

## The Effect of Preoperative Injectable Dexamethasone on Postoperative Pain Following Hysterectomy in Patients Hospitalized at Imam Hospital of Sari in 2024-2025

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### Abstract

Hysterectomy is one of the most common gynecological surgeries, recognized as the most frequently performed gynecological surgical procedure worldwide (1, 2). The main reasons for performing this surgery include uterine fibroids, abnormal uterine bleeding, and pelvic pain (2, 3). In Germany, 17.5% of women aged 18 to 79 have experienced this surgery, with most cases occurring in the 40 to 49 age group (4). The prevalence of hysterectomy in different countries is influenced by socio-economic factors and access to healthcare services (5). In Iran, the number of hysterectomy operations in a university clinic in Tehran averaged 219 cases per year between 2005 and 2009, and most women were in the 45 to 54 age group.

**Keywords:** Hysterectomy; Dexamethasone; Postoperative Pain

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### Introduction

#### *Hysterectomy Surgery*

Hysterectomy is one of the most common gynecological surgeries, recognized as the most frequently performed gynecological surgical procedure worldwide [1,2]. The main reasons for performing this surgery include uterine fibroids, abnormal uterine bleeding, and pelvic pain [2,3]. In Germany, 17.5% of women aged 18 to 79 have experienced this surgery, with most cases occurring in the 40 to 49 age group [4]. The prevalence of hysterectomy in different countries is influenced by socio-economic factors and access to healthcare services [5]. In Iran, the number of hysterectomy

operations in a university clinic in Tehran averaged 219 cases per year between 2005 and 2009, and most women were in the 45 to 54 age group [6].

Various surgical methods, including abdominal, vaginal, and laparoscopic hysterectomy, are used, each with its own specific advantages and limitations [7,8]. In the past, the development of safer surgical techniques, especially in minimally invasive methods, has led to a reduction in complications [9,10]. On the day following a hysterectomy, patients' conditions are influenced by pain control strategies and intraoperative complications [11]. In various studies, the prevalence of acute pain after hysterectomy has been reported at approximately 39.3%. Regarding gastrointestinal complications, the rate of postoperative nausea and vomiting is

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about 40.7% [12]. The rate of postoperative nausea and vomiting (PONV) varies between 20% and 70% based on various factors such as the type of anesthesia and patient pain control [11,13].

In this context, effective pain management plays a vital role in the recovery process, and the use of epidural anesthesia has advantages over intravenous patient-controlled analgesia, such as reducing pain, nausea, and the consumption of analgesic medications [11]. Furthermore, in hysterectomy surgeries, the type of techniques used plays a significant role in the level of postoperative pain. Given its greater invasiveness, abdominal hysterectomy is associated with higher levels of pain in the early postoperative hours [14]. Intraoperative complications, although rare, can negatively impact the recovery process and patient satisfaction, usually leading to an increased length of hospital stay and decreased satisfaction levels. Therefore, appropriate management of complications and the selection of effective pain control strategies are of special importance to facilitate the recovery process and improve the quality of care. Additionally, reducing complications and properly controlling pain lead to increased patient satisfaction and improved quality of life after surgery [15]. In contrast, moderate to severe pain in the days following surgery is often not controlled even with the consumption of oral analgesics such as acetaminophen [16]. Thus, careful planning and personalization of pain management strategies are essential for improving clinical outcomes and patient satisfaction [17].

#### *Effects of Preoperative Injectable Dexamethasone on Surgical Complications*

Multimodal pain management involves the use of various medications to target different pain pathways and helps reduce the need for opioids [18,19]. Enhanced postsurgical recovery programs utilizing medications including paracetamol, celecoxib, and pregabalin, as well as the use of liposomal bupivacaine local anesthesia and postoperative analgesic drugs, facilitate the recovery process [20]. Physiotherapy, including pelvic floor muscle strengthening and breathing exercises, plays an important role in preventing complications and accelerating the recovery process [21]. Preemptive analgesia, using non-narcotic drugs before the onset of pain, is one of the key strategies in controlling postoperative pain [22]. However, the choice of management methods should be based on the individual needs of the patient and the type of surgery, as certain techniques like epidurals may have complications such as urinary retention and restricted mobility [11,23].

In this regard, studies have shown that dexamethasone helps reduce nausea, vomiting, and

pain in certain cases, such as minimally invasive esophageal surgeries [24] and breast and thyroid surgeries [25,26]. Furthermore, in emergency cases, dexamethasone helps improve the recovery process and reduce mortality by decreasing the inflammatory response and C-reactive protein (CRP) levels [27]. In studies related to laparoscopic and emergency surgeries, the use of dexamethasone has been shown to act as a mitigating factor for surgical stress and inflammatory responses [27,28]. This drug aids in improving postoperative recovery processes by reducing inflammatory markers such as CRP. Moreover, preemptive dexamethasone at various doses has positive effects on reducing the need for analgesics, controlling pain, and decreasing gastrointestinal complications like nausea and vomiting [29-31]. The anti-nausea and anti-emetic effects of this drug in the form of intranasal administration indicate a limited but probable impact [32]. Additionally, this drug is effective in reducing postoperative pain and opioid consumption, and by improving quality of recovery scores, it accelerates the patient discharge process [31,33].

However, the use of this drug may be associated with complications such as increased chronic wound pain in the following months, which requires a careful assessment of its benefits and harms [34]. On the other hand, interaction effects on blood sugar control indicate that a temporary increase in blood glucose following the administration of the drug in patients does not lead to further complications [35]. Given these findings, the use of dexamethasone in managing postoperative complications requires careful evaluation and continuous monitoring to ensure its efficacy and safety across different populations.

#### *Importance of Investigating the Effect of Preoperative Injectable Dexamethasone on Postoperative Pain Following Hysterectomy*

Considering the above points, studying the effect of preoperative injectable dexamethasone on reducing pain after hysterectomy in patients hospitalized at Imam Hospital of Sari in 2024 is of particular importance, despite the fact that dexamethasone is a glucocorticoid with anti-inflammatory and anti-steroidal properties that can create a significant improvement in patients' rest quality and recovery process [36]. The analgesic and anti-emetic effects of this drug have been reported in numerous studies; such that reductions in pain scores and the need to consume stronger analgesics have been observed in patients receiving dexamethasone [29,37]. However, the use of this drug is associated with potential risks such as chronic wound pain six months after surgery, particularly in patients receiving dexamethasone

[34]. Furthermore, dexamethasone can lead to an increase in blood glucose levels, especially in diabetic patients or those at risk of hyperglycemia. Although immunosuppressive effects have not been observed in studies, there are theories regarding a reduction in immune responses and an increased risk of infection [38].

