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Original Research Article

Comparison of Two Doses of Intravenous Dexamethasone along with Spinal Anesthesia, Prolonging Postoperative Analgesia in the Lower-Segment Caesarean Section

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Abstract

Introduction: Lower-segment caesarean section is commonly performed under spinal anaesthesia, but postoperative pain remains an important concern as it may delay early ambulation, breastfeeding, and maternal recovery. Intravenous dexamethasone has anti-inflammatory, analgesic, and antiemetic properties and may improve postoperative comfort. This study compared the efficacy of 4 mg and 8 mg intravenous dexamethasone in prolonging postoperative analgesia after lower-segment caesarean section under spinal anesthesia.

Methods: This randomized controlled trial was conducted in the Department of Anaesthesiology at Shree Krishna Hospital, Karamsad, Anand, and Gujarat, India. A total of 66 patients undergoing lower segment caesarean section under spinal anaesthesia were included and randomly allocated into 2 equal groups of 33 each. Group A received 4 mg intravenous dexamethasone, while Group B received 8 mg intravenous dexamethasone just before spinal anaesthesia. Postoperative pain was assessed using the Numeric Rating Scale at 0, 2, 4, 8, 12, 16, and 24 hours. Total durations of analgesia, nausea, vomiting, and shivering, as well as rescue analgesic requirements, were also recorded.

Results: At 0 hours, both groups had a mean NRS score of 0. At 2 hours, Group A had a significantly higher mean NRS score than Group B (0.52 ± 0.71 vs 0.18 ± 0.46; $p = 0.02$). Similar significant differences were observed at 4, 8, and 12 hours, with lower pain scores in Group B. At 16 hours, the difference was not statistically significant (4.67 ± 0.99 vs 4.15 ± 1.12; $p = 0.052$). The mean duration of analgesia was significantly longer in Group B than in Group A (16.00 ± 3.46 hours vs 11.64 ± 3.22 hours; $p < 0.001$). Group B also had fewer episodes of nausea and vomiting ($p = 0.02$) and shivering ($p = 0.03$).

Conclusion: Intravenous dexamethasone 8 mg given before spinal anaesthesia was more effective than 4 mg in prolonging postoperative analgesia after lower segment caesarean section. It also reduced nausea, vomiting, and shivering, thereby improving overall perioperative comfort.

Keywords: Caesarean section, Dexamethasone, Spinal anaesthesia, Postoperative analgesia, Numeric Rating Scale, Shivering.

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Introduction

Lower segment caesarean section is one of the most commonly performed obstetric surgical procedures and is usually conducted under spinal anaesthesia because of its rapid onset, reliable sensory and motor blockade, and better maternal safety profile. However, postoperative pain after caesarean section remains an important clinical concern. Inadequate pain relief may delay early ambulation, interfere with breastfeeding, increase maternal discomfort, and affect early mother-child bonding. Effective postoperative analgesia is therefore an essential component of perioperative care in patients undergoing lower-segment caesarean section.[1–5]

Postoperative pain is multifactorial and involves inflammatory, neurogenic, and tissue injury-related mechanisms. Spinal anaesthesia provides good intraoperative anaesthesia, but its analgesic effect is limited to the early postoperative period. Various systemic and regional analgesic techniques have been used to extend postoperative pain relief, including opioids, nonsteroidal anti-inflammatory drugs, local anaesthetic adjuvants, and epidural analgesia. However, these methods may be associated with adverse effects such as nausea, vomiting, pruritus, sedation, respiratory depression, gastric irritation, renal dysfunction, or the need for technical expertise and additional monitoring.[6–10]

Dexamethasone is a long-acting synthetic corticosteroid with potent anti-inflammatory and antiemetic properties. Its analgesic effect is mainly attributed to the inhibition of phospholipase A2 and the reduction of inflammatory mediators, such as prostaglandins and cytokines. By reducing tissue inflammation, oedema, and peripheral sensitization, dexamethasone may decrease postoperative pain intensity and prolong the duration of analgesia. In addition, its antiemetic action is useful in reducing perioperative nausea and vomiting, which are common and distressing complications after caesarean section under spinal anaesthesia.[11–15]

Intravenous dexamethasone has gained interest as an adjuvant for postoperative analgesia because it is simple to administer, avoids neuraxial drug related concerns, provides systemic action, and allows accurate dose delivery. Previous studies have commonly evaluated 8 mg intravenous dexamethasone for postoperative analgesia, but lower doses may also provide clinically useful pain relief with a potentially lower drug exposure. The optimal dose of intravenous dexamethasone for prolonging postoperative analgesia after caesarean section, therefore, remains a relevant area of clinical evaluation.[1–3,16–18]

The present randomized controlled study was conducted to compare the efficacy of 4 mg and 8 mg intravenous dexamethasone administered along with spinal anaesthesia in prolonging postoperative analgesia in patients undergoing lower segment caesarean section. The study also assessed its effect on postoperative nausea, vomiting, and shivering during the perioperative period.

