

COMPARATIVE EFFICACY OF INTRAVENOUS AMISULPRIDE-ONDANSETRON VERSUS DEXAMETHASONE-ONDANSETRON FOR PREVENTION OF POSTOPERATIVE NAUSEA AND VOMITING AFTER LAPAROSCOPIC CHOLECYSTECTOMY: A PROSPECTIVE RANDOMIZED DOUBLE-BLIND STUDY

Lavanya Parashar¹, Taruna Murari², Puneet Kumar Banga³, Tenzin Kyizom⁴

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Corresponding Author:

Dr. Puneet Kumar Banga

Email: drpuneetbanga24@gmail.com

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¹PG Resident, Department of Anaesthesia, SGRRIM & HS, Dehradun, India.

²Assistant Professor, Department of Anaesthesia, SGRRIM & HS, Dehradun, India.

³Assistant Professor, Department of Anaesthesia, SGRRIM & HS, Dehradun, India.

⁴Professor, Department of Anaesthesia, SGRRIM & HS, Dehradun, India.

ABSTRACT

Background: Postoperative nausea and vomiting (PONV) remains a common complication following general anaesthesia and is particularly frequent after laparoscopic surgery. Laparoscopic cholecystectomy combines several patient-, anaesthetic-, and procedure-related risk factors for PONV. Multimodal prophylaxis using antiemetic agents acting through different receptor pathways is therefore recommended in patients at increased risk. **Aim:** To compare the efficacy of intravenous amisulpride combined with ondansetron versus intravenous dexamethasone combined with ondansetron for prevention of postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy under general anaesthesia. **Materials and Methods:** This prospective, randomized, double-blind comparative study was conducted in the Department of Anaesthesiology at Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun. A total of 120 adult patients aged 18–65 years with American Society of Anaesthesiologists (ASA) physical status I or II undergoing elective laparoscopic cholecystectomy under general anaesthesia were enrolled. Patients were randomized into two groups of 60 each. Group A received intravenous amisulpride 5 mg with ondansetron 4 mg, while Group B received intravenous dexamethasone 8 mg with ondansetron 4 mg. Postoperative nausea and vomiting were assessed for 24 hours. Nausea severity was assessed using an 11-point verbal numerical rating scale. The requirement for rescue antiemetic medication and postoperative emetic episodes were recorded. **Results:** The demographic characteristics and ASA physical status were generally comparable between the two groups. During the first 24 postoperative hours, 70.0% of patients in the amisulpride–ondansetron group and 63.3% in the dexamethasone–ondansetron group experienced no emetic episode ($p=0.439$). A single emetic episode occurred in 5.0% and 18.3% of patients, respectively, with a statistically significant difference ($p=0.023$). However, the occurrence of two or three emetic episodes did not differ significantly between the groups. At 24 hours, absence of nausea was reported by 51.7% of patients in the amisulpride group and 50.0% in the dexamethasone group ($p=0.840$). The requirement for rescue antiemetic therapy was 25.0% in the amisulpride–ondansetron group and 16.7% in the dexamethasone–ondansetron group ($p=0.369$). **Conclusion:** Both amisulpride–ondansetron and dexamethasone–ondansetron provided effective prophylaxis against postoperative nausea and vomiting following laparoscopic cholecystectomy. Although fewer patients receiving amisulpride experienced a single breakthrough emetic episode, overall 24-hour nausea, vomiting and rescue antiemetic requirements were comparable between the two regimens. These findings support amisulpride–ondansetron as a potential non-steroidal alternative to dexamethasone–ondansetron for multimodal PONV prophylaxis.

INTRODUCTION

Postoperative nausea and vomiting (PONV) remains an important complication of anaesthesia and surgery because of its effects on patient comfort, recovery, oral intake, and postoperative resource utilization. The risk of PONV is influenced by a combination of patient-related, anaesthetic, and surgical factors. Female sex, nonsmoking status, previous history of PONV or motion sickness, and postoperative opioid administration constitute the four components of the widely used simplified Apfel risk score. Increasing numbers of these risk factors are associated with progressively greater risk of PONV.^[1,2]

Laparoscopic surgery is recognized as an important setting for PONV because pneumoperitoneum and visceral manipulation may contribute to stimulation of pathways involved in postoperative emesis. Laparoscopic cholecystectomy is consequently associated with a substantial risk of postoperative nausea and vomiting and has been widely used in clinical trials evaluating antiemetic prophylaxis. Previous randomized studies have demonstrated clinically important reductions in PONV with pharmacological prophylaxis in patients undergoing laparoscopic cholecystectomy.^[3]

