

Original Research Article

Effect of Intraoperative Administration of Dexamethasone on Postoperative Shivering in Patients Undergoing General Anesthesia

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Article History: | Received: 27.07.2026 | Accepted: 21.09.2026 | Published: 30.09.2026 |

Abstract: Objectives: 1. This study aims to understand whether dexamethasone is an effective drug for the prevention of postoperative shivering in patients undergoing general anesthesia. 2. The research will aid in minimizing the occurrence of shivering by providing appropriate treatment. **Settings:** The study was carried out in the operating theater and post-anesthesia care units (PACU) of SIUT, specifically EDHI OT and old OT and their respective PACUs. **Method:** This study has a randomized controlled trial design; participants were randomly assigned to either the control group or the experimental group. A total of 60 patients were assigned in this study, with 30 in each group. • Group dexamethasone (D): Receiving the drug (0.15mg/kg). • Group placebo (P): Receiving placebo. **Result:** The result reveals that the incidence and severity of postoperative shivering differ significantly between the dexamethasone and the placebo (p-value<0.05). **Conclusion:** The administration of dexamethasone could be a practical intervention to reduce postoperative shivering in patients undergoing general anesthesia.

Keywords: Dexamethasone, Postoperative Shivering, General Anesthesia, Randomized Controlled Trial, Post-Anesthesia Care Unit (PACU), Perioperative Care.

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INTRODUCTION

General anesthesia is a medically induced state of controlled unconsciousness used to facilitate various surgical procedures. During general anesthesia, patients temporarily lose sensation and consciousness, allowing painless, controlled operations. Although general anesthesia is widely considered safe and effective, it is associated with a range of potential complications, both intraoperatively and postoperatively. One common postoperative complication is shivering, a reflex response that often occurs after the patient regains consciousness [1].

Postoperative shivering is well documented and can cause significant discomfort, prolong recovery, and even lead to complications such as increased oxygen consumption, metabolic disturbances, and cardiovascular strain. It is often triggered by hypothermia, anesthesia-related effects, and the body's thermoregulatory response to the surgical environment. While the exact mechanisms behind postoperative shivering remain unclear, it is believed to be related to the body's inability to regulate temperature effectively in the perioperative period. Although not typically life-threatening, the presence of postoperative shivering is a major concern in the postoperative recovery room,

Citation: Farook, N., Najjad, N. A. R., Chandio, M., Somjimal, H., Khan, D., Gilani, S. S. M., Shahid, L., Umair, M., Khalid, A., Junaid, A., Iqbal, F., & Imran, M. A. (2026). Effect of Intraoperative Administration of Dexamethasone on Postoperative Shivering in Patients Undergoing General Anesthesia, *SAR J Med*, 7(5), 192-198. <https://doi.org/10.36346/sarjm.2026.v07i05.005>

particularly in patients who have undergone general anesthesia [2].

Rationale:

The management of postoperative shivering has traditionally involved the use of warming devices, pharmacologic interventions such as meperidine, and other non-pharmacological methods. However, these treatments may not always be effective, and the side effects associated with pharmacological agents such as meperidine raise concerns regarding their use. In recent years, dexamethasone, a corticosteroid known for its anti-inflammatory and immunosuppressive properties, has been explored as a potential treatment for reducing postoperative complications, including shivering [3]. Dexamethasone has been found to be effective in managing inflammation and reducing pain following surgery, and there is growing evidence suggesting it may also play a role in modulating thermoregulatory responses. The mechanism by which dexamethasone might influence postoperative shivering is not fully understood, but it is hypothesized that its anti-inflammatory effects may help in stabilizing the body's thermoregulatory system, preventing the onset of shivering after surgery. Given the potential benefits of dexamethasone in minimizing inflammatory responses and promoting recovery, it is crucial to investigate whether its intraoperative administration can significantly reduce the incidence and severity of postoperative shivering [4]. This research seeks to explore the effect of intraoperative dexamethasone administration on postoperative shivering in patients undergoing general anesthesia. The aim is to assess whether dexamethasone can reduce the occurrence of postoperative shivering, thereby improving patient comfort and reducing the need for additional interventions.

