Archives of Anesthesiology and Critical Care (May-Jun 2026); 12(3): 230-235.

Available online at http://aacc.tums.ac.ir

Research Article

The Effect of Gabapentin on Post-Cesarean Section Pain in Patients Undergoing Spinal Anesthesia

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ARTICLE INFO

Article history:
Received 24 May 2025
Revised 14 June 2025
Accepted 28 June 2025

Keywords:
Local anesthetic resistance;
Scorpion sting;
Failed block;
Inadequate block

ABSTRACT

Background: Caesarean section is associated with postoperative pain that results in patient dissatisfaction and necessitates the use of various analgesics. In this study, the effect of gabapentin on post-Caesarean-section pain relief was evaluated.
Methods: A total of 50 parturients undergoing spinal anesthesia for cesarean section were randomly assigned into intervention and control groups in this randomized clinical trial between 2022 and 2023. Patients in the case group received gabapentin 300 mg capsules one hour before surgery, while the control group received an identical placebo. The postoperative pain intensity and need for analgesics, as well as nausea, vomiting, and drowsiness, were evaluated at 0, 6, 12, and 24 hours after surgery.
Results: The mean age of patients in the gabapentin and placebo groups was 26.42±6.15 and 26.5±65.91, respectively (P=0.34). A significant difference was found in postoperative pain intensity and the need for analgesics between the case and control groups at zero (P=0.001 and P=0.003), six (P=0.007 and P=0.002), 12 (P=0.005 and P=0.001), and 24 (P=0.004 and P=0.021) hours after surgery. No significant differences were seen in the rates of nausea, vomiting, and drowsiness between the two groups at the different time points (P>0.05).
Conclusion: According to our findings, prescribing gabapentin 300mg before a cesarean section effectively reduces postoperative pain severity and the need for analgesics. This dose is also safe for the neonate.

Introduction

Increasing cesarean rates and the importance of pain management during this surgical procedure have made C-sections a unique challenge for women [1]. As a common surgical procedure worldwide, C-sections present special challenges in the management of pain due to the predominantly neural nature of the initial anesthesia [2], with its limitations due to the possible passage of analgesics from the mother to the fetus [3]. A multifaceted approach is needed to manage postoperative pain effectively [4-5]. Women going through C-sections must receive effective pain relief during and after surgery in order to minimize their suffering [6]. In the case of severe acute pain following a C-section, prolonged use of opioids may result in delayed recovery, postpartum depression, and opioid dependence [7]. Women with a variety of medical conditions may benefit from a variety of analgesic options but may still require special care [8]. Management of chronic pain and contraindications to spinal anesthesia and sleep apnea may require individualized approaches [9-10].

The use of pregabalin for pain relief following C-section has not been extensively studied. It has not been

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DOI: 10.18502/aacc.v12i3.21307

shown to reduce opioid use after abdominal hysterectomy at 75 or 150 mg concentrations [11]. While some studies have demonstrated no significant improvement in pain reduction or maternal satisfaction following a C-section with preoperative gabapentin 600 mg [12], gabapentin is commonly used to treat chronic pain; studies have shown that it can reduce opioid use immediately after a C-section due to its analgesic properties [13-14]. However, postoperative use of gabapentin may have some side effects, such as drowsiness and dizziness [11]. Since gabapentin has a high maternal-to-fetal vein ratio, its use in C-sections as a preventive medicine is limited [15]. However, its possible passage through breast milk is also a concern. Considering the lack of strong evidence for significant improvement in acute or chronic post-C-section pain relief, its potential side effects, and unclear safety profile for infants, gabapentin is not recommended for routine post-C-section pain management [16]. The current study was designed to determine the effect of preoperative gabapentin on postoperative pain levels in patients undergoing C-sections with spinal anesthesia.

Methods

The ethical approval to conduct this study was provided by the Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.IRH.REC.1401.076). The study was also registered at the Iran Registry of Clinical Trials (IRCT20230311057674N1).

A detailed explanation of the study protocol was provided to the participants, and their information and responses to questionnaires were collected upon obtaining their written informed consent. All patient information was kept confidential. Participants who withdrew their consent to continue participation were excluded from the study.

Study design

This randomized clinical trial was conducted at the Qaem Hospital from June to July 2024. Parturients between 18 and 40 years who were eligible for elective C-sections with spinal anesthesia with ASA class I, no recent history of using calcium channel blockers, no history of allergic reaction to gabapentin, and no contraindications for spinal anesthesia (coagulation diseases, history of sensitivity to local anesthesia, patient non-cooperation, hemodynamic diseases, and local infection) were enrolled in the study.