Ondansetron, a selective 5-hydroxytryptamine-3 (5-HT₃) receptor antagonist, is one of the most widely used agents for PONV prophylaxis. Its efficacy has been demonstrated in several randomized studies; however, PONV is mediated through multiple neurotransmitter systems, and a single receptor-targeted drug may not provide adequate protection in patients with multiple risk factors. Combination prophylaxis using agents with different mechanisms of action has therefore become an important component of contemporary PONV management.^[5] Dexamethasone is a commonly used adjunct to ondansetron. Randomized trials in laparoscopic cholecystectomy have demonstrated that dexamethasone reduces PONV, while combination therapy with ondansetron and dexamethasone provides greater protection than either agent alone in several studies.^[3,4] A dose-ranging randomized trial by Elhakim et al. found that the combination of ondansetron 4 mg with dexamethasone 8 mg provided effective prevention of PONV following laparoscopic cholecystectomy.^[4]

Amisulpride is a selective dopamine D₂/D₃ receptor antagonist that has been investigated specifically for perioperative prevention and treatment of PONV. The dopaminergic system is one of the important neurotransmitter pathways involved in the emetic response, providing a pharmacological rationale for combining a dopamine antagonist with a 5-HT₃ antagonist.^[6]

The efficacy of intravenous amisulpride has been demonstrated in several randomized controlled trials. Gan et al. evaluated intravenous amisulpride in two concurrent phase III randomized trials and demonstrated efficacy in adults at increased risk of

PONV.^[6] Kranke et al. subsequently studied patients with three or four PONV risk factors and reported a higher complete-response rate with amisulpride 5 mg when added to another antiemetic compared with control treatment.^[7] In that study, amisulpride was associated with lower incidences of emesis, nausea, significant nausea, and rescue medication use.^[7]

Other randomized investigations have examined amisulpride in the treatment of established PONV. Candiotti et al. reported efficacy of intravenous amisulpride in patients who developed PONV without prior prophylaxis, while Habib et al. demonstrated efficacy when amisulpride was used as rescue therapy after failure of prophylaxis.^[8,9] These findings have contributed to the evaluation of dopamine antagonists as components of multimodal approaches to PONV management.

A systematic review and meta-analysis by Zhang et al. evaluated five studies involving 3243 patients and found that amisulpride improved complete response compared with placebo, with a particularly consistent effect at the 5-mg dose.^[10] The adverse-event profile was broadly similar to placebo in the included studies. These findings provide supportive evidence for the use of low-dose intravenous amisulpride in PONV prevention.

Current consensus recommendations emphasize risk assessment and multimodal prophylaxis using antiemetic agents with different mechanisms of action, particularly in patients with multiple risk factors.^[5] Such an approach is especially relevant to laparoscopic cholecystectomy, where patient susceptibility and procedure-related factors may coexist.

Although both dexamethasone and amisulpride have demonstrated efficacy as components of multimodal prophylaxis, direct clinical comparisons of amisulpride–ondansetron with dexamethasone–ondansetron in patients undergoing laparoscopic cholecystectomy are limited. A head-to-head comparison may therefore provide clinically relevant information regarding whether amisulpride can provide postoperative protection comparable to a widely established dexamethasone-based regimen.

The present study was therefore designed to compare intravenous amisulpride 5 mg plus ondansetron 4 mg with intravenous dexamethasone 8 mg plus ondansetron 4 mg for prevention of PONV during the first 24 hours following laparoscopic cholecystectomy.

MATERIALS AND METHODS

Study design and setting

This prospective, randomized, double-blind comparative clinical study was conducted in the Department of Anaesthesiology, Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, after approval from the Institutional Ethics Committee.

The study was conducted over a period of 18 months.

Study population

Adult patients of either sex scheduled for elective laparoscopic cholecystectomy under general anaesthesia were screened for eligibility.

Inclusion criteria

Patients were included if they:

1. were aged 18–65 years;
2. belonged to ASA physical status I or II;
3. were scheduled for elective laparoscopic cholecystectomy under general anaesthesia;
4. were expected to undergo surgery lasting less than 60 minutes with inhalational anaesthesia; and
5. Provided written informed consent.