Additionally, the analgesic effects of dexamethasone are dose-dependent, such that higher doses enhance the analgesic effects and reduce opioid consumption [39,40]. Moreover, the timing of drug administration is important; preoperative administration is more effective in reducing pain and the need for analgesic medications [39]. Therefore, decision-making regarding the use of dexamethasone should be based on an individual assessment of patients and surgical conditions, in order to maintain a proper balance between benefits and risks, and the need for further research on the long-term consequences of this drug is felt. Thus, conducting this study can greatly help determine more effective and safer strategies for managing postoperative pain following hysterectomy in hospitalized patients.

## **Literature Review**

Among the studies conducted in this field, the following can be mentioned:

### *Iranian Studies*

1. A study was conducted in 2023 by Jamali et al. titled "The Effect of Topical Dexamethasone on Postoperative Pain Intensity in Patients Undergoing Dacryocystorhinostomy". This study aimed to investigate the effect of topical dexamethasone on pain intensity following dacryocystorhinostomy surgery. In this randomized double-blind clinical trial, 80 patients aged 18 to 75 who were candidates for surgery were divided into intervention and control groups; in the intervention group, at the end of the surgery, a tampon soaked in 8 mg of dexamethasone was placed in the superior part of the middle concha, and in the control group, a tampon soaked in distilled water was placed in the same location. Pain intensity was recorded at intervals of 0, 3, 6, 12, 18, and 24 hours postoperatively. The results showed that no significant difference in pain intensity was observed between the two groups at any of the evaluation times, and the trend of pain changes over 24 hours was similar. Therefore, this study concluded that the administration of a single dose of 8 mg topical dexamethasone was not effective in reducing postoperative pain and the need for opioid medications [41].

2. A study was conducted in 2001 by Farzi et al.

titled "The Effect of Dexamethasone Before Induction of Anesthesia on Postoperative Shivering". This study aimed to determine the effect of administering dexamethasone before the induction of anesthesia on the incidence of postoperative shivering. In this double-blind clinical trial, 250 patients aged 20 to 60 with ASA physical status I and II were randomly divided into dexamethasone and placebo groups. All patients underwent standard monitoring, and anesthesia management was identical for them. The incidence of shivering and body temperature were recorded in the recovery room for one hour post-surgery. The findings showed that the incidence of shivering in the dexamethasone group was significantly lower than in the placebo group. This study concluded that administering dexamethasone prior to the induction of anesthesia can effectively reduce the incidence of postoperative shivering in the recovery room, and this effect is independent of the duration of the surgical procedure [42].

### *International Studies*

3. A study was conducted in 2022 by Jamil et al. titled "The Effect of Dexamethasone on Postoperative Pain in Patients After Laparoscopic Cholecystectomy". This study aimed to determine the effect of a single intravenous injection of dexamethasone on pain after laparoscopic cholecystectomy. The prospective, randomized, controlled trial was conducted in the surgical ward of Benazir Bhutto Hospital in Rawalpindi over six months from December 2021 to May 2022. A total of 160 patients were divided into two groups; the control group received 5 ml of saline, and the study group received dexamethasone at a dose of 0.1 mg/kg in 5 ml of saline intravenously during the induction of anesthesia. Postoperative pain intensity was measured and recorded at 2, 6, 12, and 24 hours, which was significantly lower in the dexamethasone group compared to the control group. These results suggest that administering a preoperative dose of dexamethasone is effective in controlling postoperative pain in patients undergoing laparoscopic cholecystectomy [43].

4. A study was conducted in 2021 by Woo et al. titled "Perineural Dexamethasone Reduces Rebound Pain After Ropivacaine Single Injection Interscalene Block for Arthroscopic Shoulder Surgery: A Randomized Controlled Trial". This study aimed to investigate the effect of adding perineural dexamethasone to an interscalene block using ropivacaine on reducing the intensity and incidence of rebound pain following arthroscopic shoulder surgery. Patients were randomly divided into two groups receiving an interscalene block with 0.5% ropivacaine alone (control) or ropivacaine combined

with 5 mg of dexamethasone. The primary outcomes included the difference in pain scores before and after the block's resolution and the incidence rate of rebound pain. The findings indicated that the increase in pain following the termination of the block's effect was significantly lower in the dexamethasone group compared to the control group, and the incidence of rebound pain was also substantially lower in the dexamethasone group. Additionally, patients in the control group experienced more sleep disturbances during the postoperative period. Ultimately, the study concluded that adding dexamethasone to the interscalene block leads to a smoother resolution of the block, a significant reduction in post-block pain escalation, a decreased incidence of rebound pain, and reduced sleep disturbance in the first week after surgery [44].

5. A study was conducted in 2021 by Wanithanont et al. titled "Comparative Efficiency of the Preoperative Pterygomandibular Space Injection of Two Doses of Dexamethasone in Mandibular Third Molar Surgery". This study aimed to compare the efficacy of preoperative injections of dexamethasone at doses of 4 and 8 mg into the pterygomandibular space for reducing postoperative complications following mandibular third molar extraction. In this randomized, prospective, controlled study, which included 52 third molar surgeries in 26 patients, each patient was randomly assigned to one of two groups receiving either 4 or 8 mg of dexamethasone in the pterygomandibular space. Dexamethasone was injected after local anesthesia, and data regarding facial swelling, pain, limited jaw movement, and the number of analgesics consumed during the evaluation period were collected. The results showed a significant difference in the reduction of facial swelling and postoperative pain between the 8 mg and 4 mg dexamethasone groups, but no significant difference was observed in jaw movement limitation and the total number of medications consumed. Therefore, the preoperative injection of 8 mg dexamethasone was more effective than 4 mg in reducing swelling and pain after lower third molar extraction; however, due to the inability to clinically assess the difference in trismus, the 4 mg dose was recommended as the optimal dose for this surgical procedure [45].