Sampling method

The patients were randomly divided into the treatment or control groups. The assigned codes were recorded on separate sheets of paper and placed in sealed envelopes. After meeting the inclusion criteria, each patient was assigned to one of the two groups according to the code in the envelope they picked.

Procedure

All participants were instructed to fast for at least eight hours before surgery. A gabapentin 300 mg capsule was administered to the patients in the treatment group one hour before surgery, while a placebo was administered to the control group. Oxygen saturation, blood pressure, and heart rate were monitored before and throughout spinal anesthesia. An 18-gauge intravenous catheter was inserted, and all patients were intravenously administered ranitidine 1 mg/kg and Ringer Lactate (RL) solution 20 ml/kg over 30 minutes. Face masks were used to provide oxygen to all patients at a rate of 5 liters per minute. As soon as the patient had assumed a sitting position for 15 minutes, 2.5 ml of hyperbaric bupivacaine was administered with a 25-gauge needle after cerebrospinal fluid aspiration to provide spinal anesthesia at L3-4 or L4-5 levels. Ringer lactate solution was administered intravenously at 15 mg/kg/h until the surgery was completed. Oxytocin 10 units were infused immediately after parturition, and 40 units were infused slowly afterward. If baseline blood pressure dropped more than 20%, ephedrine was administered at a 5-10 mg bolus, and if baseline heart rate dropped more than 20%, atropine was injected at 1-0.5 mg. Opioids were not used for spinal anesthesia.

Outcome measurement

Oxygen saturation, blood pressure (diastolic, systolic, and mean arterial), and heart rate were recorded initially every 3 minutes for the first 30 minutes and then every 5 minutes until the end of the procedure. Possible side effects of the drug, including unconsciousness, respiratory depression, hypotension, seizures, bradycardia, skin rashes, nausea, itching, and vomiting, were documented within the 24-hour study period. The Visual Analog Scale (VAS) was used by patients at hours 6, 12, and 24 following surgery for pain evaluation. The patient was given an additional dose of diclofenac suppository (100 mg) if the VAS score reached 4 or higher. The amount of analgesic each patient received 24 hours after surgery was calculated and recorded.

Sample size and statistical analysis

According to a similar study by Demet Dogan Erol, with mean VAS scores of 4.1±0.31 and 5.7±0.42 in two groups, α=0.05, and β=0.1, the final sample size was calculated as 20 patients in each group [17]. Data from continuous variables were analyzed using ANOVA. The Kruskal-Wallis H test was performed when data appeared non-normally distributed. A chi-square analysis was performed between the two groups to compare categorical variables. A $P<0.05$ was considered statistically significant. The statistical analysis was conducted using SPSS version 23.0 (IBM, Armonk, New York).

Results

As the CONSORT diagram (Figure 1) shows, initially, 64 patients were assessed for eligibility criteria; however, five patients declined to participate, and only 50 patients met the inclusion criteria and were randomly divided into two treatment groups (n=25 patients in each group). The two groups were homogeneous in age (P=0.34) and BMI (P=0.49), as well as in the underlying diseases (diabetes mellitus, hypertension, and cardiovascular diseases) (Table 1). Pain intensity significantly reduced at 6, 12, and 24 h after surgery in treatment groups (P<0.05). However, the pain intensity trend over time significantly differed between the two groups (P=0.001) (Table 2).