Exclusion criteria

Patients were excluded if they had:

1. Received antiemetic medication within 24 hours before surgery;
2. pregnancy or lactation;
3. known hypersensitivity to any study drug;
4. significant cardiac, hepatic, renal, or neurological disease;
5. prolonged QT interval or treatment with medications known to affect the QT interval;
6. chronic opioid use or history of substance abuse.

Randomization and blinding

A total of 120 eligible patients were randomized into two equal groups using sequentially numbered, sealed, opaque envelopes.

Group A consisted of 60 patients and received intravenous amisulpride 5 mg with ondansetron 4 mg.

Group B consisted of 60 patients and received intravenous dexamethasone 8 mg with ondansetron 4 mg.

Study medications were prepared and packed by anaesthesia personnel who were not involved in perioperative management or postoperative outcome assessment. Patients and the observer responsible for postoperative assessment remained blinded to group allocation.

Assessment of PONV risk

The simplified Apfel score was recorded preoperatively. The four conventional risk factors were female sex, nonsmoking status, previous history of PONV or motion sickness, and anticipated postoperative opioid use. Each factor contributes one point to the score.^[1,2]

Important manuscript note: before submission, the final version should reconcile the thesis statement that some patients with previous PONV/motion sickness were excluded with the use of the Apfel score, because previous PONV/motion sickness is itself one of its components.

Anaesthetic technique

Standard monitoring consisting of electrocardiography, non-invasive blood pressure, pulse oximetry and capnography was applied to all patients.

General anaesthesia was induced using intravenous propofol and fentanyl, with tracheal intubation facilitated using a non-depolarizing neuromuscular

blocking agent. Anaesthesia was maintained using oxygen, nitrous oxide and a volatile anaesthetic agent. Intraoperative analgesia, fluid management and ventilation were standardized as far as possible between the two groups.

At the end of surgery, neuromuscular blockade was reversed and patients were extubated after fulfilling standard extubation criteria.

Administration of study medication

The study medication was administered intravenously 30 minutes after induction of anaesthesia.

- **Group A:** amisulpride 5 mg + ondansetron 4 mg
- **Group B:** dexamethasone 8 mg + ondansetron 4 mg

Postoperative assessment

Patients were transferred to the postoperative recovery area following surgery and monitored for 24 hours.

The primary postoperative outcomes were postoperative emetic episodes and severity of nausea. Nausea was assessed using an 11-point verbal numerical rating scale ranging from 0 to 10:

- 0 = no nausea
- 1–3 = mild nausea
- 4–6 = moderate nausea
- 7–10 = severe nausea

Vomiting was defined as forceful expulsion of gastric contents.

Nausea severity was documented at 1, 2, 6 and 24 hours after surgery.

Rescue antiemetic

Patients with moderate-to-severe nausea or two or more vomiting episodes received standardized rescue antiemetic treatment according to the institutional protocol.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 20. Continuous variables were expressed as mean $\pm$ standard deviation and categorical variables as frequencies and percentages. The chi-square test or Fisher's exact test was used for comparison of categorical variables. Independent Student's t-test was used for continuous variables where appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Baseline characteristics: A total of 120 patients were included, with 60 patients in each treatment group.

The age distribution was comparable between the two groups ($\chi^2=1.89$, $df=4$, $p=0.756$). Most participants were between 26 and 55 years of age. The proportion aged 26–35 years was 28.3% in Group A and 25.0% in Group B, while patients aged 36–45 years represented 31.7% and 23.3%, respectively.

The sex distribution was also comparable ($p=0.854$). Females constituted 53.3% of Group A and 56.7% of Group B, whereas males constituted 46.7% and 43.3%, respectively.

The distribution of ASA physical status was comparable between the groups ($p=0.267$). ASA I patients constituted 63.3% of Group A and 53.3% of Group B, while ASA II patients constituted 36.7% and 46.7%, respectively.

There was an isolated difference in the 70–79 kg weight category, which was more frequent in Group A than Group B (41.7% vs 20.0%, $p=0.010$). The remaining weight categories were not significantly different.