Materials and Methods

This randomized controlled trial was conducted in the Department of Anaesthesiology, Shree Krishna Hospital, Karamsad, Anand, Gujarat, India, after Institutional Ethics Committee approval [IEC/BU/143/Faculty/05/ 83/2023] and written informed consent.

A total of 66 ASA II to III patients undergoing lower segment caesarean section under spinal anaesthesia were included. Participants were randomly allocated into 2 equal groups of 33 each using WINPEPI software and the closed opaque envelope method. Group A received 4 mg intravenous dexamethasone and Group B received 8 mg intravenous dexamethasone just before spinal anaesthesia.

All patients underwent standard preoperative assessment and routine monitoring. Spinal anaesthesia was administered at the L3 to L4 intervertebral space using a 23G Quincke spinal needle, with 10 mg of 0.5% hyperbaric bupivacaine after confirmation of free cerebrospinal fluid flow.

Postoperative pain was assessed using the Numeric Rating Scale at 0, 2, 4, 8, 12, 16, and 24 hours. The primary outcome was comparison of postoperative pain scores between the 2 groups. Secondary outcomes included duration of analgesia, time to first rescue analgesic requirement, total analgesic requirement over 24 hours, and incidence of nausea, vomiting, and shivering. Requirement of inj. ephedrine and atropine was also recorded.

Data were entered in Microsoft Excel and analysed using IBM SPSS Statistics version 31.0. Continuous variables were expressed as mean and standard deviation, and categorical variables as frequency and percentage. Independent sample t-test and chi-square test were applied as appropriate. A p-value of less than 0.05 was considered statistically significant.

Results

Study Population: A total of 66 patients undergoing lower-segment caesarean section under spinal anaesthesia were included in the study. The patients were randomized equally into 2 groups of 33 each.

Group A received 4 mg intravenous dexamethasone, while Group B received 8 mg intravenous dexamethasone just before spinal anaesthesia. All patients were assessed for postoperative pain score, duration of analgesia, need for rescue analgesia, nausea, vomiting, shivering, and perioperative drug requirements.

Postoperative Pain Score (Table 1): Postoperative pain was assessed using the Numeric Rating Scale at 0, 2, 4, 8, 12, 16, and 24 hours. At 0 hours, both groups had a mean NRS score of 0. At 2 hours, Group A had a significantly higher mean NRS score than Group B. Similar significant differences were observed at 4, 8, and 12 hours, with Group B showing lower pain scores. At 16 and 24 hours, the mean NRS score remained lower in Group B, but the difference was not statistically significant. These findings show that 8 mg intravenous dexamethasone provided better pain control during the early postoperative period.

Table 1: Comparison of postoperative NRS score between Group A and Group B

Time interval	Group A (4 mg dexamethasone)	Group B (8 mg dexamethasone)	p value
0 hour	0	0	Not significant
2 hours	0.52 (0.71)	0.18 (0.46)	0.02
4 hours	1.91 (0.91)	1.12 (0.78)	<0.001
8 hours	3.03 (1.33)	2.09 (0.63)	0.001
12 hours	4.06 (1.30)	3.24 (1.12)	0.008
16 hours	4.67 (0.99)	4.15 (1.12)	0.052
24 hours	5 (0.83)	4.73 (1.07)	0.25

Duration of Analgesia (Table 2): The total duration of analgesia was significantly longer in Group B than in Group A. Patients who received 8 mg intravenous dexamethasone had a mean analgesic duration of 16.00 ± 3.46 hours, while patients who received 4 mg intravenous dexamethasone had a mean duration of 11.64 ± 3.22 hours.

The difference was statistically significant, showing that the higher dose prolonged postoperative analgesia by approximately 4.36 hours.

Table 2: Comparison of the total duration of analgesia between Group A and Group B

Parameter	Group A (4 mg dexamethasone)	Group B (8 mg dexamethasone)	p value
Total duration of analgesia	11.64 ± 3.22 hours	16.00 ± 3.46 hours	<0.001

Nausea, Vomiting, and Shivering (Table 3): Episodes of nausea and vomiting were lower in Group B compared with Group A. The difference was statistically significant. This suggests that 8 mg intravenous dexamethasone had a better antiemetic effect than 4 mg dexamethasone in the perioperative and early postoperative period. Perioperative shivering was also less frequent in Group B than in Group A, and the difference was statistically significant.

This indicates that 8 mg of intravenous dexamethasone was associated with better perioperative comfort and improved analgesic effect.

Table 3: Comparison of nausea and vomiting between Group A and Group B

Parameter	Group A (4 mg dexamethasone)	Group B (8 mg dexamethasone)	p value
Nausea and vomiting	Higher incidence	Lower incidence	0.02
Shivering	Higher incidence	Lower incidence	0.03

Rescue Analgesic Requirement: The requirement of rescue analgesia was assessed during the first 24 hours after surgery. As Group B had lower NRS scores during the early postoperative period and longer mean duration of analgesia, the need for rescue analgesia was delayed in patients who received 8 mg intravenous dexamethasone. This finding supports the superior analgesic efficacy of the 8 mg dose compared with the 4 mg dose.

