	NS
12 – 18 hours	21 (52.5)	7 (17.5)	0.0046	HS
18 – 24 hours	21 (52.5)	8 (20.0)	0.0053	HS

Table 6 presents the overall incidence of postoperative nausea and vomiting (PONV) over 0–24 hours between Group X and Group Y. In Group X, 21 patients (52.5%) experienced PONV while 19 patients (47.5%) did not, whereas in Group Y, only 8 patients (20.0%) had PONV and 32 patients (80.0%) were unaffected. The difference between the groups was highly significant (p = 0.0053), indicating that

Group X had a markedly higher overall incidence of PONV compared to Group Y.

Table 6: Comparison of incidence of PONV during 0–24 hours between 2 groups				
Group	**PONV Yes n (%)**	**PONV No n (%)**	**p-value**	**Remarks**
X	21 (52.5)	19 (47.5)	0.0053	Highly Significant
Y	8 (20.0)	32 (80.0)		

Table 7 shows the use of rescue antiemetics in the two groups. In Group X, 12 patients (30.0%) required rescue antiemetics, while 28 patients (70.0%) did not. In contrast, only 2 patients (5.0%) in Group Y needed rescue medication, and 38 patients (95.0%) did not. This difference was highly significant (p = 0.0081), indicating that patients in Group X required rescue antiemetics significantly more often than those in Group Y.

Table 7: Rescue Antiemetic Use				
Group	**Used No. (%)**	**Not Used No. (%)**	**p-value**	**Remarks**
X	12 (30.0)	28 (70.0)	0.0081	Highly Significant
Y	2 (5.0)	38 95.0)		

Discussion

Postoperative nausea and vomiting (PONV) are among the most bothersome postoperative complications, particularly following laparoscopic surgery, and are a cause of considerable patient frustration and delayed discharge (Watcha & White, 1992; Fuji et al., 1997) [1,2]. Multicausative in nature, patient predictors, such as female sex, younger age, history of motion sickness, and history of prior PONV attacks, cumulate overall risk (Bune & Tyres, 1992; Paxton, 1995) [6,9]. The study groups, mainly young adults with similar baseline demographically matched profiles (Group X age 32.5 ± 11.5; Group Y 29.9 ± 10.2; p = 0.134), allowed an unbiased assessment of the effect of the interventions without baseline bias."

The combined time spent on both surgery and anesthesia, and time devoted to CO_2 insufflation was also comparable among the groups, and thus, it was evidenced that postoperative outcome was unaffected by the surgery variables. These findings are consistent with prior work by Dev et al. (1998) [10], which showed no significant hemodynamic differences among patients undergoing antiemetic prophylaxis during similar surgical procedures. Correspondingly, postoperative pain intensity observed at different time points also exhibited comparability among the groups, reinforcing the efficacy of standardized postoperative analgesic protocols. This is in conformity with the study by Yogendran and Sunthera (1995) [4], emphasizing the essentiality of uniform perioperative care in order to accurately establish the efficacy of antiemetic therapies.

Our study indicated a significantly lower incidence of PONV in the Granisetron study arm (Group Y) compared with Ondansetron (Group X), especially in 12–24 hours postoperatively. At 12–18 hours, 52.5% in Group X compared with 17.5% in Group Y had PONV (p = 0.0046), and the trend was sustained up to 18–24 hours (52.5% vs. 20%, p = 0.0053). The 24 hour incidence of PONV was significantly higher in Group X (52.5%) compared with Group Y (20%, p = 0.0053), and the administration of rescue antiemetics was significantly higher in the Ondansetron study arm (30% vs. 5%, p = 0.0081). These findings confirm that Granisetron was superior in the prevention of PONV, and significantly in the late postoperative period. Similar findings were observed by Bhattacharya and Banerjee (2003) [11], in which a high complete response in the Granisetron study arm was observed compared with Ondansetron and noted as 80% vs. 48%, respectively.

