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Original Research Article

EFFICACY OF DEXAMETHASONE ALONE COMPARED TO DEXAMETHASONE AND METOCLOPRAMIDE COMBINED FOR POST-OPERATIVE NAUSEA AND VOMITING IN PATIENTS UNDERGOING ABDOMINAL SURGERY

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Abstract: *Post-operative nausea and vomiting (PONV) are common complications in patients undergoing major abdominal surgery, with reported frequencies of up to 54% for vomiting and 71% for nausea. PONV, typically within the first 24 hours after surgery, can result in significant morbidity, unexpected hospital admissions, reduced patient comfort, prolonged hospital stays, and increased healthcare costs. The aim of this institutional-based randomized controlled study, conducted at Aziz Bhatti Teaching Hospital in Gujarat from March 2022 to March 2023, was to assess the efficacy of dexamethasone alone and in combination with metoclopramide in preventing post-operative nausea and vomiting in patients undergoing abdominal surgery. One hundred fifty patients aged 18 to 65 who were scheduled for abdominal surgeries were recruited for this study. The patients were randomly assigned to three treatment groups: Group P (placebo), Group D (dexamethasone), and Group DM (dexamethasone and metoclopramide). Data analysis was performed using SPSS version 21, with the one-way ANOVA test used for continuous variables and the Chi-Square test employed for categorical data. A p-value of less than 0.05 was considered statistically significant. The results revealed that the overall incidence of PONV was 62% in the placebo group, 26% in the dexamethasone group, and 14% in the dexamethasone plus metoclopramide group. Significantly fewer patients in the dexamethasone + metoclopramide group ($p < 0.05$ compared to Group P) and only one patient in the dexamethasone group ($p < 0.05$ compared to Group P) required rescue antiemetic medication, whereas 8 patients in the placebo group required such treatment. Pain scores, time to first analgesic request, and adverse effects were comparable across all treatment groups. In conclusion, the combination of dexamethasone and metoclopramide demonstrated superior efficacy in preventing PONV compared to dexamethasone alone.*

Keywords: Post-Operative Nausea and Vomiting (PONV), Dexamethasone, Metoclopramide, Abdominal Surgery, Efficacy

Introduction

Post-operative nausea and vomiting (PONV) are common occurrences following surgical procedures, characterized by the sensation of nausea and the involuntary expulsion of stomach contents through vomiting (Yan et al., 2023). PONV is particularly prevalent in gynecologic patients with large intra-abdominal masses, as the emetogenic receptors on the stomach's intraluminal surface are activated (Regasa et al., 2020). The development of PONV is influenced by various factors, including preoperative variables such as sex, medical history, smoking status, intraoperative anesthesia medications, duration of surgery and anesthesia, and post-operative factors such as pain, opioid use, low blood sugar, reduced oxygen levels, and dietary intake (Echeverria-Villalobos et al., 2022).

PONV is associated with significant morbidity, such as aspiration and impaired wound healing, especially in gynecological surgeries where vomiting and nausea are reported in up to 54% and 71% of women, respectively (Nelson et al., 2023). Prolonged vomiting after abdominal, vascular, ocular, or plastic surgeries can disrupt electrolyte balance (e.g., hypocalcemia, hypochloremia, hypochloremia, hyponatremia, and metabolic alkalosis), cause dehydration, esophageal lacerations, or even rupture, delay wound healing, and lead to subcutaneous flap hemorrhage, making it a major concern for anesthesiologists (O'Brien, 2022).

Various medications have demonstrated efficacy in treating nausea and vomiting, including steroids, serotonin antagonists, and dopamine antagonists (Urits et al., 2020). Selective serotonin receptor antagonists are the most effective treatment for PONV (Akram et al., 2020). However, their widespread use is limited due to their high cost and unavailability in resource-limited healthcare facilities. As a result, a

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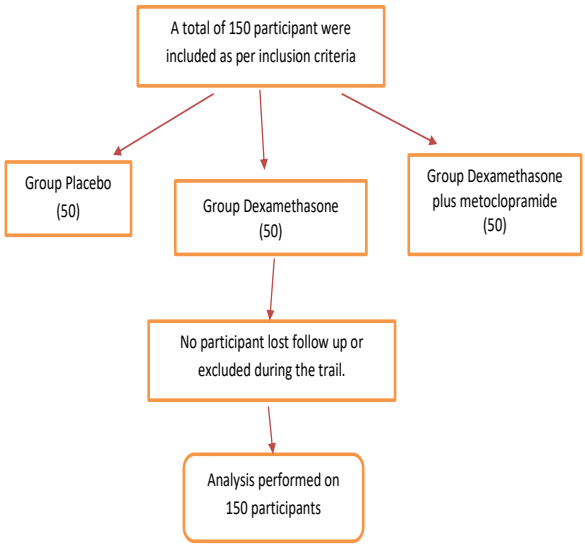
combination of different antiemetic drugs is often used for individuals scheduled for surgery, particularly for major gynecological procedures (Teshome et al., 2020). The decision to use combination therapy is guided by the PONV Apfel score, which recommends combined treatment if the numerical rating exceeds two. Nevertheless, ongoing debates exist regarding the effectiveness of combining dexamethasone and metoclopramide versus using either medication alone to treat PONV (Meyer et al., 2023).

