Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/20753
DOI URL: http://dx.doi.org/10.21474/IJAR01/20753

RESEARCH ARTICLE

EFFECT OF PREINDUCTION DEXAMETHASONE 8 MG VS 16 MG FOR RELIEF OF POSTOPERATIVE PAIN AND NAUSEA AND VOMITING IN PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA

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Manuscript Info

Manuscript History
Received: 15 Febuary 2025
Final Accepted: 18 March 2025
Published: April 2025

Key words: -
General anaesthesia, dexamethasone dosage, postoperative pain, nausea and vomiting, preinduction medication

Abstract

Aims and Objectives: This study aimed to evaluate and compare the impact of administering 8 mg versus 16 mg of dexamethasone intravenously prior to induction of general anesthesia on postoperative pain, nausea, and vomiting (PONV). Outcomes assessed included visual analogue scale (VAS) scores for pain, occurrence of PONV, and the need for additional analgesics or antiemetics postoperatively.
Methodology: A randomized prospective study was planned where 68 patients aged 18 to 65, who were in excellent health (ASAI and II) and needed elective surgeries with general anesthesia and endotracheal intubation, were observed. Participants were randomly divided into two equal groups (n=34) using the envelope method. Group D1 received 8 mg of IV dexamethasone, while Group D2 received 16 mg IV, both administered before anesthesia induction. Postoperative monitoring included assessment of pain via VAS, episodes of nausea and vomiting, and documentation of any supplementary analgesic or antiemetic usage.
Results:The occurrence of PONV was notably lower in Group D2 compared to Group D1 (11.8% vs. 32.4%, respectively; p = 0.041). However, there were no significant differences between the two groups regarding immediate postoperative pain scores or the requirement for additional pain relief or antiemetic medications.
Conclusion:Administering 16 mg of dexamethasone intravenously before anesthesia induction appears to be more effective than 8 mg in minimizing early postoperative nausea and vomiting. Nevertheless, both doses showed comparable effects on postoperative pain and the need for further analgesic or antiemetic intervention.
Categories: General Surgery, Anesthesiology, Pain Management.

Introduction: -

Postoperative pain remains a prevalent challenge, with approximately 80% of patients experiencing inadequate pain relief after surgery. When not effectively managed, this pain can delay recovery, lower quality of life, and contribute to increased complications, prolonged opioid use, and higher healthcare costs [1]. Furthermore, insufficient acute pain control following surgery has been consistently linked to a higher risk of developing chronic postoperative pain[1].

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Managing postoperative pain efficiently is vital to improving patient outcomes after surgical procedures. Surgical interventions can suppress immune function, and the extent of this suppression often correlates with the invasiveness of the operation. Providing appropriate analgesia can help counteract these negative immune effects.

Postoperative nausea and vomiting (PONV) rank as the second most common complaint among surgical patients, following pain.Estimates place its incidence between 25 and 30% [2].PONV poses a barrier to early discharge in outpatient surgeries, contributes to unplanned hospital admissions, and adds to overall treatment expenses. Many patients describe nausea and vomiting as more distressing than the surgical pain itself[3,4,5]. Preventing PONV improves patient comfort and enhances recovery efficiency.In rare cases, PONV can cause serious complications such as aspiration pneumonia, esophageal rupture, wound dehiscence, subcutaneous emphysema, and pneumothorax. It may also prolong a patient's stay in the post-anesthesia care unit and is a major factor in unexpected overnight admissions after day surgery[2,6,7].

Dexamethasone, a synthetic corticosteroid, has demonstrated effectiveness in reducing the incidence of PONV across various surgical procedures. While we don't completely understand how it prevents PONV, it's thought to mainly work by interacting with glucocorticoid receptors, having little effect on mineralocorticoid receptors [4,8,9]. These receptors are found in regions of the brain involved in the vomiting reflex[10], such as the area postrema and the nucleus of the solitary tract. Possible ways this happens include blocking the production of prostaglandins in the central nervous system, affecting serotonin pathways, and altering how easily substances can pass through the blood-brain barrier.Despite these theories, direct experimental evidence remains limited. Interestingly, the anti-inflammatory properties of dexamethasone are even more pronounced than its antiemetic effects[5,10].