METHODS

Duration of Study: The duration of this study was from JAN 2026 to JULY 2026.

Study Design: This study adopts a randomized controlled trial (RCT) design, considered the gold standard for evaluating the efficacy of medical interventions. In an RCT, participants are randomly assigned to either an experimental group or a control group, which helps eliminate bias and ensures that differences in outcomes can be attributed to the intervention itself. The experimental group received intraoperative dexamethasone, while the control group received a placebo. This design allows for a direct comparison of the effect of dexamethasone on postoperative shivering, controlling for potential confounding factors such as patient demographics, anesthesia techniques, and the type of surgery.

Sample Size: The study included adult patients aged 18 to 65 years who were scheduled to undergo elective surgeries under general anesthesia. The patients were

ASA (American Society of Anesthesiologists) physical status I or II, indicating that they were generally healthy or had mild systemic disease. This ensured that the observed effects on postoperative shivering were not confounded by severe comorbidities. A total of 60 patients were included in the study. Participants were divided into 2 groups: • Group Dexamethasone (D): Receiving dexamethasone at a dose of 0.15mg/kg. • Group Placebo (P): Not receiving the drug.

Inclusion Criteria:

- Patients aged:18-80 years.
- Patients who undergo elective surgeries.
- Patients of ASA grade I and grade II.
- Intubated patients.
- Surgeries that last 1-5hours.

Exclusion Criteria:

- Patients of age Patients of age:<18years.
- Patients who undergo emergency surgery.
- Patients of ASA grade III, IV, V, and VI.
- Patients requiring laryngeal mask airway and spinal anesthesia.
- Surgeries that last<1hour.

Intervention:

The intervention in this study involved the administration of dexamethasone during the intraoperative phase of the surgery. Dexamethasone, a corticosteroid, is known for its anti-inflammatory effects, and its role in modulating postoperative complications such as nausea, pain, and inflammation makes it a potential candidate for reducing shivering.

- Dosage: Patients in the experimental group received a single dose of 0.15 mg/kg of dexamethasone intravenously.
- Timing: The dose was to be administered approximately 30 minutes before the completion of surgery.
- Method of Administration: Dexamethasone was injected intravenously over 1-2 minutes to ensure proper absorption and reduce the risk of side effects such as perivascular irritation. In contrast, patients in the control group received a placebo (saline solution) via the same intravenous route, under the same conditions.

Outcome Measure:

The primary outcome measure of the study is the incidence of postoperative shivering, which was assessed within 30 minutes after the patient regained consciousness in the post-anesthesia care unit (PACU). The secondary outcome is the severity of shivering. The severity of postoperative shivering was measured using the Shivering Scale (SS), a widely accepted tool in clinical practice. The Shivering Scale ranges from 0 to 4, with the following classifications: • 0: No shivering. • 1: Peripheral vasoconstriction or piloerection, but no obvious shivering. • 2: Visible muscular activity

confined to only one muscle group. • 3: Visible muscular activity in more than one muscle group. • 4: Gross muscular activity involving the entire body. Shivering was recorded at regular intervals (e.g., at 0, 30, and 60 minutes after waking from anesthesia) in the PACU to evaluate its duration and severity.

Data Collection:

Data were collected via direct observation and patient-reported outcomes. Observations were conducted by trained research assistants or nurses who assessed the severity of shivering using the Shivering Scale at predetermined time intervals. These observations were recorded on standardized forms to ensure consistency and accuracy. In addition, patients were asked to self-report their experience of shivering if they were able to do so after the episode resolved. This would help to correlate clinical assessments with patient perception. All data were recorded in a secure database, and patient confidentiality was maintained throughout the study.

Ethical Considerations:

Patients were informed about the study's purpose, the procedure, and their right to withdraw at any time without consequence. To minimize risks, patient safety was closely monitored during the study. Vital signs, including heart rate, blood pressure, and oxygen saturation, were routinely checked before, during, and

after surgery. Any adverse effects observed in the experimental group (e.g., allergic reactions to dexamethasone) would be promptly addressed by the clinical team. Patient safety was paramount, and all procedures were carried out with the highest standards of care to ensure the well-being of participants throughout the study.