6. A study was conducted in 2015 by Nielsen et al. titled "Preoperative Dexamethasone Reduces Acute But Not Sustained Pain After Lumbar Disk Surgery: A Randomized, Blinded, Placebo-Controlled Trial". This study aimed to evaluate the preoperative effects of dexamethasone on reducing pain and complications after lumbar disc surgery. In this blinded study, 160 patients were randomly assigned to two groups receiving either 16 mg of dexamethasone or a placebo, and all patients received standardized

surgical procedures, preoperative care, paracetamol and ibuprofen administration, and postoperative pain control with patient-controlled analgesia. The results showed that compared to the placebo group, the dexamethasone group significantly reduced pain intensity during movement and the incidence of vomiting in the 24 hours following surgery. There was also a notable reduction in the incidence of wound infection and leg muscle weakness or paralysis in the dexamethasone group, but these differences were not statistically significant. Consequently, preoperative dexamethasone reduced pain upon movement and vomiting during the postoperative period of lumbar disc surgery, although its long-term effects evaluated after three months were not significant, highlighting the need for further research with long-term scales [46].

7. A study was conducted in 2010 by Fukami et al. titled "Efficacy of Preoperative Dexamethasone in Patients with Laparoscopic Cholecystectomy: A Prospective Randomized Double-Blind Study". This study aimed to evaluate the efficacy of preoperative dexamethasone in reducing symptoms following laparoscopic gallbladder surgery. In this prospective, double-blind, placebo-controlled study, 80 patients undergoing the surgery were randomly assigned to two groups receiving either 8 mg of intravenous dexamethasone or a placebo. All patients underwent standard anesthesia and surgery and were hospitalized for 3 days postoperatively. The incidence of postoperative nausea and vomiting, pain intensity, and fatigue were recorded, and the need for analgesics and antiemetics was also evaluated. The results indicated no apparent drug-induced adverse effects; the rate of postoperative nausea in the dexamethasone group was significantly lower (18%) compared to the placebo group (40%), and the rate of vomiting also had a significant reduction (3% in the dexamethasone group versus 18% in the placebo group). Furthermore, dexamethasone significantly reduced postoperative pain intensity and fatigue, and the number of patients requiring 50 mg of diclofenac was lower in the dexamethasone group than in the placebo group. As a result, this study demonstrated that the preoperative administration of 8 mg of dexamethasone is safe and effectively reduces the occurrence of nausea, vomiting, pain, and fatigue after laparoscopic cholecystectomy [47].

8. A study was conducted in 2010 by Thangaswamy et al. titled "Dexamethasone Before Total Laparoscopic Hysterectomy: A Randomized Controlled Dose-Response Study". This study aimed to evaluate the efficacy of a single preoperative dose of dexamethasone at varying doses in reducing the need for postoperative analgesia following total laparoscopic hysterectomy in a prospective,

randomized, double-blind, placebo-controlled manner. In this research, 55 patients were randomly divided into three groups, where group P received a saline solution, group D4 received 4 mg of dexamethasone, and group D8 received 8 mg of dexamethasone intravenously two hours before anesthesia induction. The results showed that the time to the first request for analgesia was significantly longer in group D8 compared to group D4 and the placebo group, and the total postoperative fentanyl consumption in this group was also significantly lower. Furthermore, the administration of 8 mg of dexamethasone led to a 99.3-microgram reduction in fentanyl consumption within 24 hours post-surgery. The incidence of postoperative nausea and vomiting was significantly lower in group D8, and 36.8% of patients in this group required no rescue medication, whereas all patients in the placebo group experienced nausea and vomiting. No adverse effects were observed in any of the groups. Ultimately, the study concluded that administering 8 mg of intravenous dexamethasone two hours before anesthesia induction delays the request for analgesics, decreases total fentanyl consumption, and reduces the incidence of postoperative nausea and vomiting in patients undergoing total laparoscopic hysterectomy [30].

#### *Summary and Significance of the Literature*

Reviewing previous studies regarding the effect of dexamethasone on pain control and postoperative complications reveals that although numerous investigations have proven the efficacy of this drug in various surgeries such as laparoscopic cholecystectomy, orthopedic shoulder surgeries, impacted wisdom tooth extraction, and lumbar disc surgery, there is still limited data regarding the impact of preoperative injectable dexamethasone on pain control following hysterectomy. Moreover, existing studies have mostly been conducted in large centers with diverse patient populations and have not paid adequate attention to the specific conditions of patients hospitalized in regional hospitals such as Imam Hospital of Sari. These shortcomings have led to a lack of specialized and localized evidence for clinical decision-making in this area.

On the other hand, hysterectomy, as one of the common gynecological surgeries, requires precise and specialized studies to improve pain management and reduce the use of opioids in order to mitigate the side effects caused by analgesic drugs. Therefore, conducting research on the effect of preoperative injectable dexamethasone on postoperative pain following hysterectomy in patients hospitalized at Imam Hospital of Sari in 2024 has become a necessity. This study can not only fill the existing scientific gap

but also, by providing valid regional data, establish an effective clinical guideline to reduce postoperative pain, enhance the quality of postoperative care, and alleviate the burden of adverse effects from current treatments. Thus, executing this research is of great scientific and practical importance and can pave the way for substantial improvements in pain management following hysterectomy in hospitalized patients.

## **Materials and Methods**

### *Study Design and Population*

This research is an interventional study and a randomized double-blind clinical trial conducted at Mazandaran University of Medical Sciences in the years 2024-2025. The research protocol was approved by the Research Ethics Committee of Mazandaran University of Medical Sciences with the code IR.MAZUMS.IMAMHOSPITAL.REC.1403.088. Based on previous studies and existing limitations, 75 patients constituted the statistical population of this study, comprising patients hospitalized in the women's ward aged 18 to 60 years who underwent elective hysterectomy under general anesthesia in 2024 and 2025.

### *Inclusion Criteria*

- Female patients who are candidates for elective hysterectomy (based on specific therapeutic indications).
- Age 18 years and older (adult).
- Written informed consent to participate in the research.
- No hypersensitivity or history of allergy to dexamethasone.
- Absence of severe active disease or systemic infection.
- No active malignant diseases in the uterus or ovaries.
- No consumption of opioids or analgesic medications prior to surgery (within the last 24 hours).
- Not pregnant.
- Normal liver and kidney function (no acute or chronic insufficiency).
- Absence of severe blood glucose control issues (e.g., uncontrolled diabetes).
- Ability to participate in postoperative follow-ups and complete pain questionnaires.

### *Exclusion Criteria*

- Diabetes or impaired glucose tolerance.

- Peptic ulcer.
- History of motion sickness or PONV after general anesthesia.
- Women undergoing hormone therapy.
- Patients undergoing long-term treatment with corticosteroids or non-steroidal anti-inflammatory drugs (NSAIDs).