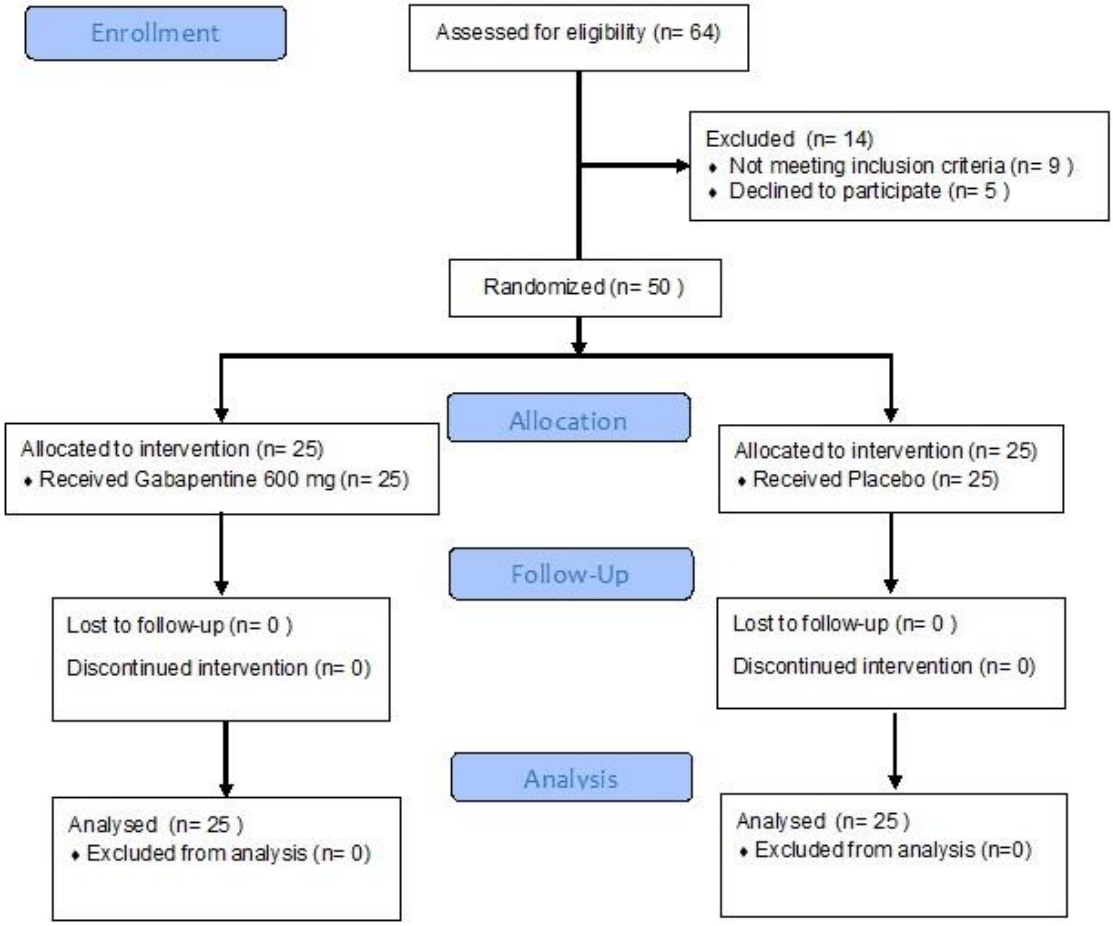

Figure 1- Consort 2010 flow diagram

Table 1- Basic characteristics of patients in the studied groups (* Independent samples T-Test, ** Chi-square Test)

Variable		Treatment Group (n=25)	Control Group (n=25)	P value
Age		26.42±6.15	26.65±5.91	0.34*
BMI		24.2±3.06	23.75±2.68	0.49*
Underlying Disease	Diabetes Mellitus	2 (10%)	1 (5%)	>0.05
	Hypertension	3 (15%)	2 (10%)	>0.05
	Cardiovascular Disease	1 (5%)	0	>0.05

Table 2- Pain intensity in 24 hours after surgery in different groups

Time Points	Treatment group (n=25)	Control group (n=25)	P
0	3.34±1.92	5.38±2.48	0.001
6	3.81±2.49	5.01±1.86	0.007
12	3.04±1.35	4.48±2.02	0.005
24	2.84±1.15	4.03±2.02	0.004

There was a significant difference in the average dose of analgesic drugs used during the first 24 hours after surgery between the treatment and control groups (P<0.05). There was also a statistically significant difference in trend analysis of the change in analgesic consumption between the two groups (P=0.001) (Table 3). No significant difference was found in the incidence of nausea/vomiting and drowsiness (P=0.911, P=0.891, P=0.323, and P>0.999) at different time points between the two groups (Table 4).

Discussion

Postoperative pain in many cases of major surgery can persist for several days afterward, necessitating the administration of different analgesics and patient dissatisfaction with the procedure [18-19]. C-section is one of the most common surgical procedures worldwide, and sometimes severe localized pain results within 48 hours after the procedure [20]. Many analgesics and even narcotics are used to reduce pain, while the most common complication is postoperative nausea, vomiting, or drug-related side effects [21-22]. It is crucial to consider the drugs' fetal effects, such as decreased Apgar scores after maternal narcotics consumption. It is essential to use drugs with minimal side effects to reduce postoperative pain, and it is also imperative that both the mother's and the newborn's health be taken into consideration [23].