This study was conducted to address these debates and evaluate the efficacy of dexamethasone alone and in combination with metoclopramide for the prevention and treatment of PONV in patients. Its objective was to provide scientific evidence and insights into the effectiveness of these medications in managing PONV.

Methodology



Consort diagram of selection, inclusion, and data analysis process

A randomized controlled trial was conducted at the Aziz Bhatti Teaching Hospital in Gujarat from March 2022 to March 2023. Ethical approval was obtained from the hospital review committee. The study included ASA class I and II adult patients undergoing abdominal surgeries. Exclusion criteria encompassed nicotine users, individuals with a history of malignant hyperthermia, motion sickness, or extrapyramidal disease, patients under the age of 18, those with previous allergic reactions to study drugs, and individuals who had recently vomited or used antiemetics within 24 hours prior to the procedure. One hundred fifty patients were randomly assigned to three groups: placebo, dexamethasone, and a combination of dexamethasone with metoclopramide. Patients adhered to NPO guidelines and received premedication with 500 mg of oral paracetamol and 3 mg of alprazolam the night before surgery. Instructions were provided for self-reporting nausea and emesis using an 11-point NRS score. The study drugs were administered double-blindly using identical 5-ml syringes prepared by an anesthetist. Group 1 received a placebo (0.9% saline), Group 2 received a placebo after anesthesia induction and dexamethasone 8 mg at the end of surgery, and Group 3 received dexamethasone 8 mg after anesthesia induction and metoclopramide 10 mg at the end of surgery.

All patients underwent general anesthesia following a standardized procedure. Monitoring during anesthesia included continuous ECG, noninvasive blood pressure, pulse oximetry, and capnometry. Intravenous Ringer lactate solution was administered at specified rates. After surgery, patients received oxygen supplementation for 2 hours and were monitored for 24 hours. Nursing personnel documented the incidence of nausea and vomiting at three evaluation periods: 0-4 hours, 4-12 hours, and 12-24 hours. Patients were instructed to indicate the presence or absence of nausea, vomiting, or retching during each evaluation period. Rescue antiemetics were administered if specific criteria were met. The complete response was defined as the absence of nausea or vomiting throughout the trial.

An intravenous mixture of metamizole 1.25 g and tramadol hydrochloride 100 mg in 100 ml 0.9% NaCl was administered for pain relief after surgery. Pain assessments were conducted using the visual analog scale (VAS) at designated intervals. Additional analgesia was administered based on patient demand or when VAS scores exceeded a certain threshold. Side effects and adverse events were noted by follow-up nurses or self-reported by patients. Specifics of adverse occurrences, including headaches, vertigo, and anxiety, were documented using open-ended questioning.

The collected data was analyzed using SPSS version 21. Descriptive statistics were used to analyze sociodemographic characteristics, presenting mean ± standard deviation results. One-way ANOVA was used to compare numerical data between groups, while non-parametric data were assessed using the Kruskal-Wallis test. The Chi-Square test or Fisher exact test was applied for categorical data analysis. A p-value of 0.05 or less was considered statistically significant.

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Results

A total of 150 participants who underwent surgeries were included in the study. There were no statistically significant differences among the three groups regarding patient age, height, weight, duration of anesthesia, type of surgery, and total amount of fentanyl administered ($p > 0.05$). The perioperative data, including post-operative analgesia and demographic characteristics, were comparable across the groups (Table 1).

Table 1 Patients Demographics:

Variables	Group P (Placebo)	Group D (Dexamethasone)	Group DM (Dexamethasone plus Metoclopramide)
ASA I/II	30/20	27/23	31/19
Age (years)	52.9 ± 16.5	55.6 ± 15.9	50.9 ± 16.1
Sex (M/F)	33/17	29/21	26/24
Weight (kg)	72.8 ± 12.7	73.3 ± 13.1	69.8 ± 11.3
Height (cm)	171.6 ± 12.4	169.0 ± 17.4	174.6± 15.4
Duration of anesthesia (min)	71 ± 19	73 ± 14	70 ± 17
Duration of surgery (min)	49 ± 25	52 ± 29	55± 19
Fentanyl administered (lg)	200± 49	197 ± 53	198 ± 51
Data are reported as the mean ± standard deviation (SD); there are no appreciable differences across groups.			