#### *Sample Size Determination*

To calculate the sample size using the results of the Fukami study and based on pain intensity, the calculation was performed as detailed below (47): Here, 25 patients were considered for each group, making a total of 75 patients in three groups, who were entered into the study using a randomized block sampling method. The reason for using this method was to ensure that if the study was interrupted for unforeseen reasons, the groups would have an approximately equal size. The blocks were sized 6 and were allocated based on the entry row number into the study. Random Allocation software was used for random assignment.

#### *Sample Collection*

In this interventional, randomized, double-blind clinical trial, the sample collection process was conducted systematically and precisely. Eligible individuals, comprising patients hospitalized at Imam Hospital of Sari scheduled to undergo hysterectomy surgery, were randomly assigned to the intervention groups (injectable dexamethasone at two doses) and the control group (placebo) after assessing the inclusion and exclusion criteria and obtaining informed consent. The study variables included age, weight, fasting blood glucose levels, duration of surgery, adverse effects, postoperative nausea and vomiting (PONV), pain intensity, postoperative opioid consumption, and the treatment group, each of which was accurately collected and recorded.

Age, as a quantitative background variable, was recorded in years using an approved checklist. Patient weight was also quantitative and recorded in kilograms based on scale measurements. Fasting blood glucose, a quantitative background variable, was measured in milligrams per deciliter (mg/dL) using a glucometer and recorded. Blood glucose levels were measured two hours before induction and at the time of anesthesia induction. The duration of surgery, as a quantitative background variable, was recorded in hours using the hospital's operative report.

Adverse effects and PONV were documented as qualitative dependent variables using symptom registration checklists; specifically, the incidence of

PONV was evaluated by the presence of vomiting or nausea lasting more than 5 minutes, for which patients received 0.1 mg/kg intravenous ondansetron as an antiemetic treatment. Adverse effects included the time to the first analgesic requirement, pain intensity at rest and during movement, the occurrence of nausea and vomiting, and surgical site infection, while corticosteroid-specific complications, including wound infection and delayed healing, were evaluated on the seventh postoperative day.

Pain intensity, as the most important quantitative dependent variable, was measured using a 100-millimeter Visual Analogue Scale (VAS), where 0 represents no pain and 100 indicates the worst imaginable pain, evaluated and recorded at various times postoperatively. The amount of analgesic opioid consumption was also recorded as a quantitative dependent variable based on the dose administered in the patient's medical file. The treatment group, as a qualitative independent variable comprising injectable dexamethasone at two doses or an injectable placebo, was entered into the research checklist.

All data were collected and recorded confidentially by a trained interviewer in accordance with the research protocol to ensure data accuracy and precision. Patients were closely followed up regarding pain intensity and medication consumption at specific postoperative time intervals. The double-blind nature of the study ensured that neither the patients nor the evaluators had information about the patients' treatment groups to control bias in recording outcomes. This enhanced the internal validity of the study and the generalizability of the results to the target population.

#### *Execution Method*

This study was conducted after obtaining approval from the Ethics Committee of Imam Hospital, Mazandaran University of Medical Sciences, and receiving an ethics code. Before entering the study, all patients provided written informed consent after receiving complete explanations about the objectives, methods, possible complications, and their research rights. Full compliance with ethical principles and patient data confidentiality was guaranteed throughout all stages of the study.

Patients were randomly divided into three study groups based on a computer-generated list of random numbers. The study solutions were coded in sealed envelopes and handed by the second author to the ward nurse, who was not involved in the study. The nurse prepared the solutions and administered them intravenously to the patients two hours before the surgery. Group P received 2 ml of saline as a

placebo, group D4 received 2 ml containing 4 mg of dexamethasone in saline, and group D8 received 2 ml containing 8 mg of dexamethasone in saline. All patients were blinded to the nature of the administered drug.

In the operating room, safe intravenous access was established for the patients, and cardiovascular and respiratory monitoring, including an electrocardiogram, non-invasive blood pressure, and pulse oximetry, were performed. Ten minutes prior to the induction of anesthesia, patients received 0.03 mg/kg of midazolam intravenously. Anesthesia induction was performed with doses of 2 µg/kg fentanyl and 2 to 3 mg/kg propofol. After induction, anesthesia was maintained with a mixture of 33% oxygen in nitrous oxide and isoflurane (1 to 1.5%), with controlled ventilation to maintain normocarbida. In the event of a 20% increase in heart rate or mean arterial blood pressure compared to the baseline, or signs of sweating and tearing, supplemental analgesia with 0.5 µg/kg of fentanyl was injected, and the total dose of consumed fentanyl was recorded. Patient hydration was maintained with lactated Ringer's solution according to the ward's standard. The patient was placed in the Trendelenburg position, and the abdomen was insufflated with carbon dioxide up to a maximum pressure of 15 mmHg. At the end of the operation, after reversing the neuromuscular block with 50 µg/kg neostigmine and 20 µg/kg atropine, the endotracheal tube was extubated.

Considering the effect of the surgical approach on complications and postoperative pain, the surgeon and the type of surgery were identical and consistent for all patients. Postoperatively, patients were transferred to the recovery room, and pain scores were recorded by a fixed, blinded investigator at rest and during movement (where the patient was asked to turn to one side) at times 0, 30 minutes, 1, 2, 4, 8, 12, and 24 hours after surgery. Pain intensity was measured using a 100-mm VAS, with 0 representing no pain and 100 indicating the most severe pain possible.

The occurrence of PONV lasting more than 5 minutes was assessed, and if necessary, treated with 0.1 mg/kg intravenous ondansetron. Total fentanyl consumption at 2, 4, 8, 12, and 24 hours postoperatively was measured as the primary outcome. Secondary outcomes included the time to the first analgesic requirement, pain intensity at rest and during movement, the incidence of nausea and vomiting, and surgical site infection. Furthermore, blood glucose levels were measured two hours before induction and at the time of anesthesia induction, and corticosteroid-specific complications, including wound infection and delayed healing, were evaluated on the seventh day after surgery.

The collected data were analyzed using SPSS

software version 24. Results were reported as percentages, means, medians, minimums, and maximums. The normality of the quantitative variables' distribution was assessed using the Shapiro-Wilk test, and the comparison of qualitative group variables was performed using the Chi-square or Fisher's exact test. To compare the quantitative variables between two groups, the independent T-test or its non-parametric equivalent was utilized. For the final analysis of pain intensity recorded at 8 different times, repeated measures analysis of variance (ANOVA) or Generalized Estimating Equations (GEE) was employed. A significance level of 5% was considered.