Table 1: Baseline demographic and clinical characteristics

Characteristic	Amisulpride + Ondansetron (n=60)	Dexamethasone + Ondansetron (n=60)	p-value
Female	32 (53.3%)	34 (56.7%)	0.854
Male	28 (46.7%)	26 (43.3%)	
ASA I	38 (63.3%)	32 (53.3%)	0.267
ASA II	22 (36.7%)	28 (46.7%)	
18–25 years	3 (5.0%)	3 (5.0%)	0.756
26–35 years	17 (28.3%)	15 (25.0%)	
36–45 years	19 (31.7%)	14 (23.3%)	
46–55 years	14 (23.3%)	19 (31.7%)	
56–65 years	7 (11.7%)	9 (15.0%)	

Postoperative emetic episodes

During the first 24 postoperative hours, 42 patients (70.0%) in the amisulpride–ondansetron group and 38 patients (63.3%) in the dexamethasone–ondansetron group had no emetic episode. This difference was not statistically significant ($p=0.439$). A single emetic episode occurred in 3 patients (5.0%) in Group A compared with 11 patients (18.3%) in

Group B, representing a statistically significant difference ($p=0.023$).

Two emetic episodes occurred in 10 patients (16.7%) in Group A and 9 patients (15.0%) in Group B ($p=0.803$). Three episodes occurred in 5 patients (8.3%) and 2 patients (3.3%), respectively ($p=0.439$).

Table 2: Distribution of postoperative emetic episodes during the first 24 hours

Number of emetic episodes	Amisulpride + Ondansetron (n=60)	Dexamethasone + Ondansetron (n=60)	P-value
0	42 (70.0%)	38 (63.3%)	0.439
1	3 (5.0%)	11 (18.3%)	0.023
2	10 (16.7%)	9 (15.0%)	0.803
3	5 (8.3%)	2 (3.3%)	0.439

Overall, the findings indicate that both regimens provided substantial protection against postoperative emesis, with a difference observed specifically in the distribution of single breakthrough episodes.

Nausea severity

At 1 hour, the majority of patients in both groups reported mild nausea. Mild nausea was present in 63.3% of patients receiving amisulpride–ondansetron and 65.0% receiving dexamethasone–ondansetron ($p=0.849$). No significant difference was observed for moderate or severe nausea.

At 2 hours, mild nausea remained the most frequent category, occurring in 58.3% and 66.7% of patients,

respectively ($p=0.346$). Severe nausea was uncommon.

At 6 hours, mild nausea remained predominant, affecting 58.3% of Group A and 63.3% of Group B ($p=0.575$). No severe nausea was recorded in either group.

At 24 hours, absence of nausea was reported in 51.7% of patients in Group A and 50.0% in Group B ($p=0.840$). Mild nausea was present in 46.7% of patients in each group. Moderate nausea remained uncommon, and no severe nausea was recorded.

Table 3: Nausea severity at 24 hours

Nausea severity	Amisulpride + Ondansetron (n=60)	Dexamethasone + Ondansetron (n=60)	p-value
None	31 (51.7%)	30 (50.0%)	0.840
Mild	28 (46.7%)	28 (46.7%)	
Moderate	1 (1.7%)	2 (3.3%)	
Severe	0	0	

Rescue antiemetic requirement

During the first 24 postoperative hours, rescue antiemetic medication was required by 15 patients (25.0%) in the amisulpride–ondansetron group and

10 patients (16.7%) in the dexamethasone–ondansetron group. The difference was not statistically significant ($p=0.369$).

Table 4: Requirement for rescue antiemetic during the first 24 hours

Rescue antiemetic	Amisulpride + Ondansetron (n=60)	Dexamethasone + Ondansetron (n=60)	p-value
Required	15 (25.0%)	10 (16.7%)	0.369
Not required	45 (75.0%)	50 (83.3%)	

Thus, although rescue medication was numerically more frequent in the amisulpride group, the difference did not reach statistical significance.

DISCUSSION

The present randomized double-blind study compared two multimodal antiemetic regimens—amisulpride 5 mg plus ondansetron 4 mg and dexamethasone 8 mg plus ondansetron 4 mg—in patients undergoing laparoscopic cholecystectomy. The principal finding was that both regimens provided substantial protection against postoperative emesis, with no statistically significant difference in the overall distribution of emetic episodes or 24-hour nausea severity. A statistically significant difference was observed in the occurrence of a single emetic episode, which was less frequent in the amisulpride group.