Dexamethasone is thought to reduce nausea and vomiting after surgery by blocking signals from the parasympathetic nervous system to the brain's vomiting center. [7,11]. In addition to its antiemetic effects, it has been associated with decreased postoperative pain and earlier return to oral intake following surgery[4,12,13]. The drug may also enhance the overall quality of recovery and help reduce postoperative fatigue. Studies, including those by De Oliveira and colleagues, have shown that dexamethasone doses exceeding 0.2 mg/kg can lower pain intensity and reduce opioid requirements[14,15,16,17,18].The pain relief from glucocorticoids is thought to occur by stopping peripheral phospholipase from working, which lowers the creation of inflammatory substances made by the cyclooxygenase and lipoxygenase pathways [16,19].

Even with these advantages, dexamethasone is not commonly recommended as part of a pain management planbecause its effectiveness in treating both pain after surgery and nausea is still being studied [15,20,21].

Earlier research primarily utilized doses ranging between 8 to 10 mg; however, recent smaller dose-response studies have demonstrated that even 2.5 to 5 mg may be effective [2].

The Society for Ambulatory Anesthesia (SAMBA) has given recommendations [9] for handling PONV, saying that patients who are at moderate to high risk should get a preventive intravenous dose of 4–5 mg dexamethasone when anesthesia starts. Its efficacy in this role is comparable to other standard antiemetics such as ondansetron 4 mg IV and droperidol 1.25 mg IV [10]. Notably, SAMBA emphasizes administration at the time of anesthetic induction rather than postoperatively [6].

Commonly used doses range from 8 to 12 mg IV [16,22,23,24,25]. This study looks at whether a higher dose of 16 mg, instead of the usual 8 mg, is more effective at preventing PONV and managing pain after surgery in patients who are under general anesthesia with endotracheal intubation.

Materials and Methods.

This quasi-observational study was conducted at a tertiary care hospital in South India over a two-year period. The required sample size was determined using G*Power software, resulting in 34 patients per group to achieve 80% power, an effect size of 0.7, and a significance level (α) of 5%. A total of 68 adult patients were enrolled using a simple random sampling method. After obtaining informed written consent, eligible patients undergoing surgery under general anesthesia with endotracheal intubation were randomly divided into two groups using the sealed envelope technique. Group D1 received 8 mg of intravenous dexamethasone at induction, while Group D2 received 16 mg IV at the same time point. Continuous variables were expressed as mean ± standard deviation, and comparisons of demographic characteristics and VAS pain scores between groups were performed accordingly.

An independent t-test was employed for the analysis of continuous variables, while categorical variables were compared using either the Chi-square test or Fisher's exact test, as appropriate.

The study included patients between 18 and 65 years of age, categorized as ASA physical status I or II, who were scheduled for elective surgical procedures under general anesthesia. Exclusion criteria encompassed individuals with significant cardiovascular, respiratory, hepatic, renal, neurologic, psychiatric, or metabolic disorders; a history of malignant hyperthermia; and pregnant women. Patients classified as ASA grade III or above were not included in the study.

As part of preoperative preparation, patients were administered oral ranitidine 150 mg the night before and on the morning of surgery, along with lorazepam 1 mg the night prior. Upon arrival in the operating theater, standard monitoring devices were attached, including a pulse oximeter, a three-lead ECG, and a non-invasive blood pressure cuff. An 18-gauge IV cannula was secured, and fluid therapy was initiated based on individual preoperative and intraoperative needs.

All participants received fentanyl 2 mcg/kg IV and glycopyrrolate 0.2 mg IV prior to the administration of the study drug. Randomization into Group D1 (8 mg IV dexamethasone) or Group D2 (16 mg IV dexamethasone) was carried out using the sealed envelope method. No additional antiemetic agents, such as ondansetron, were administered during the intraoperative period.