Table 2 presents the incidence of nausea and vomiting in each treatment group during the three evaluation periods. As anticipated, nausea was more common than vomiting at each stage, as some patients reported nausea without experiencing vomiting.

Table 2: Frequency of nausea and vomiting 24 hours after surgery.

Time Duration (Hours)	Group P (Placebo)	Group D (Dexamethasone)	Group DM (Dexamethasone plus Metoclopramide)
0-4			
Nausea	12(24)	6 (12)	3(6)
Vomiting	10(20)	4(8)	2(4)
Total PONV	22(44)	10(20)	5(10)
Rescue antiemetic's	4(8)	1(2)	0(0)
4-12			
Nausea	15(30)	8(16)	4(8)
Vomiting	11(22)	5(10)	3(6)
Total PONV	26(52)	13(26)	4(8)
Rescue antiemetics'	6(12)	1(2)	0(0)
12-24			
Nausea	18(36)	8(16)	4(8)
Vomiting	13(26)	5(10)	3(6)
Total PONV	31(62)	13(26)	7(14)
Rescue antiemetic's	8(16)	1(2)	0(0)
Complete response	19(38)	37(74)	43(86)

Dexamethasone with metoclopramide. Post-operative nausea and vomiting (PONV) incidence was evaluated over 24 hours.

The results showed that 62% of patients in the placebo group, 26% in the dexamethasone group, and 14% in the dexamethasone with metoclopramide group experienced PONV (Figure 1). Both the dexamethasone group and the dexamethasone with metoclopramide group had significantly lower incidences of PONV compared to the placebo group ($p < 0.05$). There was no significant difference in the frequency of PONV between the dexamethasone group and the dexamethasone with the metoclopramide group ($p > 0.05$).

Regarding rescue antiemetic use, only one patient in the dexamethasone group required it, while eight patients in the placebo group and none in the dexamethasone with metoclopramide group needed rescue antiemetics. The differences between the groups were statistically significant ($p < 0.05$).

Regarding post-operative analgesia, there were no significant differences between the groups regarding pain intensity at rest and during movement, the number of patients receiving analgesia, or the time before the first analgesic request. Only four patients in the placebo group requested additional analgesic boosting with tramadol hydrochloride.

Adverse effects such as headache, lightheadedness, jitteriness, anxiety, restlessness, drowsiness, and perineal itching were reported, but there were no significant differences between the groups in the occurrence of these adverse effects.

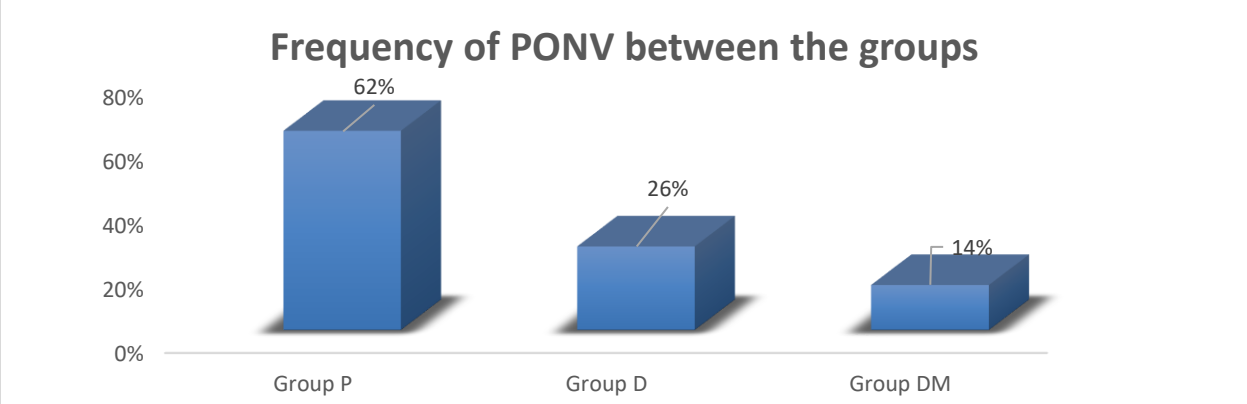

Figure 1: Frequency of post-operative nausea and vomiting 24 hours after surgery.