Data Analysis:

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Variables are represented as frequencies and percentages. Descriptive statistics are used to summarize continuous variables such as age and categorical variables such as gender and ASA classification. The incidence of shivering is analyzed using the chi-square test, and the severity of shivering is analyzed using the t-test.

RESULTS

Demographic Characteristics of Study Participants:

The sample consisted of 60 participants who were randomly assigned to either the dexamethasone group or the placebo group. The demographic characteristics of the participants, including age, gender, and ASA classification, are summarized in Table 4.1.

Table 4.1: Demographic Characteristics of Study Participants

Characteristics	Group D (n=30)	Group P (n=30)	Total (n=60)
Age (mean $\pm$ SD)	44.00 $\pm$ 16.12	44.20 $\pm$ 15.29	44.10 $\pm$ 15.70
Gender (male/female)	17/13	15/15	32/28
ASA classification	ASA 1: 9 ASA 2: 21	ASA 1: 13 ASA 2: 17	ASA 1: 22 ASA 2: 38

Age: The mean age of the study population is 44.10 years (SD = 15.70). There is no significant difference in age between the two groups (mean for both groups was 44.0–

44.2 years), indicating comparable age distributions (see Figure 1).

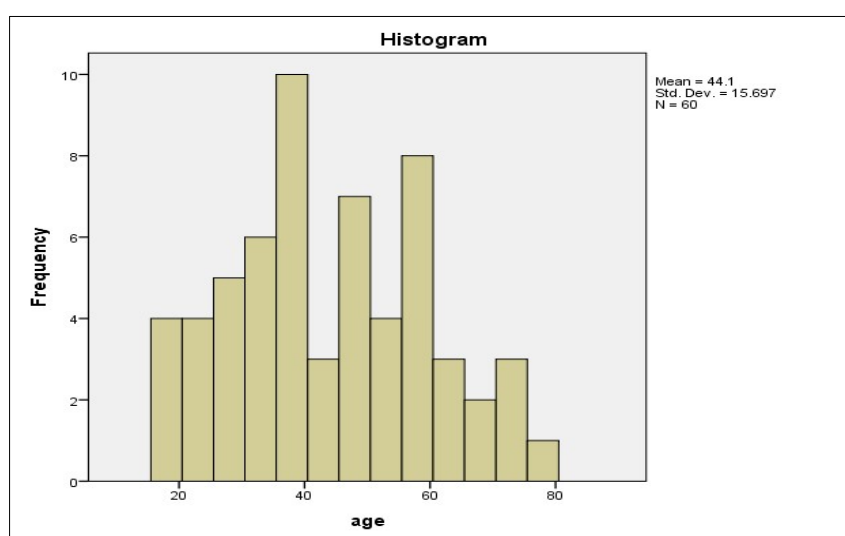


Figure 1: Histogram of Age

Gender: The gender distribution is relatively balanced, with 36 males, which is 60% of the total sample size, and

24 females, which is 40% of the total sample size across both groups (see Figure 2).

