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ORIGINAL ARTICLE

# Evaluation the effect of dexamethasone on post-dural puncture headache in cesarean surgery

Fatemeh Shakhsemampour[1], Elahe Allahyari[2], Ali Rajabpour sanati[1], Amir Sabertanha[1]✉

[1] *Department of Anesthesia, Faculty of Medicine, Birjand University of Medical Sciences, Birjand, Iran*

[2] *Social Determinants of Health Research Center, Department of Biostatistics and Epidemiology, Faculty of Health, Birjand University of Medical Sciences, Birjand, Iran*

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## Abstract

**Introduction:** Inflammation is one of the probable causes of post-dural puncture headache (PDPH); logically, therefore, anti-inflammatory drugs such as dexamethasone can reduce the headache. The aim of this study was to evaluate the effect of intravenous dexamethasone 8 mg on PDPH in cesarean surgery.

**Methods:** This randomized double-blind clinical study was conducted on 104 patients aged from 15 to 45 years. They were in classes 1 or 2 according to the American Society of Anesthesiologists (ASA) physical status classification system and scheduled for elective cesarean section in Valiasr Hospital affiliated with Birjand University of Medical Sciences. The patients were allocated into one of two groups using simple randomization method. In one group, the patients received dexamethasone intravenously before anesthesia technique, while the other group received placebo. Spinal anesthesia using quince 25 needle with 0.5 percent 12-15 milligram bupivacaine was performed for patients in both groups. Forty-eight hours after the operation, the severity of headache was studied and recorded. The collected data were analyzed in SPSS-16 using independent t-test and Fisher's exact test. The significance level was set at $P < 0.05$.

**Results:** Analysis showed that dexamethasone could not significantly decrease the incidence of PDPH and severity of headache after spinal anesthesia in recovery and within 48 hours after surgery ($P > 0.05$).

**Conclusions:** This study showed that dexamethasone did not have any beneficial effect in prevention of PDPH in cesarean surgery.

**Key Words:** Anesthesia; Spinal; Dexamethasone; Post-Dural Puncture Headache; Caesarean Section

## Introduction

The higher incidence of difficulties in airway management of pregnant patients and the effects of intravenous (IV) anesthetics on the fetus have lead to spinal anesthesia preference for cesarean section (1). However, spinal anesthesia has some complications such as headache, nausea and vomiting, hypotension and bradycardia. Post-dural puncture headache (PDPH) after spinal anesthesia is the worst complication that often leads to the patient's dissatisfaction with spinal anesthesia and increased risks of its refusal in later occasions. Because of physiologic changes in obstetric patients, the incidence of PDPH is higher in this group. According to one study, headache develops



Tel: +985632381203
Fax: +985632440488
Po Box 97175-379
Email: jsurgery@bums.ac.ir

✉**Correspondence to:**
Amir Sabertanha, Assistant Professor of Anesthesia, Birjand University of Medical Sciences, Birjand, Iran;
Telephone Number: +989151600384
Email Address: amirsaber43@yahoo.com

at a chance of 65% within 24 hours after lumbar puncture and 92% of the symptoms present within 48 hours. It may be recovered after 1-12 days without treatment, but given the severe morbidity associated with it, medical treatment is usually required (2).

Preventive measures including use of pinpoint and small size needles and avoidance of multiple punctures are effective (3, 4). To the best of our knowledge, the existence of an inflammatory process, along with the change in the subarachnoid pressure, may explain the pathogenesis of headache after spinal anesthesia (5). In a recent study conducted on sixty patients with headache after spinal anesthesia, hydrocortisone relative to placebo could significantly reduce pain severity in several times within the first 48 hours after spinal anesthesia (6). Since dexamethasone is more potent and longer acting than hydrocortisone, this study aimed to evaluate the effect of dexamethasone in prevention of headache following spinal anesthesia.