Ultimately, throughout the study, if patients were unwilling to continue participating or if adverse effects occurred, they were excluded from the study and received standard treatments.

## **Results**

### *Introduction*

In this chapter, the results from the data analysis of 75 patients undergoing elective hysterectomy, who were randomly assigned to three groups: placebo, 4 mg dexamethasone (D4), and 8 mg dexamethasone (D8), are presented. The results are reported based on background variables, pain intensity, the need for analgesic opioids, the incidence of postoperative nausea and vomiting, and adverse effects, as well as categorized by age, weight, fasting blood glucose, and the duration of the surgery.

### *Demographic and Clinical Characteristics of the Study*

A total of 75 eligible patients were included in the study, evenly distributed into three groups of 25. The mean age of the patients in the total sample was 47.2 ± 0.8 years, and no statistically significant difference was observed among the three groups ( $P = 0.78$ ). As seen in Table 4.1, there was no significant difference among the three groups in terms of age, weight, fasting blood glucose, and duration of surgery, indicating the success of the randomization process in balancing the background variables.

### *Postoperative Pain Intensity in Different Treatment Groups*

Postoperative pain intensity was recorded using a 100-millimeter Visual Analogue Scale (VAS) at 0, 30 minutes, 1, 2, 4, 8, 12, and 24 hours after surgery. The following table shows the mean pain scores in the three groups at the main time intervals.

**Table 1:** Comparison of demographic and background characteristics of patients in the three study groups

| Variable                      | Placebo Group (n=25) | D4 Group (n=25) | D8 Group (n=25) | P-value |
|-------------------------------|----------------------|-----------------|-----------------|---------|
| Age (years)                   | 47.5 ± 8.1           | 46.0 ± 7.9      | 48.1 ± 8.2      | 0.78    |
| Weight (kg)                   | 67.5 ± 9.2           | 66.9 ± 8.7      | 66.0 ± 10.3     | 0.91    |
| Fasting blood glucose (mg/dL) | 97 ± 11              | 96 ± 10         | 97 ± 12         | 0.95    |
| Duration of surgery (minutes) | 88 ± 15              | 86 ± 14         | 85 ± 13         | 0.82    |

**Table 2:** Comparison of pain scores in the three treatment groups at different times after surgery

| Time After Surgery | Placebo (P) | D4 (4mg) | D8 (8mg) | Total P-value |
|--------------------|-------------|----------|----------|---------------|
| 0 hour             | 69 ± 13     | 65 ± 12  | 64 ± 12  | 0.43          |
| 30 minutes         | 66 ± 14     | 58 ± 13  | 53 ± 11  | 0.03          |
| 1 hour             | 63 ± 15     | 54 ± 13  | 50 ± 10  | 0.01          |
| 2 hours            | 58 ± 14     | 47 ± 12  | 41 ± 13  | 0.002         |
| 4 hours            | 53 ± 13     | 40 ± 11  | 33 ± 10  | 0.001         |
| 8 hours            | 47 ± 12     | 34 ± 10  | 26 ± 8   | 0.001         |
| 12 hours           | 37 ± 11     | 27 ± 8   | 18 ± 7   | 0.001         |
| 24 hours           | 29 ± 9      | 18 ± 7   | 10 ± 4   | 0.001         |

As seen in Table 4.2, in the early postoperative hours (from 30 minutes onwards), pain intensity in the groups receiving dexamethasone (especially D8) was significantly lower than in the placebo group. The difference between the D8 group and the placebo group at all times after one hour was statistically significant, indicating a stronger effect of the higher dose of dexamethasone on pain reduction.

• **Investigating Pain Based on Age:** Pain after surgery was evaluated in patients under and over 50 years of age. The mean pain scores in younger patients (under 50 years) in the D8 group were significantly lower ( $P=0.002$ ). In older patients (50 years and older), the difference between the groups was slightly greater, and dexamethasone demonstrated higher efficacy ( $P=0.001$ ). This finding may indicate a higher sensitivity of older patients to the anti-inflammatory effects of dexamethasone.

• **Investigating Pain Based on Weight:** Analysis of pain intensity based on weight (less than and more than 65 kg) showed that the patient's weight did not have a significant effect on the efficacy of dexamethasone. Pain in both weight categories was lower in the dexamethasone groups ( $P<0.05$ ).

• **Investigating Pain Based on Fasting Blood Glucose:** The patients' fasting blood glucose levels were divided into two categories (normal and borderline). No remarkable difference in pain scores was observed between patients with normal and borderline glucose levels, and dexamethasone had similar efficacy in both categories ( $P>0.05$ ).

• **Investigating Pain Based on Surgery Duration:** The duration of surgery (shorter or longer than 90 minutes) had no significant effect on pain intensity. In both duration categories, the dexamethasone groups showed less pain compared to the placebo group.

• **Investigating Pain Based on the Incidence of PONV:** Patients experiencing PONV (nausea and

vomiting) demonstrated higher pain scores compared to patients without PONV. This difference was significant in all three groups, indicating an inverse relationship between the reduction of PONV by dexamethasone administration and pain reduction.

#### • Investigating Pain Based on Adverse Effects:

The incidence of surgical site infection and delayed wound healing did not have a significant effect on pain scores. Patients without these complications in all three groups had pain scores similar to the overall group.

#### *The Need for Analgesic Opioid Consumption in 24 Hours Post-Surgery*

The total fentanyl consumption in the 24 hours post-surgery was recorded for each patient, and the mean consumption in milligrams was calculated in the three groups.

The consumption of analgesic opioids in the dexamethasone groups was significantly lower than in the placebo group, with the lowest consumption belonging to the D8 group. This finding is consistent with the results of trials and systematic reviews that have reported the opioid-sparing effect of dexamethasone.

• **Opioid Consumption Based on Age:** Analysis of analgesic opioid consumption based on age showed that older patients (50 years and older) had less need for analgesic opioids. The significant difference in the reduction of opioid consumption between the dexamethasone and placebo groups was 35% higher in older patients ( $P=0.01$ ).

• **Opioid Consumption Based on Weight:** Opioid consumption did not show a remarkable difference among patients with different weights. In both weight categories, the dexamethasone groups had lower consumption.

• **Opioid Consumption Based on Fasting Blood Glucose:** The patient's fasting glucose (normal or

borderline) had no significant effect on the amount of opioid consumption.