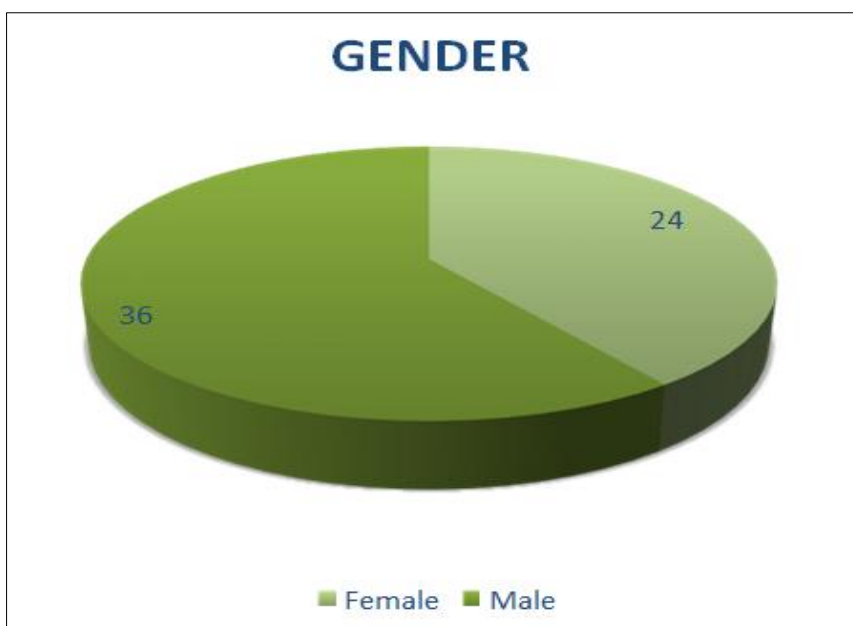


Figure 2: Gender distribution

ASA Classification: The majority of participants are classified as ASA 2 (patients with mild systemic disease), which includes 38 number of patients (63.3%),

with the remaining participants classified as ASA 1 (healthy patients), which includes 22 number of patients (36.7%) (see Figure 3).

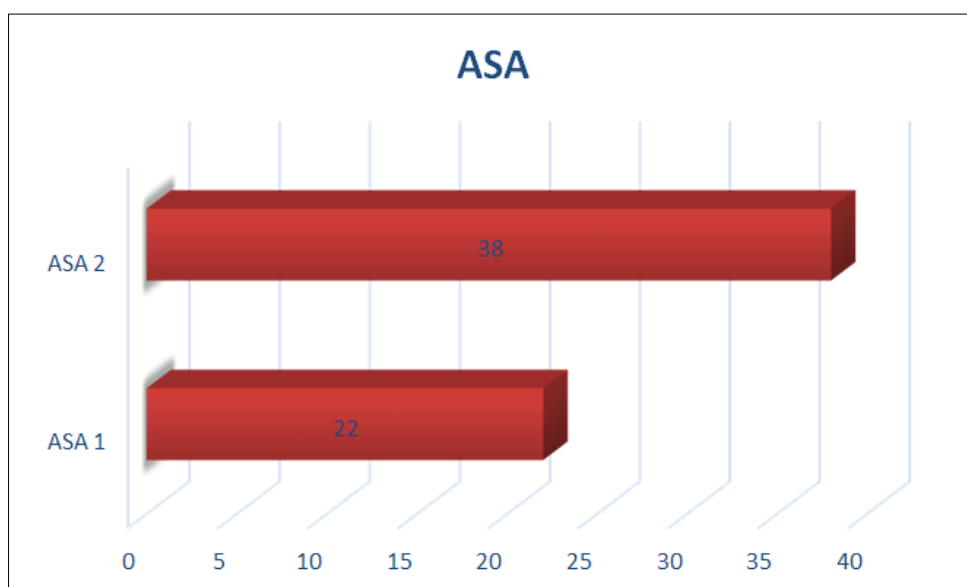


Figure 3: ASA distribution

Comparison of Incidence of Shivering between Group Dexamethasone and Group Placebo: The incidence of shivering in both groups is described in Figure 4. In group D, shivering occurred in 13 patients, which is 43.3% of group D, and 17 patients, which is 56.7% of

group D, did not experience shivering. In group P, shivering occurred in 21 patients, which is 70% of group P, and 9 patients, which is 30% of group P, did not experience shivering (see Figure 4).