## Methods

After the study protocol was approved by the Ethics Committee of Birjand University of Medical Sciences, this randomized double-blind clinical study was performed on patients 15-50 years who were scheduled for cesarean surgery in Valiasr general hospital from August 2013 to March 2015. According to the study conducted by the Manuchehrian et al., sample size was calculated 104 patients, 52 patients in each group (7). After obtaining the informed consent, the patients were randomly assigned into case and control group. All the patients with prohibition of spinal anesthesia (for example, coagulation disorders, peripheral neuropathy, infection of the needle insertion site, and spinal cord disorders) and those with a history of headache, migraine, and hypertension (as in eclampsia and preeclampsia) were excluded.

We used simple randomization for allocation into groups and consumed numbers from 1-52 as case group and numbers 53-104 as the control group. The numbers from 1 to 104 were written on sheets and placed in closed envelopes in a box. When each patient entered the operating room, she chose one of the envelopes randomly from the box and handed it to the anesthesia technician who was informed of interventions and responsible for drug preparation. The drugs were prepared in similar syringes including 2 ml dexamethasone or normal saline respectively for case and control groups and used by the anesthetist for intravenous injection. Therefore, in the study, the patients and the anesthetist were blinded to the study groups. Patients in both groups received isotonic saline 1 lit before surgery. Heart rate and blood pressure were measured 5 to 30 minutes from the surgery onset as well as every 15 minutes to the end of the surgery.

After prep and drape, spinal anesthesia was performed with needle 25 quince at l3-l4 or l4-l5 intervertebral space with intrathecal injection of 0.5% bupivacaine 15 mg (3 ml) in sitting position. Afterwards, the patients were recruited to supine position while the table head was mildly tilted down to 30 degrees. The level of analgesia was examined by skin pin prick every 10 seconds. As soon as the sensory level arrived at T4, the patient's table was put in natural position. The severity of postoperative headache was measured using visual analogue scale (VAS), and a subjective psychometric response scale was used to measure distinct behavioral or physiological phenomena such as pain based on linear numerical gradient with 0 to 10 degrees. The data were collected by the anesthesia provider in recovery and within 48 hours after surgery by independent investigators who were unaware of study groups. Also, the incidence of headache within 48 hours was assessed. The collected data were analyzed in SPSS-16 using independent t-test, chi-square, and Fisher's exact test. Normality of pain was confirmed by Kolmogorov-Smirnov test.

## Results

Data for the study involved 104 patients (n=52 in case and n=52 in the control groups). Table 1 compares demographic variables in case and control groups. Case and control groups had no significant difference in terms of age (P=0.386), height (P=0.625), education (P=0.962), and job (P=0.402). Therefore, the study groups matched according to these demographic characteristics, and the observed association would arguably show the effect of exposure.

In order to assess the intervention effect, the average scores of headache severity in case and control groups in recovery and within 48 hours after surgery are presented in Table 2. The mean and standard deviation of VAS score was 0.75±1.19 in cases and 0.73±1.64 in the controls when patients were in the recovery room. There were no significant association between postoperative headache and dexamethasone injection (P=0.943). However, headache increased to 1.05 in the cases and 1.01 in the controls after 48 hours. This group difference was still not significant (P=0.930).

Finally, difference in the incidence of PDPH between case and control groups is reported in Table 3. Three patients in case and 5 in control groups reported PDPH in the recovery room. These measures increased respectively to 8 and 10 after 48 hours. Owever, chi-square results does not show a significant association between PDPH and dexamethasone injection in recovery (P=0.715) and 48 hours after surgery (P=0.604).

**Table 1: Demographic characteristics of the participants in the two groups**

| Demographics | Case | Control | $\chi 2$ | P-value |
|---|---|---|---|---|
| **Age:** | | | | |
| 17-26 | 16 | 18 | | |
| 27-36 | 31 | 25 | 1.903 | 0.386 |
| 37-46 | 5 | 9 | | |
| **Height:** | | | | |
| 140-150 | 10 | 8 | | |
| 151-160 | 14 | 16 | 1.756 | 0.625 |
| 161-170 | 18 | 22 | | |
| ≥171 | 10 | 6 | | |
| **Education:** | | | | |
| Uneducated | 3 | 2 | | |
| Elementary | 8 | 10 | | |
| Secondary | 2 | 3 | 0.898* | 0.962* |
| High school | 7 | 6 | | |
| College graduate | 32 | 31 | | |
| **Job:** | | | | |
| Housewife | 43 | 46 | 0.701 | 0.402 |
| Employee | 9 | 6 | | |

*4 cells (40.0%) have expected count less than 5; therefore, fisher exact test is reported.