- **Opioid Consumption Based on Surgery Duration:** In longer surgeries (more than 90 minutes), the total opioid consumption was higher in each group, but the reduction ratio in the dexamethasone groups compared to the placebo remained constant.
- **Opioid Consumption Based on the Incidence of PONV:** Patients experiencing PONV showed a lower need to increase opioid doses. This may indicate a relationship between the reduction of PONV by dexamethasone and a reduction in the need for opioids.
- **Opioid Consumption Based on Adverse Effects:** No significant difference in analgesic opioid consumption was observed between patients with and without surgical infection.

#### *Incidence of Postoperative Nausea and Vomiting (PONV)*

The incidence of PONV was recorded as a secondary outcome, and the proportion of patients with PONV in each group was calculated. As shown in Table 4.4, the incidence of PONV in the groups receiving dexamethasone was significantly lower than in the placebo group, and the lowest rate of PONV was observed in the 8 mg dexamethasone group. This finding is consistent with numerous pieces of evidence that introduce dexamethasone as an effective drug in reducing PONV after hysterectomy.

#### *Time to First Analgesic Dose Request*

The mean time to the first analgesic dose after surgery was recorded for each patient. The 8 mg dexamethasone group showed the longest delay in requesting the first analgesic (219 minutes), which is 2.3 times longer than the placebo group. This finding is particularly important for reducing opioid

consumption and its associated complications.

#### *Adverse Effects and Related Outcomes*

During the follow-up period (24 hours and the seventh day), cases of surgical wound infection, delayed wound healing, and other important adverse effects were recorded. Adverse effects did not differ significantly among the three groups ( $P > 0.05$ ). The incidence of wound infection and delayed healing was very low, and there was no statistically significant difference among the various groups. This finding indicates that the doses of dexamethasone used (4 and 8 mg) are safe and do not cause severe adverse effects.

#### *Summary of Key Findings*

The results of this study are briefly summarized as follows:

- **Reduction in Pain Intensity:** Dexamethasone, especially the 8 mg dose, significantly reduced pain intensity after hysterectomy at all evaluated time points.
- **Reduction in Opioid Consumption:** The total consumption of analgesic opioids in the 8 mg dexamethasone group was 47% lower than in the placebo group.
- **Reduction in PONV:** The incidence of PONV in the 8 mg dexamethasone group was 71% lower than in the placebo group.
- **Delay in Analgesic Request:** The time to the first analgesic request in the 8 mg dexamethasone group was more than double that of the placebo group.
- **Safety:** No serious complications occurred, and there were no significant differences in adverse effects among the groups.
- **Dose-Dependent Effects:** The effects of dexamethasone were dose-dependent, with the higher dose (8 mg) showing better effects than the lower dose (4 mg).

**Table 3:** Comparison of mean fentanyl consumption in the 24 hours post-surgery

| Group       | Mean Fentanyl Consumption (mg) $\pm$ Standard Deviation | P-value |
|-------------|---------------------------------------------------------|---------|
| Placebo (P) | 1.7 $\pm$ 0.4                                           | ---     |
| D4          | 1.2 $\pm$ 0.3                                           | 0.004   |
| D8          | 0.9 $\pm$ 0.2                                           | 0.001   |

**Table 4:** Comparison of the incidence of PONV in the three study groups

| Group   | With PONV | Without PONV | P-value |
|---------|-----------|--------------|---------|
| Placebo | 14 (56%)  | 11 (44%)     | ---     |
| D4      | 7 (28%)   | 18 (72%)     | 0.03    |
| D8      | 4 (16%)   | 21 (84%)     | 0.008   |

## Discussion and Conclusion

### Discussion

Based on the results of the present study as well as findings from other research, the administration of dexamethasone significantly reduces the amount of postoperative pain, a reduction that is clearly observed in the VAS scale scores at various times following surgery; particularly in the groups receiving the higher dose (8 mg), a significant decrease in pain intensity compared to the placebo group was observed. These findings, similar to the results of other studies, indicate that dexamethasone has a strong effect on reducing pain in the early postoperative hours and brings about significant differences among different groups at all times after one hour [28,37]. Furthermore, it was more broadly observed in the study by Datta et al. [48] that in laparoscopic surgeries, the preoperative administration of a single 8 mg dose of dexamethasone was effective in reducing postoperative pain intensity and opioid consumption. For instance, the addition of dexamethasone to local anesthesia has led to improved patient satisfaction [49,50]. These findings suggest that dexamethasone, in appropriate doses and with due consideration for individual patient factors, can be utilized as an effective and safe method for reducing pain and enhancing the patient discharge process after surgery, although there is a need for further research regarding the determination of the optimal dose and the investigation of potential side effects at high doses [51,52].

In the current study, the results showed that the use of dexamethasone at doses of 4 and 8 mg had no significant effect on the incidence of wound infection, delayed wound healing, and other major adverse effects, such that no statistical differences were observed among the different groups in these regards. These findings are in line with the results of a study presented by Corcoran et al. [53] evaluating the effects of dexamethasone in non-cardiac surgeries, indicating that in the field of non-cardiac surgery, dexamethasone is safe concerning the risk of wound infection. In contrast, another analysis conducted by Ismael et al. [54] indicated an increased risk of superficial and deep surgical wound infections in patients consuming steroids preoperatively. Additionally, regarding metabolic complications, dexamethasone significantly increases postoperative blood glucose levels in non-diabetic women

undergoing hysterectomy, and these hyperglycemic responses can lead to a delay in the wound healing process and an increased risk of wound infections [55]. Moreover, there is a possibility of delayed wound healing due to an increased risk of wound infections and local inflammations as a result of dexamethasone use, although direct research in this area is limited. Overall, although dexamethasone is effective in reducing postoperative nausea and vomiting and can improve the quality of patient recovery, its administration must be done with caution and based on individual assessments, particularly in diabetic patients or those at risk for wound infections, to prevent the occurrence of serious complications. These findings demonstrate that the benefits of the drug must be weighed against its risks, and there is a need for further research to determine the optimal dose and appropriate timing of administration so that its benefits can be utilized while preventing unwanted adverse effects.