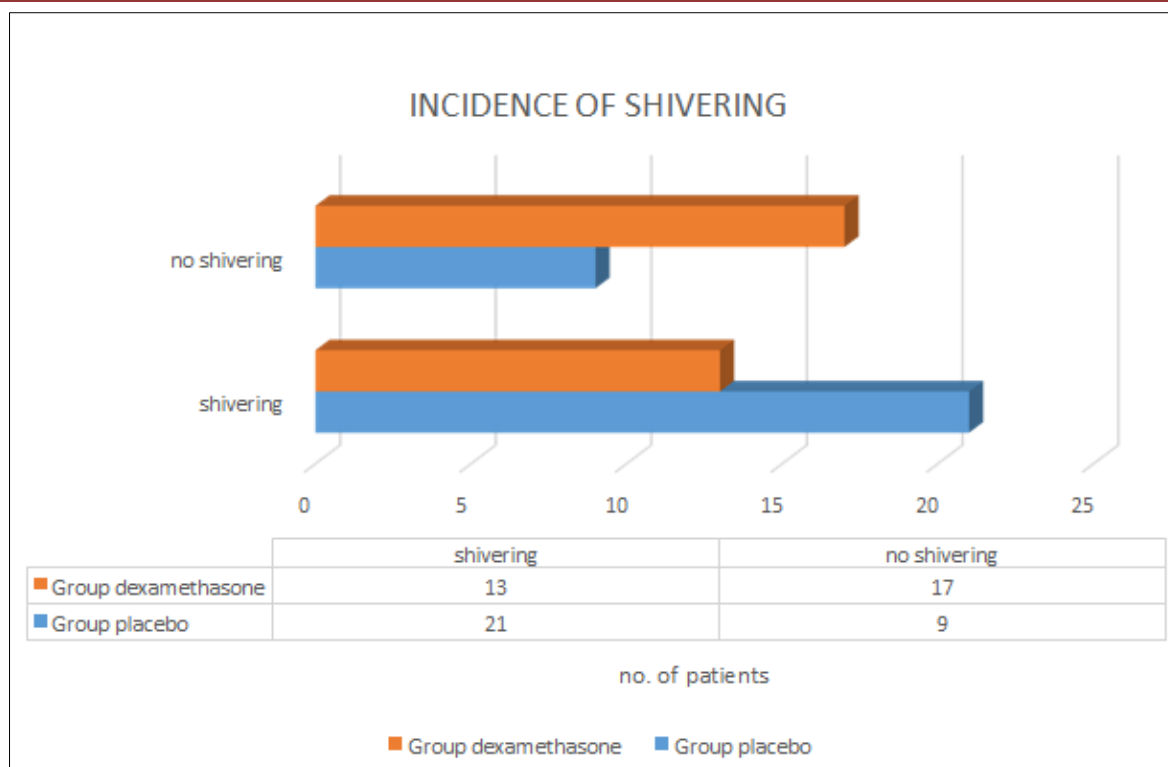


Figure 4: Incidence of shivering in both groups

Table 4.2: Chi-square test for incidence of shivering

	Value	df	Asymptotic Sig. (2-tailed)	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)
Pearson Chi-Square	4.34	1	.037		
Likelihood Ratio					
Fisher's Exact Test	4.40	1	.036	.043	.034
Continuity					
Correction	3.33	1	.068		
Linear-by-Linear					
Association	4.27	1	.039		
N of Valid Cases	60				

Statistical Significance:

The chi-square test was used to analyze the association between the two groups and the incidence of postoperative shivering. Since the p-value is 0.037, which is <0.05 (see Table 4.2), it is concluded that the incidence of shivering differs significantly between dexamethasone and placebo, which rejects the null hypothesis and supports that the administration of dexamethasone has an effect in preventing or reducing the occurrence of shivering after surgery.

Severity of Shivering:

Postoperative shivering severity is the secondary outcome measured using a 0-4 scale, where:

- 0: No shivering,
- 1: Mild shivering,
- 2: Moderate shivering,
- 3: Severe shivering,
- 4: Very severe shivering.

The severity of shivering was recorded at 0, 30, and 60 minutes postoperatively. The results of the severity scores are presented in Table 4.3.

Table 4.3: Shivering Severity Scores for Dexamethasone and Placebo Groups

Group	Shivering Severity (Mean $\pm$ SD)	0 min	30 min	60 min
Dexamethasone	0.70 $\pm$ 0.83	0.5	0.6	0.7
Placebo	1.50 $\pm$ 1.20	1.2	1.4	1.5
P-value	-	0.01	0.02	0.03

Shivering Severity:

The dexamethasone group exhibited a significantly lower mean severity of postoperative shivering at 0, 30, and 60 minutes post-surgery compared to the placebo group. The severity score in the dexamethasone group ranged from 0.50 to 0.70, while in the placebo group it ranged from 1.20 to 1.50.