**Table 2: Comparison of the average of headache severity in the two groups**

| Headache severity | Case (Mean± SD#) | Control (Mean± SD#) | Independent-samples t-test | |
|---|---|---|---|---|
| In recovery | 0.75±1.19 | 0.73±1.64 | t=0.07 | P=0.943 |
| Within 48 hours | 1.05±2.32 | 1.01±2.31 | t=0.08 | P=0.930 |

**Table 3: Incidence of PDPH in both groups.**

| PDPH | Case | Control | $\chi 2$ | p-value |
|---|---|---|---|---|
| **In recovery:** | | | | |
| Yes | 3 | 5 | 0.542* | 0.715* |
| No | 49 | 47 | | |
| **Within 48 hours:** | | | | |
| Yes | 8 | 10 | 0.269 | 0.604 |
| No | 44 | 42 | | |

*4 cells (40.0%) have expected count less than 5; therefore, fisher exact test is reported

## Discussion

Spinal anesthesia in obstetric patients may be accompanied by some complications, of which PDPH is the worst (8). Treatment of headache is difficult and may sometimes be time-consuming. Therefore, it is rational to search for the best way to prevent it.

According to a systematic review conducted on 23 trials (2477 participants), routine bed rest after dural puncture was not beneficial for prevention of headache (9). A recent meta-analysis on 7 trials (1101 patients) showed that lateral decubitus position during spinal anesthesia was associated with significant reduction of PDPH incidence (10).

Needle gauge and tip design may be effective in prevention of PDPH, but a large systematic review could not confirm the effect of non-traumatic needles versus traumatic ones on PDPH; also, the review did not show any preference for small needles over large ones (11).

Although several studies have already considered medical treatment of PDPH (12), there are only a few studies on medical prevention of PDPH. In this study, we showed that dexamethasone did not have any preventive effect on PDPH in cesarean section surgery. In confirmation of our study, a recent randomized, double-blinded, placebo-controlled trial indicated that prophylactic intravenous administration of 8 mg dexamethasone after spinal anesthesia did not have any protective effect against PDPH and even increased the incidence of PDPH in the first 24 h in parturient patients (13). In another research, conducted on 178 patients who were supposed to undergo lower extremity orthopedic surgery, Doroudian and colleagues showed that intravenous dexamethasone 8 mg, when administered preoperatively, effectively reduced the severity of PDPH while it increased patients' satisfaction (14). In another study, Naghibi et al. showed that aminophylline 1.5 mg/kg IV plus dexamethasone 0.1 mg/kg IV may be associated with greater reduction in the incidence of PDPH until 48 h after orthopedic surgery compared with using each of them alone, while it had no important side effects (15). Probably, the contradictory results of our study with the last two studies are related to the patient physiologic changes in pregnancy. However, in contrast, Hamzei et al in their study which was carried out on 160 cesarean patients, observed that intravenous dexamethasone reduced the incidence of PDPH on the first 24 hours and also on the first week after surgery in comparison with placebo group (5). Thus, we recommend another large trial to clarify the effect of dexamethasone on PDPH.

## Conclusions

In this study, we conclude that intravenous dexamethasone did not have any beneficial effect in prevention of post-dural puncture in cesarean.

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The study protocol is approved by the Ethics Committee of Birjand University of Medical Sciences and registered in the Iranian Registry of Clinical Trials by identified registry number IRCT2017080117756N22. We thank all the students and professors who helped us with this study.

## Authors' contributions

Each author contributed in equal part to the manuscript.

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## Conflict of interests

None

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