The baseline characteristics were generally comparable between the treatment groups. Age, sex and ASA physical status did not differ significantly. This is important in a comparative antiemetic study because patient-related characteristics are established determinants of PONV risk. Apfel et al. identified female sex, nonsmoking, previous PONV or motion sickness and postoperative opioid use as the principal components of the simplified risk score.^[1] The subsequent evidence-based analysis of PONV risk factors further supported the importance of these patient and perioperative variables.^[2]

The predominance of females in the present study is consistent with the recognized epidemiology of PONV. Laparoscopic cholecystectomy itself is also associated with increased PONV risk, making this population appropriate for evaluation of multimodal prophylaxis. Randomized trials involving laparoscopic cholecystectomy have demonstrated clinically relevant differences in PONV according to the antiemetic strategy used.^[3]

Emesis

In the present study, 70.0% of patients receiving amisulpride–ondansetron remained free from emesis during the first 24 hours compared with 63.3% receiving dexamethasone–ondansetron. Although the difference was not statistically significant, the proportion experiencing a single emetic episode was significantly lower with amisulpride–ondansetron.

This observation is pharmacologically plausible because amisulpride acts through dopaminergic D2/D3 receptor antagonism, thereby providing receptor coverage complementary to the serotonergic blockade produced by ondansetron. The importance of dopamine receptor antagonism in PONV prophylaxis has been evaluated in several randomized trials of intravenous amisulpride.^[6,7]

Gan et al. evaluated intravenous amisulpride in two concurrent randomized phase III trials and found evidence supporting its efficacy in adults with increased risk of PONV.^[6] The subsequent high-risk multicenter trial by Kranke et al. included patients

with three or four risk factors and demonstrated a higher complete-response rate with amisulpride 5 mg added to another antiemetic compared with control treatment. Emesis, nausea and rescue medication use were also lower in the amisulpride group.^[7]

The findings of the present study therefore add to the existing evidence by examining amisulpride specifically in combination with ondansetron and comparing this regimen with an established dexamethasone–ondansetron combination in laparoscopic cholecystectomy.

The evidence supporting dexamethasone-based prophylaxis is also substantial. In a randomized trial involving laparoscopic cholecystectomy, Erhan et al. reported lower PONV incidence with dexamethasone compared with placebo.^[3] Elhakim et al. subsequently demonstrated that dexamethasone 8 mg combined with ondansetron 4 mg was effective for preventing PONV and that higher dexamethasone doses did not provide additional benefit.^[4]

Combination therapy has also been investigated directly in laparoscopic cholecystectomy. A randomized trial reported higher complete-response rates with ondansetron plus dexamethasone compared with either drug alone.^[12] Bano et al. similarly reported lower nausea and vomiting and reduced rescue antiemetic use with dexamethasone–ondansetron compared with dexamethasone alone.¹¹ These findings support the concept that complementary receptor mechanisms may improve PONV prevention.

Nausea

In the present study, nausea severity was comparable between treatment groups at all evaluated time points. Mild nausea was the most frequently reported category during the early postoperative period, whereas severe nausea became uncommon or absent at later assessment points.

At 24 hours, approximately half of the patients in each group were free from nausea, while 46.7% in each group reported mild nausea. Moderate nausea was uncommon and no patient reported severe nausea at this time point.

These findings suggest that the two multimodal regimens produced broadly similar control of nausea over the postoperative period. This is consistent with evidence that combination antiemetic prophylaxis can reduce the burden of PONV by targeting multiple emetogenic pathways. Current consensus guidelines recommend multimodal prophylaxis particularly for patients with multiple risk factors.^[5]

The absence of a significant difference in nausea despite the lower frequency of single emetic episodes with amisulpride is noteworthy. Nausea and vomiting are related but distinct clinical outcomes and may not respond identically to pharmacological intervention. Therefore, assessment of both outcomes remains important in comparative PONV studies.

Rescue antiemetic requirement

Rescue antiemetic medication was required in 25.0% of patients receiving amisulpride–ondansetron and 16.7% of those receiving dexamethasone–

ondansetron. Although rescue use was numerically higher in the amisulpride group, the difference was not statistically significant.

This finding indicates that the two regimens provided broadly comparable overall prophylactic control. Previous studies of combination prophylaxis have similarly demonstrated reductions in rescue antiemetic requirements when complementary agents are used.^[11,12]

The results should nevertheless be interpreted cautiously because rescue medication requirement is influenced not only by the pharmacological efficacy of prophylaxis but also by the threshold used to administer rescue therapy, postoperative opioid exposure, pain intensity and clinical practice.

Amisulpride in the context of previous evidence

The present study adds to the clinical literature on amisulpride. Earlier randomized studies demonstrated efficacy of intravenous amisulpride compared with placebo, including in patients with multiple PONV risk factors.^[6,7] The high-risk trial by Kranke et al. is particularly relevant because amisulpride was administered in addition to another antiemetic, reflecting the multimodal strategy used in contemporary practice.^[7]

Amisulpride has also been evaluated for treatment of established PONV. Candiotti et al. reported efficacy of intravenous amisulpride in patients who developed PONV without prior prophylaxis, while Habib et al. demonstrated benefit after failure of prophylaxis.^{8,9} Thus, the current study examines amisulpride within the prevention setting rather than.