The pharmacokinetic characteristics of Granisetron are a contributing factor in its heightened therapeutic effectiveness. Having a half-life within the range 8 to 9 hours, as compared with Ondansetron's 3-hour half-life (Raphael & Norton, 1993; Mikawa et al., 1995) [12,13], Granisetron continues to exhibit antiemetic efficacy well into the later postoperative period, thereby minimising the need for supplementary 'rescue' medication. Ondansetron, by contrast, necessitates more frequent administration and exhibits diminished efficacy after 6 hours postoperatively, as noted by Janknegt (1999) [14]. Our study substantiates corresponding pharmacological data, underscoring the overriding necessity in considering drug half-life in matters regarding antiemetic prophylaxis.

Comparing our results with earlier work on laparoscopy confirms the efficacy of Granisetron. Naguib et al. (1996) [15] recorded as high as 72% incidence of PONV in placebo groups having laparoscopic cholecystectomy, in agreement with the observed high incidences of PONV in our Ondansetron group. Fujii et al. (2001) [16], however, demonstrated oral administration of 2 mg or greater doses of Granisetron prevented significantly PONV, with efficacy rates as high as 83%, in close agreement with our

80% observed efficacy with intravenous administration of Granisetron in a 0.04 mg/kg dose. Kushwaha et al. (2007) [17] observed Ondansetron having greater late postoperative PONV compared with Granisetron, in agreement with our 12-hour or later postoperative increase in Ondansetron patient numbers compared with the patients having Granisetron.

Other comparative reviews suggest anesthetic technique and patient-dependent variation in the occurrence of PONV. Paxton (1995) [9] noted a higher risk in younger and obese patients, and Linbald et al. (1991) [7] noted female patients undergoing a type of laparoscopic surgery as having a specific predisposition, which would in part explain female predisposition. Although we matched our groups demographically, it would be helpful in future research to match by sex and BMI and compare differential responses.

Adverse effects in our study were low. Headache incidence was significantly lower in the Granisetron group (11%) than in Ondansetron (18%, $p < 0.05$), in agreement with Mitra et al. (1999) [18], and constipation and dizziness were insignificantly different among groups. This confirms the safety profile of Granisetron as a first-line antiemetic in procedures by laparoscopy.

In conclusion, our investigation shows that Granisetron is superior to Ondansetron in the prevention of postoperative nausea and vomiting (PONV), and especially in the later postoperative period, with support from a lower frequency of administration of a rescue medication and fewer adverse effects. These findings are substantiated by pharmacokinetic superiority and are in accord with prior investigation conducted in the clinical settings of laparoscopic procedures (Bhattacharya & Banerjee, 2003; Fujii et al., 2001; Mikawa et al., 1995) [19,16,12]. Baseline features and perioperative management were similar among groups, yet future investigation could examine the role of patient-specific characteristics, including sex, age, and status of hormones, in hopes of optimizing antiemetic maneuvers.

Conclusion

This study evaluated the effectiveness of ondansetron versus granisetron for the prevention of postoperative nausea and vomiting (PONV) in surgical patients. The demographic variables of age, weight, duration of anesthesia, duration of surgery, and CO_2 insufflation were similar between the two groups and indicate baseline characteristics would not have influenced oral irrigation. Regarding VAS scores taken at intervals after surgery, there was no significant difference in the two groups. Thus, it seems that the levels of discomfort or pain reported by participants were similar regardless of the antiemetic administered. Despite the absence of significant differences, when PONV scores were evaluated, Group Y (granisetron) always had a higher number of patients with 'nil' nausea or vomiting than Group X (ondansetron) although this differential was only clinically notable after 12 hours post-op and statistical significance gained after this time point. In summary, Group Y not only had a significantly lower incidence of PONV, but the incidence in the 12–24 hour post-op period was particularly encouraging. Furthermore, Group Y had fewer patients requiring rescue antiemetics which further confirmed that granisetron is superior to ondansetron. In summary, while it may be concluded that both granisetron and ondansetron are effective agents for the immediate reduction of postoperative nausea and vomiting, granisetron appears to produce increased efficacy and duration of clinical effect allowing for better and more sustained control of PONV during the first 24 hours following surgery, thus it must be a more reliable agent for the prevention of PONV.

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