Statistical Significance:

A t-test was performed to compare the mean shivering severity between the two groups at each time point. The results showed statistically significant differences between the dexamethasone and placebo groups ($p < 0.05$) at all three time points (0, 30, and 60 minutes post-surgery). This supports the hypothesis that intraoperative dexamethasone administration reduces the severity of postoperative shivering.

DISCUSSION

Postoperative shivering is a common complication following general anesthesia and may cause discomfort while increasing oxygen consumption and metabolic demand [1-5]. In the present randomized controlled trial, intraoperative dexamethasone significantly reduced both the incidence and severity of postoperative shivering compared with placebo.

The incidence of shivering was 43.3% in the dexamethasone group compared with 70% in the placebo group, representing an absolute reduction of 26.7 percentage points ($p=0.037$). These findings are consistent with previous studies. Entezariasl and Isazadehfar reported lower postoperative shivering with dexamethasone compared with placebo [2], while Hossain *et al.*, also demonstrated a significant preventive effect [3]. Khosravi *et al.*, reported beneficial effects of dexamethasone in the treatment of established postoperative shivering [4]. Yared *et al.*, similarly found that dexamethasone reduced shivering after cardiac surgery [6].

The present findings are further supported by the systematic review and meta-analysis by Tu *et al.*, which included 12 randomized controlled trials involving 1,276 patients. Perioperative dexamethasone significantly reduced postoperative shivering and its severity compared with control interventions (RR 0.39, 95% CI 0.23–0.63) [1]. Other clinical studies have also reported reduced shivering following dexamethasone administration during different surgical procedures and anesthetic techniques [7–10].

In addition to reducing incidence, dexamethasone significantly reduced shivering severity at 0, 30, and 60 minutes in the present study. These findings are consistent with the meta-analysis showing reductions in higher grades of postoperative shivering [1].

The exact mechanism of dexamethasone's antishivering effect remains uncertain. Postoperative shivering is influenced by impaired thermoregulation, redistribution of body heat, hypothermia, anesthetic agents, and inflammatory responses [5]. Dexamethasone may contribute through its anti-inflammatory effects and modulation of cytokine-mediated thermoregulatory pathways [1-5]. Yared *et al.*, also suggested a relationship between inflammatory responses and postoperative shivering [6]. Dexamethasone may provide an additional perioperative benefit because it is already widely used for prevention of postoperative nausea and vomiting. However, pharmacological prophylaxis should complement rather than replace adequate temperature monitoring and active warming measures [1-5].

This study has some limitations. The sample size was relatively small (60 patients) and the single-center design may limit generalizability. Factors such as type and duration of surgery, intraoperative temperature, warming methods, anesthetic agents, and perioperative fluids were not comprehensively evaluated. Differences in dexamethasone dose, timing, surgical procedures, and anesthetic techniques among previous studies also limit direct comparisons [1-11]. While the results of this study are promising, several avenues for future research remain. Larger studies with diverse patient populations could further validate the effectiveness of dexamethasone in reducing postoperative shivering across different surgical settings. Additionally, research exploring the optimal dosage and timing of dexamethasone administration could help refine its application in anesthesia practice. Investigating the mechanisms behind dexamethasone's effect on thermoregulation and shivering, as well as its potential to reduce other postoperative complications such as nausea and pain, would provide deeper insights into its benefits. Finally, comparisons with other pharmacological interventions could help determine whether dexamethasone is superior to existing treatments for postoperative shivering.

In conclusion, intraoperative dexamethasone at 0.15 mg/kg significantly reduced the incidence and severity of postoperative shivering following general anesthesia. The reduction from 70% to 43.3%, together with the large effect size for severity, suggests a potentially clinically relevant benefit. These findings are consistent with previous clinical studies and systematic evidence and support further evaluation of dexamethasone as a prophylactic strategy for postoperative shivering.