Limitations

The study has several limitations. First, it was conducted at a single tertiary-care center, which may limit generalizability. Second, the sample size was relatively modest. Third, only ASA I and II patients undergoing laparoscopic cholecystectomy were studied, limiting extrapolation to higher-risk populations and other surgical procedures. Fourth, follow-up was limited to 24 hours, so delayed PONV beyond this period was not evaluated.

In addition, the observed imbalance in the 70–79 kg weight category should be acknowledged when interpreting the findings. Finally, although several postoperative nausea time points were recorded, the current analysis primarily focuses on the overall 24-hour outcome rather than modeling the repeated measurements longitudinally.

CONCLUSION

Both intravenous amisulpride 5 mg plus ondansetron 4 mg and dexamethasone 8 mg plus ondansetron 4 mg provided effective prophylaxis against postoperative nausea and vomiting following laparoscopic cholecystectomy.

The overall incidence and severity of postoperative nausea and the requirement for rescue antiemetic therapy were comparable between the two treatment

groups. A lower frequency of single breakthrough emetic episodes was observed in the amisulpride–ondansetron group, although the overall distribution of postoperative emesis did not differ significantly.

These findings suggest that amisulpride–ondansetron is a potential non-steroidal alternative to dexamethasone–ondansetron as part of multimodal PONV prophylaxis in patients undergoing laparoscopic cholecystectomy.

Larger multicenter randomized trials would be useful to determine whether clinically meaningful differences exist between these two regimens and to evaluate their efficacy in patients with higher baseline PONV risk.

REFERENCES

1. 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.
2. 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.
3. Erhan Y, Erhan E, Aydede H, Yumus O, Yentur A. Ondansetron, granisetron, and dexamethasone compared for the prevention of postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy: a randomized placebo-controlled study. *Surg Endosc*. 2008;22(6):1487-1492.
4. Elhakim M, Nafie M, Mahmoud K, Atef A. Dexamethasone 8 mg in combination with ondansetron 4 mg appears to be the optimal dose for the prevention of nausea and vomiting after laparoscopic cholecystectomy. *Can J Anaesth*. 2002;49(9):922-926.
5. Gan TJ, Belani KG, Bergese S, Chung F, Diemunsch P, Habib AS, et al. Fourth consensus guidelines for the management of postoperative nausea and vomiting. *Anesth Analg*. 2020;131(2):411-448.
6. Gan TJ, Kranke P, Minkowitz HS, et al. Intravenous amisulpride for the prevention of postoperative nausea and vomiting: two concurrent, randomized, double-blind, placebo-controlled trials. *Anesthesiology*. 2017;126(2):268-275.
7. Kranke P, Bergese SD, Minkowitz HS, Melson TI, Leiman DG, Candiotti KA, et al. Amisulpride prevents postoperative nausea and vomiting in patients at high risk: a randomized, double-blind, placebo-controlled trial. *Anesthesiology*. 2018;128(6):1099-1106.
8. Candiotti KA, Kranke P, Bergese SD, et al. Randomized, double-blind, placebo-controlled study of intravenous amisulpride as treatment of established postoperative nausea and vomiting in patients who have had no prior prophylaxis. *Anesth Analg*. 2019;128(6):1098-1105.
9. Habib AS, Kranke P, Bergese SD, Chung F, Ayad S, Siddiqui N, et al. Amisulpride for the rescue treatment of postoperative nausea or vomiting in patients failing prophylaxis: a randomized, placebo-controlled phase III trial. *Anesthesiology*. 2019;130(2):203-212.
10. Zhang LF, Zhang CF, Tang WX, He L, Liu Y, Tian DD, et al. Efficacy of amisulpride on postoperative nausea and vomiting: a systematic review and meta-analysis. *Eur J Clin Pharmacol*. 2020;76(7):903-912.
11. 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;18(5):265-269.
12. Ahsan K, Abbas N, Naqvi SMN, Murtaza G, Tariq S. Comparison of efficacy of ondansetron and dexamethasone combination and ondansetron alone in preventing postoperative nausea and vomiting after laparoscopic cholecystectomy. *J Pak Med Assoc*. 2014;64(3):242-246.