After providing extra oxygen and checking the level of carbon dioxide in the breath, general anesthesia was started with propofol at a dose of 2 mg/kg through an IV, and intubation was made easier with vecuronium at 0.1 mg/kg through an IV. We maintained anesthesia by administering isoflurane and nitrous oxide in oxygen. Patients were ventilated using volume-controlled mechanical ventilation. Mean arterial pressure (MAP) was maintained within 20% of baseline values through appropriate fluid management and, when necessary, vasopressor support. All efforts were made to maintain normal body temperature throughout the procedure.

At the conclusion of surgery, neuromuscular blockade wasreversed with neostigmine 0.05 mg/kg IV and glycopyrrolate 0.01 mg/kg IV. Tracheal extubation was performed once the patient regained adequate spontaneous respiration and could follow verbal instructions. Patients were then transferred to the Post-Anesthesia Care Unit (PACU) for postoperative observation.

Pain was assessed upon PACU arrival (designated as time 0) using a 10-point Visual Analogue Scale (VAS), where 0 indicated no pain and 10 the worst imaginable pain. All participants received 1 g IV paracetamol for routine postoperative pain management. We administered rescue analgesia with IV tramadol or fentanyl if the VAS scores were 4 or higher. We evaluated PONV in the immediate postoperative period, recording nausea and vomiting as a single composite outcome.We administered ondansetron 0.1 mg/kg IV if necessary. Any additional requirements for analgesics or antiemetics during the first 24 hours post-surgery were documented.

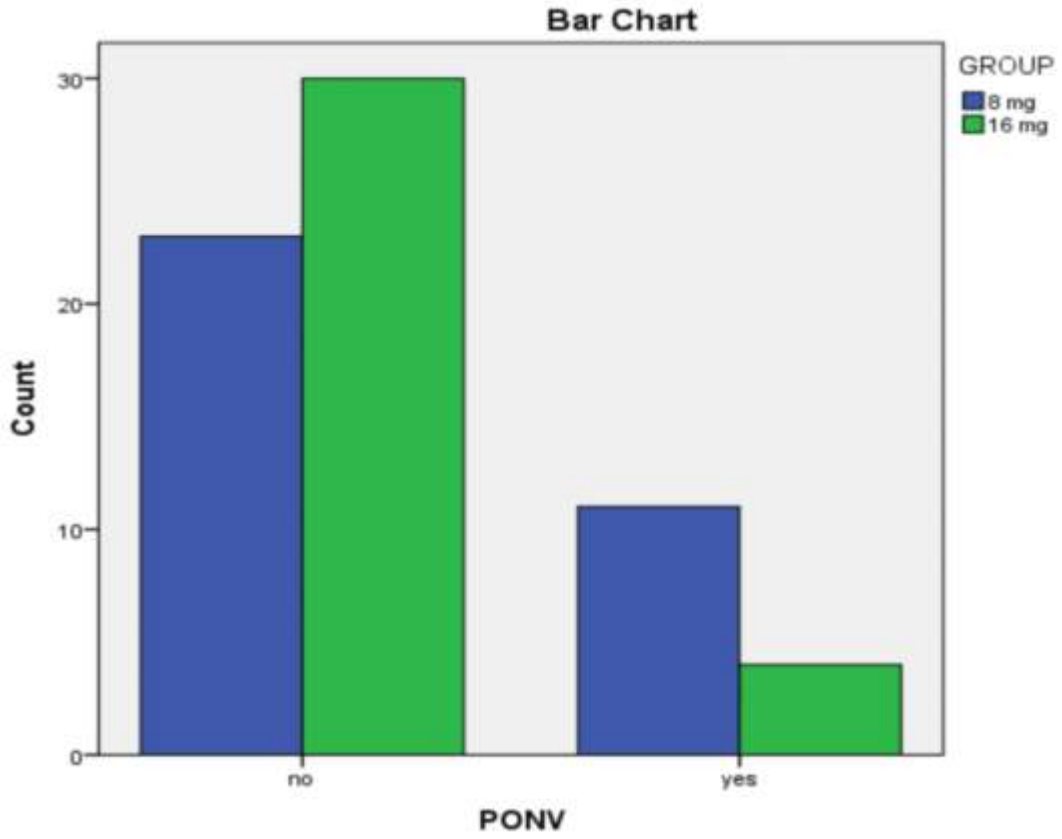
Results.