In the present study, the results showed that the incidence of PONV in the groups receiving dexamethasone was significantly reduced compared to the placebo group, with the lowest rate of PONV observed in the group receiving 8 mg of dexamethasone. This finding aligns with the results of other studies; for instance, Sekhavat et al. [56] demonstrated that 8 mg of intravenous dexamethasone in patients undergoing hysterectomy significantly reduces the rate of nausea and vomiting compared to a placebo. On the other hand, the results of comparative studies, such as the research by Sharma et al. [57], indicate that the combination of dexamethasone with palonosetron is more effective than other antiemetic drugs in reducing PONV in laparoscopic surgery patients. However, the efficacy of dexamethasone in reducing PONV may vary depending on the type of surgery, the administered dose, and the route of administration; for example, a study reported that intranasal dexamethasone (4 mg) had no significant effect on reducing PONV, indicating that the mode of administration plays a crucial role in the efficacy of this drug [32]. Overall, the findings of this study and the results of previous studies emphasize the importance of using dexamethasone for PONV prophylaxis and show that selecting the appropriate dose, route of administration, and, if necessary, the use of pharmacological combinations can significantly enhance the efficacy of this drug in controlling postoperative complications. Based on the findings of

**Table 5:** Mean time to the first analgesic requirement after surgery

| Group   | Mean Time (minutes) | P-value |
|---------|---------------------|---------|
| Placebo | 95 ± 28             | ---     |
| D4      | 142 ± 35            | 0.01    |
| D8      | 219 ± 45            | 0.001   |

our study and other research, an inverse relationship between the incidence of PONV and pain intensity has been observed in patients, such that patients suffering from PONV exhibited higher pain scores; this difference was significant in all three evaluated groups, demonstrating the direct impact of PONV reduction on pain alleviation through dexamethasone administration. Previous studies have also shown that dexamethasone in combination with antiemetic drugs such as dolasetron or palonosetron significantly decreases the prevalence of PONV and reduces the need for postoperative analgesic consumption [57-59]. Additionally, the combination of dexamethasone with other drugs like granisetron or ondansetron has been effective in preventing PONV and can lead to a reduction in postoperative pain and analgesic requirements [60]. It is important to emphasize that despite the efficacy of dexamethasone in reducing PONV and pain, overall patient risks must be considered, as in some cases, particularly in low-risk patients, it may not have a significant impact [61,62]. Therefore, the selection of antiemetic and analgesic strategies must be tailored to individual needs and surgical conditions to achieve optimal results.

Based on the findings of the present study, the preoperative administration of dexamethasone at a dose of 8 mg showed a significant delay in the need for the first analgesic following total abdominal surgery, such that the mean time to the first analgesic request in the 8 mg dexamethasone group reached 219 minutes, which was relatively longer compared to the placebo group (95 minutes), and this difference was statistically significant ( $p = 0.001$ ). This finding is in line with the results of previous studies, such as the research by Jamwal et al. [37] and Nikhade et al. [29], which indicate that dexamethasone can delay the onset of the need for analgesics in patients after abdominal surgeries. It should be noted that although higher doses such as 15 mg have shown greater efficacy in reducing analgesic consumption in some studies [52], the 8 mg dose was considered the effective dose in our study. Overall, these findings indicate that dexamethasone can play a critical role in controlling postoperative pain and reducing the consumption of analgesic medications; however, its dose and timing of administration need to be adjusted based on individual needs and the type of surgery to achieve the best results.

In the results of the current research and other studies, the consumption of analgesic opioids in the

24 hours post-surgery in the groups that received preoperative dexamethasone was significantly lower than in the placebo group, with the lowest consumption amount observed in the D8 group. This reduction in the consumption of analgesic opioids is consistent with the results of systematic reviews and clinical trials, which show that dexamethasone has an augmentative effect in reducing the need for opioid analgesics [29,37]. On the other hand, reducing the need for opioid analgesics in patients undergoing hysterectomy surgery, in addition to better pain control, can help reduce the adverse effects associated with the long-term use of opioids, such as a decrease in gastrointestinal complications and cognitive issues [63,64]. Another important aspect to consider is the dose-dependency of the drug response, as various studies have investigated different doses of dexamethasone, ranging from 8 to 24 mg, demonstrating that higher doses are more effective in improving outcomes and reducing opioid consumption [31,52]. Consequently, the use of dexamethasone as part of multimodal postoperative pain control strategies can contribute to improving the quality of care and reducing the consumption of narcotic drugs, although the need for further research to determine the optimal dose and timing for each type of surgery and individual patient is felt [65,66].

The current research showed that dexamethasone is effective in reducing pain intensity and narcotic analgesic consumption after elective hysterectomy across all age groups, such that patients receiving dexamethasone (D4 and D8) exhibited a significant reduction in pain scores and opioid requirements compared to the placebo group. Contrary to expectations, our findings suggest that older patients (50 years and older) had a significantly lower need for opioids, and this reduced need was more evident in the groups receiving dexamethasone. This issue is consistent with previous studies indicating that with advancing age, the need for narcotic analgesic medications decreases in patients undergoing hysterectomy, which could be due to a higher sensitivity of the central nervous system in older individuals or changes in pharmacophysiology [67]. Additionally, our analyses showed that in patients under 50 years of age, the effect of dexamethasone on reducing pain and analgesic consumption was not less than in older groups, but in older patients, the drug's efficacy in reducing the opioid requirement was greater, which may indicate this group's higher sensitivity to the anti-

Table 6: Comparison of main adverse effects in the three groups

| Complication             | Placebo n (%) | D4 n (%) | D8 n (%) | P-value |
|--------------------------|---------------|----------|----------|---------|
| Wound infection (7 days) | 2 (8%)        | 1 (4%)   | 1 (4%)   | 0.62    |
| Delayed wound healing    | 3 (12%)       | 1 (4%)   | 2 (8%)   | 0.58    |
| Transient hyperglycemia  | 2 (8%)        | 3 (12%)  | 4 (16%)  | 0.49    |

inflammatory effects of the drug. These findings are in agreement with studies that emphasize the positive effects of dexamethasone in reducing pain intensity in gynecological surgeries and lowering opioid consumption [38,68]. Ultimately, considering our findings and previous studies, it can be concluded that the positive effects of dexamethasone in reducing pain and the need for narcotic analgesics in hysterectomy patients are generally observed across all age groups; however, the high sensitivity of older patients to the drug's effects and the reduced need for narcotics in this group highlight the importance of paying special attention to age when planning postoperative pain control strategies.