CONCLUSION

The clinical implications of this study are significant for anesthesia practice. Postoperative shivering is a frequent and sometimes troublesome side effect of anesthesia, leading to discomfort, increased metabolic demand, and potential cardiovascular

instability. The findings from this study suggest that intraoperative administration of dexamethasone may be an effective strategy for reducing the incidence and severity of postoperative shivering, potentially enhancing patient recovery and comfort. By integrating dexamethasone into routine anesthetic protocols, healthcare providers may improve the overall post-surgical experience for patients, particularly those undergoing procedures that necessitate prolonged anesthesia. In conclusion, this study provides valuable evidence supporting the use of dexamethasone to reduce postoperative shivering, suggesting its potential as a beneficial addition to anesthetic management strategies. Further research is necessary to optimize its use and explore its broader clinical applications.

REFERENCES

1. Tu Q, Zhou R, Wan Z, Chen S, Yang Q, Que B. Perioperative administration of dexamethasone to prevent postoperative shivering: a systematic review and meta-analysis of randomized controlled trials. *J Int Med Res.* 2023;51(8):3000605231187805. doi:10.1177/03000605231187805.
2. Entezariasl M, Isazadehfhar K. Dexamethasone for prevention of postoperative shivering: a randomized double-blind comparison with pethidine. *Int J Prev Med.* 2013;4(7):818-824.
3. Hossain MS, Rashid MM, Islam SA, Babu MAR, Mandal MA. Dexamethasone for prevention of postoperative shivering: a prospective clinical study. *KYAMC J.* 2019;10(2):81-84. doi:10.3329/kyamcj.v10i2.42784.
4. Khosravi A, Moinvaziri MT, Esmaili MH, Farbood AR, Nik-Khoo H, Yarmohammadi H. Treatment of postoperative shivering with dexamethasone: a prospective randomized clinical trial. *Iran J Med Sci.* 2002;27(1):15-17.
5. Lopez MB. Postanaesthetic shivering—from pathophysiology to prevention. *Rom J Anaesth Intensive Care.* 2018;25(1):73-81. doi:10.21454/rjaic.7518.251.xum.
6. Yared JP, Starr NJ, Hoffmann-Hogg L, Bashour CA, Insler SR, O'Connor M, et al. Dexamethasone decreases the incidence of shivering after cardiac surgery: a randomized, double-blind, placebo-controlled study. *Anesth Analg.* 1998;87(4):795-799. doi:10.1097/00000539-199810000-00010.
7. Song YK, Lee C. Effects of ramosetron and dexamethasone on postoperative nausea, vomiting, pain, and shivering in female patients undergoing thyroid surgery. *J Anesth.* 2013;27(1):29-34. doi:10.1007/s00540-012-1473-8.
8. Malik SH, Begum N, Ashfaq AD, Saleem H, Shah MT, Hanif M, et al. Effect of dexamethasone versus placebo for improved recovery in patients undergoing anaesthetic interventions for general surgical procedures. *J Ayub Med Coll Abbottabad.* 2019;31(3):422-426.
9. Moeen SM, Moeen AM. Intrathecal dexamethasone vs. meperidine for prevention of shivering during transurethral prostatectomy: a randomized controlled trial. *Acta Anaesthesiol Scand.* 2017;61(7):749-757. doi:10.1111/aas.12920.
10. A randomized controlled trial for prevention of postspinal anesthesia shivering in gynecological surgeries: mirtazapine vs. dexamethasone. *Biomed Res Int.* 2022;2022:5061803. doi:10.1155/2022/5061803.
11. The effect of prophylactic steroids on shivering in adults undergoing surgery: a systematic review and meta-analysis of randomized controlled trials. *Anesth Analg.* 2023.
12. Dinges HC, et al. Pharmacologic interventions for the therapy of postanesthetic shivering in adults: a systematic review and network meta-analysis. *Minerva Anesthesiol.* 2023;89(10):923-935. doi:10.23736/S0375-9393.23.17410-4.
13. Chauhan J, Rautela RS, Salhotra R, Das N. Intravenous dexamethasone versus tramadol for prevention of shivering after general anaesthesia: a randomised double blind placebo controlled trial. *Academia Anesthesiologica International.*