The present study has investigated the effectiveness of preoperative gabapentin 300 mg capsules in reducing post-cesarean pain. Furthermore, side effects such as drowsiness, nausea, vomiting, and the need for additional analgesia were evaluated. Neonatal health was also assessed through changes in the Apgar score. Initially, gabapentin appeared to reduce postoperative pain severity significantly. It also reduced the need for postoperative analgesia. No difference was seen in nausea, vomiting, and postoperative sleepiness between the gabapentin and control groups. Hence, the use of gabapentin seems to be safe during C-sections. This finding is in line with recent studies that gabapentin 300 mg is sufficient to provide adequate relief of post-cesarean pain.

A systematic review and meta-analysis have reported that gabapentin significantly reduces pain scores among women within 24 hours after the operation [13]. Additionally, they reported no differences in opioid consumption, supplemental analgesic use, or maternal and neonatal side effects between the two groups, which is consistent with our findings. Nonetheless, the study concentrated primarily on 600 mg of gabapentin. Additionally, Kazemi et al. conducted a study to evaluate similar analgesic effects of gabapentin 600 mg and 1200 mg, which is consistent with the present study [12]. They concluded that the lower 600 mg dose alone provides adequate pain relief after cesarean delivery.

Khezri et al. evaluated the effects of gabapentin 300 mg on pain relief in women undergoing cesarean sections and suggested that even 300 mg of gabapentin can be effective as an analgesic [24]. In other words, gabapentin can effectively reduce surgical pain with a minimum dose of 300 mg if prescribed according to the prescribed protocol.

A study by Moore et al. reported that administering gabapentin 600 mg reduced pain and increased maternal satisfaction [25].

Table 3- The analgesic dose used within 24 hours after surgery in different groups

Variable	Time Points	Treatment Group (n=25)	Control Group (n=25)	P
Average Dose (mg)	0	36.0±11.37	68.86±10.92	0.076
	6	36.0±9.92	71.34±9.16	0.001
	12	36.2±12.71	50.34±10.17	0.045
	24	30.16±11.04	41.25±11.26	0.049
Frequency of Consumption	0	8 (40%)	15 (75%)	0.003
	6	9 (45%)	17 (85%)	0.002
	12	7 (35%)	16 (80%)	0.001
	24	5 (25%)	14 (70%)	0.021

Table 4- Incidence of nausea and drowsiness within 24 hours after surgery in two groups

Variable	Time Points	Treatment Group (n=25)	Control Group (n=25)	P
Nausea/Vomiting	0	4 (20%)	2 (25%)	0.911
	6	4 (20%)	3 (15%)	0.891
	12	1 (5%)	2 (10%)	0.323
	24	0 (0.0)	0 (0.0)	>0.999
Drowsiness	0	1 (5%)	0 (0.0)	0.363
	6	0 (0.0)	0 (0.0)	0.342
	12	0 (0.0)	0 (0.0)	>0.999
	24	0 (0.0)	0 (0.0)	>0.999

Despite this, opioid administration was not different between the two groups, and no significant difference was seen between the two groups regarding the infants' Apgar scores, intraoperative treatments, or umbilical artery pH, which contradicts the current study regarding reduced analgesia requirements. Additionally, in a study conducted by Monks et al., the patient group receiving gabapentin injections had a significantly lower pain intensity over 24 hours compared with the placebo group [26]. The patient satisfaction level was much higher in the gabapentin group compared to the placebo group, which is in line with our study findings. Most patients are not satisfied with the procedure of epidural injection of normal saline and epidural blood patch due to its invasiveness and lack of ease of performing epidural blood patch and considering the few side effects of gabapentin [27-28]. The present study showed that a single dose of a 300 mg gabapentin capsule before a cesarean section can replace current treatments for post-surgery pain relief. Due to the constrained number of participants in the study, different variables such as newborn weight, previous C-sections, and other factors could not be evaluated. Further studies with gabapentin 300 mg in patients undergoing cesarean section through various anesthesia protocols and considering the maternal and infantile outcomes are suggested.

Conclusion

According to our findings, patients scheduled for C-section who received a single preoperative dose of gabapentin 300 mg experienced less pain after surgery and required less analgesia. It was also found that this dosage was safe for newborns.

Acknowledgement

The authors would like to appreciate the help and support from the Clinical Research Development Unit, Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, IRAN.

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