Demographic Data

A total of 68 participants were included in the study and evenly allocated into two groups: Group D1 received 8 mg of intravenous dexamethasone, while Group D2 received 16 mg. The demographic characteristics of the two groups were similar. The mean age of participants in Group D1 was 41.74 ± 13.55 years, and in Group D2, it was 40.5 ± 13.38 years. Statistical evaluation using an independent t-test showed no significant difference in age between the groups ($p = 0.706$). Gender distribution was also comparable, with females accounting for 52.9% and males for 47.1% of the total population. The chi-square test confirmed no statistically significant difference in gender distribution between the two groups ($p = 0.627$).

Postoperative Pain (VAS) Scores Post-surgical pain intensity was measured using the Visual Analogue Scale (VAS). Group D2 (16 mg) reported a mean VAS score of 4.21 ± 1.78, while Group D1 (8 mg) had a slightly lower mean score of 3.74 ± 1.67. Although there was a numerical difference between the groups, it did not reach statistical significance ($p = 0.267$), suggesting that a higher dexamethasone dose did not provide additional benefit in immediate postoperative pain control.

Incidence of PONV.
Bar chart showing PONV in 8mg vs 16mg group
There is a significant difference in PONV between the 8mg dose groupand the 16mgdose group, as the p-value is 0.041(Less PONV in 16 mg group).



Additional Analgesic Requirements

Both study groups recorded the need for rescue analgesics like tramadol or fentanyl. In Group D1 (8 mg), half of the patients (50%) needed additional pain relief, whereas in Group D2 (16 mg), this number dropped to 35.3%. While the higher dose group showed a reduced need for supplemental analgesics, the difference between the two groups was not statistically significant ($p = 0.225$).

Additional Antiemetic Requirements.
Supplementary antiemetic administration was also assessed. In the 8 mg group, 23.5% of participants required further antiemetic treatment, compared to 11.8% in the 16 mg group. Although the difference favored the higher dexamethasone dose, it was not statistically significant ($p = 0.261$).

Discussion.

Demographic Characteristics
Both groups exhibited balanced demographic characteristics. The average age was 41.74 years in the 8 mg group and 40.5 years in the 16 mg group, with no statistically significant difference ($p > 0.05$). Of the 68 total patients, 36 were female and 32 were male. Group D1 included 17 males and 17 females, while Group D2 had 15 males and 19 females, all within the 18–65 year age range.

Postoperative Pain Score.
Analysis of postoperative pain scores using the Visual Analogue Scale (VAS) indicated slightly higher values in the 16 mg group. However, this difference was not statistically meaningful ($t = -1.12$, $p = 0.267$). In Group D1, 18 patients (53%) had VAS scores ≥4, while in Group D2, 23 patients (67.6%) reported similar levels of pain. Despite

the numerical difference, the results did not reach statistical significance (p = 0.610), challenging the assumption that a 16 mg dose would be more effective for postoperative pain relief than 8 mg.
This result matches what De Oliveira and others found, showing that higher doses of dexamethasone might lower the need for opioids and enhance pain relief after surgery, but their effects were similar to those of medium doses between 0.11 and 0.2 mg/kg. [17,18,21].
Ragi Jain and C.K. Dua [18] studied how different amounts of dexamethasone affected pain relief during surgery below the belly button and discovered that a 16 mg dose greatly reduced pain when moving at 24 and 36 hours after surgery.However, they reported no noticeable impact on pain experienced at rest or on postoperative nausea and vomiting. These findings align with ours, as our study focused on immediate postoperative pain at rest and similarly did not find any notable benefit from administering 16 mg of dexamethasone.