Table 3: Post-operative pain assessment using the Visual Analogue Scale (VAS) at rest and during exercise, first tramadol demand, and analgesic rescue

	VAS (mean range)		Patients receiving postoperative analgesia N (%)	Rescue analgesic N (%)	Time to first tramadol administration(min)
	At rest	With activity			
Group 1 **0-4** **4-12** **12-24** **Total 0-24**	 3.3 (2.3–4.9) 2.3 (1.9–5.2 2.2 (1.6–2.6)	 3.8 (2.4–5.1) 3.3 (2.4–5.7) 2.4 (1.9–3.1)	 38(76) 7(14) 0(0) 45(90)	4(8)	72.3 ± 19.1
Group 2 **0-4** **4-12** **12-24** **Total 0-24**	 3.6 (1.8–4.3) 2.9 (1.9–5.5) 2.5 (1.7–2.9	 3.3 (1.6–5.3) 2.5(2.7–4.5) 2.6 (1.9–2.9)	 33(66) 6(12) 0(0) 39(78)	0(0)	74.8 ± 26.3
Group 2 **0-4** **4-12** **12-24** **Total 0-24**	 3.7 (1.4–4.6) 2.5 (1.9–4.2 2.6(1.8–2.5)	 4.1 (1.7–4.3) 2.7(1.8–4.4) 2.5(1.7-3.2)	 35(70) 5(10) 0(0) 40(80)	0(0)	69.6 ± 24.0

Table 4: Frequency of side effects

Variable	Group P (Placebo) n (%)	Group D (Dexamethasone) n (%)	Group DM (Dexamethasone plus Metoclopramide) n (%)
Headache	6(12)	5(10)	4(8)
Dizziness	2(4)	0(0)	0(0)
Anxiety	5(10)	3(6)	1(2)
Perineal l itching	0(0)	0(0)	0(0)
Sedation	5(10)	6(12)	3(6)
Sleep disturbance	10(20)	7(14)	5(10)

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Discussion

This study aimed to investigate the efficacy of dexamethasone alone and in combination with metoclopramide in preventing post-operative nausea and vomiting (PONV) in patients undergoing abdominal surgery. PONV is a common concern following abdominal procedures under general anesthesia, but its exact causes are not fully understood (Sinha et al., 2022). Various factors such as age, gender, smoking, anesthesia medications, and surgical manipulation have been proposed as potential contributors to PONV (Pourtaheri et al., 2022). However, in this study, the treatment groups were comparable in demographic characteristics, duration of anesthesia, and surgical procedures, suggesting that the differences in PONV incidence may be attributed to variations in the antiemetic medications used.

Dexamethasone, an anti-inflammatory corticosteroid, has shown effectiveness in providing surgical analgesia and preventing nausea and vomiting in patients receiving highly emetogenic anticancer drugs. 8-10 mg is commonly recommended for prophylaxis against PONV. In this study, a dosage of 8 mg of dexamethasone was selected. Although the exact mechanism and site of action of dexamethasone in reducing PONV are not fully understood, it is suggested that it may inhibit prostaglandins or release endorphins, which can improve mood, enhance well-being, and increase appetite (Abdildin et al., 2023).

Several previous studies have demonstrated the efficacy of dexamethasone in preventing PONV when administered alone. For instance, Henzi et al. conducted a meta-analysis of 17 studies involving 1,946 patients and found that prophylactic dexamethasone was superior to placebo in preventing PONV without any clinically significant harm. In this study, the overall incidence of PONV was 62% without prophylactic antiemetics, but it significantly decreased to 26% with the administration of dexamethasone (Henzi et al., 2000). Similar findings have been reported in studies involving children and adults. However, conflicting results have been observed in studies focusing on gynecological procedures.

In some studies, Metoclopramide, a dopamine receptor antagonist, has been combined with dexamethasone. In this study, the combination of dexamethasone and metoclopramide was more effective than dexamethasone alone in preventing PONV. This is consistent with other investigations. However, the efficacy of metoclopramide as a standalone antiemetic has been debated (Rasheed et al., 2019).

The most commonly reported adverse effects in this study were headaches, fatigue, and drowsiness. However, the treatment groups had no statistically significant differences in adverse effects. These findings are in line with previous research that found no increased incidence of adverse effects with the combination of dexamethasone and metoclopramide (Yu et al., 2019).

Furthermore, dexamethasone administration, either alone or combined with metoclopramide, reduced post-operative pain and the need for analgesics in this study. This is consistent with previous studies that have shown the analgesic properties of dexamethasone. The combination of dexamethasone and metoclopramide also eliminated the need for rescue antiemetics within 24 hours postoperatively (Lei et al., 2020; Rekatsina et al., 2021).

However, it is important to acknowledge the limitations of this study, such as the small sample size and single-center design. Further research, including larger multicenter randomized controlled trials, is recommended to validate these findings and provide more robust evidence for the prophylaxis of PONV.

Conclusion

In conclusion, the combination of dexamethasone and metoclopramide was more effective in preventing PONV than dexamethasone alone or a placebo. The findings support the use of a combined treatment approach for high-risk patients.

Conflict of interest

The authors declared an absence of conflict of interest.

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