The current study revealed that patient weight does not have a significant effect on the efficacy of dexamethasone in reducing pain and the need for opioid consumption, although in both weight categories, the level of pain after drug administration in patients weighing less than or more than 65 kg was reduced compared to the placebo group. This finding aligns with previous studies stating that patient weight does not significantly impact medication requirements post-surgery [69]. Furthermore, the results showed that opioid consumption did not differ remarkably between the two weight groups, and patients in the dexamethasone-consuming groups had a lower need for opioids compared to the placebo group, which indicates the positive effect of dexamethasone in reducing opioid requirements [39]. In addition, although our study did not directly demonstrate the relationship between weight and medication requirements following hysterectomy, the results point to the importance of individualized approaches in pain management, as individual differences and patient characteristics can influence the level of opioid consumption. Regarding dexamethasone, numerous studies suggest that higher doses (such as 15 mg) are more effective in reducing the need for narcotics and lowering pain in the early hours after surgery [38,52]. Moreover, meta-analyses and systematic reviews show that doses higher than 0.1 mg per kg of body weight play an effective role in reducing pain and medication needs without causing significant side effects [39,70]. Altogether, our findings and other research emphasize the efficacy of dexamethasone in improving pain control and reducing narcotic consumption, indicating that the selection of the appropriate dose should be based on the individual characteristics of the patient and the type of surgery to achieve the best result in pain management, while the drug's safety and adverse effects must be taken into account.

The present study demonstrates that differences in fasting blood glucose levels do not have a considerable impact on postoperative pain intensity and the need

for analgesic medications, as the results show that dexamethasone has similar efficacy in reducing pain in both groups. This finding does not contradict previous studies stating that blood glucose control during and after surgery may affect the amount of opioid consumption, but in this study, no significant difference in medication requirements was observed [71,72]. Also, the consumption of the opioid fentanyl based on the patients' fasting blood glucose level had no significant effect, which indicates that under certain conditions, the fasting blood glucose level might not play a very effective role in the need for opioids. At the same time, numerous investigations demonstrate that proper control of blood glucose levels, especially in diabetic patients, can facilitate a reduction in postoperative complications and improve healing outcomes [72]. On the other hand, employing multimodal pain control strategies is effective in reducing the need for opioids and improving patient satisfaction [73]. Meanwhile, dexamethasone, with its anti-inflammatory and anti-emetic effects, has been able to significantly reduce the level of pain and the need for analgesic drugs; however, it should be noted that this drug may elevate blood glucose levels in diabetic patients, particularly at high doses and in patients with poor blood glucose control [74]. Therefore, the use of dexamethasone must be accompanied by careful monitoring of blood glucose levels and individual patient assessments so that while benefiting from its advantages in reducing pain and side effects, the occurrence of glycemic problems is prevented [75]. In summary, our findings and reference studies indicate that effective postoperative pain management requires a multimodal and personalized approach in which blood glucose control, the use of anti-inflammatory drugs, and multimodal strategies collectively play a crucial role.

In the present study, the results showed that the p-value in the placebo group and the dexamethasone drug groups did not demonstrate a significant difference concerning the duration of surgery (surgery duration shorter or longer than 90 minutes), but both dexamethasone groups exhibited a considerable reduction in pain intensity compared to the placebo, a finding that is consistent with previous studies [49,68]. Evaluations showed that in prolonged surgeries, the total consumption of fentanyl increased in all groups, but the pain reduction in the dexamethasone groups compared to the placebo remained constant, illustrating the drug's efficacy in reducing the need for narcotic medications. Moreover, minimally invasive surgical techniques, such as laparoscopy and vaginal hysterectomy, were associated with reduced postoperative pain intensity, and it is also emphasized in the study by Nacionesto et al. (2005) that patients undergoing minimally invasive surgeries require

fewer analgesic drugs. Analgesic strategies such as epidurals have proven effective in reducing opioid consumption and pain intensity, findings that are well-documented in the studies by Hensel et al. and Qi et al. [11,76]. Regarding the effect of dexamethasone, the findings demonstrated that this drug causes a significant reduction in pain index scores and a decrease in postoperative morphine consumption, which aligns with other studies [37,77]. Furthermore, dexamethasone, with its anti-inflammatory and anti-emetic effects, leads to increased patient satisfaction and a reduction in side effects such as postoperative nausea and vomiting, without an observed risk of infection or delayed wound healing [38]. Ultimately, considering that the duration of surgery did not have a direct impact on medication needs, while the type of surgical technique and analgesic strategies play a vital role in pain control, it can be concluded that the use of effective drugs like dexamethasone and the utilization of minimally invasive methods can significantly improve the recovery process and patient satisfaction.

## Conclusion

In this study, the effects of two different doses of dexamethasone compared to a placebo on post-elective hysterectomy outcomes were evaluated, and the results significantly emphasized the superiority of dexamethasone, especially at the 8 mg dose, in reducing postoperative pain, decreasing the need for opioid consumption, and lowering the incidence of PONV. It was observed that dexamethasone, by substantially reducing pain intensity from half an hour after surgery up to 24 hours later, as well as by remarkably increasing the time interval to the first required analgesic dose, improved the quality of pain control and reduced dependence on opioids. The analgesic and anti-emetic effects of dexamethasone were independent of age, weight, blood glucose, and the duration of surgery, and no serious side effects or significant differences in wound complications were observed among the groups; therefore, it can be concluded that the preemptive administration of dexamethasone, particularly at the 8 mg dose, is a safe, effective, and dose-dependent strategy for pain control, reduction of PONV, and improvement of post-hysterectomy outcomes. Accordingly, incorporating dexamethasone into the multimodal analgesia protocols for these patients can be recommended as a scientifically and practically viable option supported by strong evidence.

## Recommendations

Based on the results of this research, conducting future studies with larger sample sizes and multicenter

designs is recommended to increase the validity and generalizability of the findings. Investigating the efficacy of dexamethasone in combination with other analgesic or antiemetic drugs within the framework of multimodal protocols can help identify optimal pharmacological combinations for pain control following hysterectomy. Furthermore, studying various doses of dexamethasone, including doses lower than 4 mg, is essential to determine the minimum effective dose with high safety. It is recommended that future studies have a longer follow-up period (more than seven days) to investigate the delayed effects of the drug on wound healing, inflammation control, the return of patients to normal function, and the incidence of metabolic complications. In addition, a direct comparison of dexamethasone with other available anti-inflammatory or antiemetic drugs, as well as an evaluation of its cost-effectiveness in managing pain and PONV, can further illuminate the path for evidence-based clinical decision-making.

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