Postoperative Nausea and Vomiting (Ponv).
The incidence of PONV was notably lower in Group D2 (16 mg) compared to Group D1 (8 mg). In Group D1, 32.4% (11 patients) experienced PONV, while only 11.8% (4 patients) in Group D2 were affected (p = 0.041). These results suggest that 16 mg of dexamethasone is more effective in reducing PONV than the 8 mg dose.
Our results match those of ShigeyoshiYamanaga and other researchers, who found that taking higher doses of dexamethasone (between 8 to 14 mg) resulted in a 28% decrease in PONV (p = 0.010) compared to control groups or those taking lower doses (4 to 6 mg).
A study by V. Hermans and others found that there was no significant difference in the rates of PONV between two groups that received either 0.15 mg/kg or 0.5 mg/kg of dexamethasone at the beginning, compared to a placebo [17,20,26].
Gomez-Hernandez and others[27] found that giving women an 8 mg dose of dexamethasone during breast cancer surgery greatly reduced the chances of post-operative nausea and vomiting (PONV) compared to those who received a placebo (28.6% vs. 60%, p = 0.02).

Additional Antiemetic Requirement.
The need for supplemental antiemetics was higher in Group D1, with 26.5% (9 patients) requiring them, compared to 8.8% (3 patients) in Group D2. However, this difference was not statistically significant (p = 0.056). Therefore, while dexamethasone appears to reduce the incidence of PONV, the difference in antiemetic requirements between the two groups was not clinically significant.
Gomez-Hernandez and others [27] discovered that giving 8 mg of dexamethasone before surgery to patients having a mastectomy lowered the number of patients needing extra antiemetics compared to those who received a placebo (21 vs. 8 patients, p = 0.01).
Karanicolas et al. [28] found that using more dexamethasone (8-16 mg) was more effective at preventing PONV in patients undergoing laparoscopic cholecystectomy than using less (2-5 mg), with 8 mg giving the best results.
Additional Analgesic Requirement
The need for additional analgesics in the immediate postoperative period was relatively high in both dexamethasone groups in our study, with 23.5% of patients in both Group D1 and Group D2 requiring extra analgesia (p < 0.001). This finding suggests that dexamethasone may not be an effective sole agent for postoperative analgesia.
In contrast, a study by Gomez-Hernandez et al. [27] found that 8 mg of intravenous dexamethasone significantly reduced postoperative pain in patients undergoing mastectomy with axillary lymph node dissection. These patients showed lower VAS scores immediately after surgery (VAS score of 4.54 ± 1.55 vs. 5.83 ± 2.00, p = 0.004), and this reduction in pain persisted at 6 hours (p < 0.0005) and 12 hours (p = 0.04) post-surgery. Additionally, the dexamethasone group required fewer analgesics compared to the placebo group (p = 0.008). However, it is important to note that this study focused only on mastectomy patients, while our research included individuals undergoing various surgeries.
De Oliveira et al. [21] conducted a meta-analysis to evaluate the impact of different dexamethasone doses on postoperative pain. They categorized doses into low (≤ 0.10 mg/kg), intermediate (0.11–0.20 mg/kg), and high (≥ 0.21 mg/kg) groups and found that higher doses of dexamethasone led to opioid-sparing effects and reduced pain. Our findings align with this observation. While dexamethasone is widely used to alleviate postoperative nausea and vomiting [9], its analgesic effect, particularly after laparoscopic cholecystectomy, remains inconclusive according to a systematic review [21,29].

Study Limitations.

This study has some limitations, including a small sample size, a short duration of 24 hours for pain assessment, and the exclusion of dynamic pain or pain during movement. Additionally, we did not consider the duration of surgery, which could have influenced pain outcomes.

Conclusions.

In our study, patients in Group D2 (16 mg dexamethasone) required more rescue analgesics than those in Group D1 (8 mg), but this difference was not statistically significant. The pain scores in Group D2 were slightly higher, but again, the difference was not significant. However, the incidence of PONV was significantly lower in Group D2 compared to Group D1, with this difference being statistically significant.

Fewer patients in Group D2 required additional antiemetic treatment compared to Group D1, and this difference was statistically significant. Both groups had a significant need for additional analgesics.

In conclusion, our study suggests that a higher dose of dexamethasone (16 mg) is more effective than 8 mg intravenously for reducing the incidence of postoperative nausea and vomiting (PONV) in the immediate postoperative period.However, there was no significant advantage in terms of immediate postoperative painor the need for additional analgesics and antiemetics. Dexamethasone may therefore not be a very useful stand-alone medication for treating postoperative pain.

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