Perioperative Drug Requirement: The requirement of inj. ephedrine and inj. atropine was recorded as part of intraoperative monitoring. These observations were included to assess perioperative safety and hemodynamic stability in both groups. The study drugs were administered under standard perioperative monitoring, and all patients were followed up to 24 hours after surgery.

Overall Findings: Overall, 8 mg intravenous dexamethasone was more effective than 4 mg intravenous dexamethasone in patients undergoing lower-segment caesarean section under spinal anaesthesia. Group B had lower postoperative NRS scores at 2, 4, 8, and 12 hours. The difference at 16 hours was not statistically significant, but the mean score remained lower in Group B. The total duration of analgesia was significantly longer in Group B, with a mean duration of 16.00 ± 3.46 hours compared with 11.64 ± 3.22 hours in Group

A. Group B also had significantly fewer episodes of nausea, vomiting, and shivering. These results indicate that 8 mg intravenous dexamethasone provided better postoperative analgesia and improved perioperative comfort compared with 4 mg intravenous dexamethasone.

Discussion

Postoperative pain after lower segment caesarean section remains an important concern in obstetric anaesthesia, as inadequate analgesia may delay ambulation, impair breastfeeding, increase maternal discomfort, and affect early mother-child interaction. In the present study of 66 patients undergoing lower segment caesarean section under spinal anaesthesia, 8 mg intravenous dexamethasone provided better postoperative analgesia than 4 mg intravenous dexamethasone. Group B showed lower NRS scores at 2, 4, 8, 12, and 24 hours, longer duration of analgesia, and lower incidence of nausea, vomiting, and shivering. This finding supports the role of intravenous dexamethasone as a useful systemic adjuvant in caesarean section patients.[1–5]

Postoperative Analgesia: In the present study, postoperative NRS scores were lower in the 8 mg dexamethasone group during the early postoperative period. At 2 hours, the mean NRS score was 0.52 ± 0.71 in Group A and 0.18 ± 0.46 in Group B, with a statistically significant difference. Similar significant differences were observed at 4, 8, and 12 hours. At 16 hours, the mean NRS score was still lower in Group B, but the difference was not statistically significant. This suggests that the analgesic advantage of 8 mg dexamethasone was more prominent during the first 12 postoperative hours.

Similar findings have been reported by Shalu and Ghodki, who observed that intravenous dexamethasone prolonged the duration of spinal anaesthesia in elective caesarean section.[1] Memon and Bagga also reported that a single dose intravenous dexamethasone improved postoperative pain and reduced postoperative nausea and vomiting in patients undergoing lower segment caesarean section under spinal anaesthesia.[2] The present findings are consistent with these studies and suggest that 8 mg dexamethasone is more effective than 4 mg for early postoperative pain control.

Duration of Analgesia: The total duration of analgesia was significantly longer in Group B than in Group A. Patients receiving 8 mg dexamethasone had a mean duration of analgesia of 16.00 ± 3.46 hours, while those receiving 4 mg dexamethasone had a mean duration of 11.64 ± 3.22 hours. This difference was statistically significant and clinically relevant. Prolonged analgesia after caesarean section helps early mobilization, maternal rest, newborn care, and breastfeeding.

The analgesic effect of dexamethasone is mainly related to inhibition of phospholipase A2 and suppression of inflammatory mediators such as prostaglandins and cytokines. These actions reduce peripheral sensitization, tissue inflammation, and oedema, thereby decreasing postoperative pain.[4,11,14,15] This mechanism explains the longer analgesic duration observed in the 8 mg group.

Nausea and Vomiting: In the present study, nausea and vomiting were significantly lower in Group B compared with Group A. This finding is consistent with the well-established antiemetic property of dexamethasone. Postoperative nausea and vomiting are common after caesarean section and may increase patient distress, delay oral intake, and reduce satisfaction with perioperative care.

Similar antiemetic benefits of dexamethasone have been reported in systematic reviews and clinical studies, showing a reduction in postoperative nausea, vomiting, and analgesic requirement after perioperative dexamethasone use.[12,19–22] The lower incidence in Group B suggests that 8 mg dexamethasone provides better antiemetic protection than 4 mg in this clinical setting.

Shivering: Shivering was also significantly less frequent in Group B. Post-spinal shivering is a common and uncomfortable perioperative event. It may increase oxygen consumption, interfere with monitoring, and add to maternal discomfort. The exact mechanism by which dexamethasone reduces shivering is not fully understood, but suppression of inflammatory mediators and possible modulation of the thermoregulatory response may be involved.

The present finding is comparable with previous studies that reported a reduction in post-spinal anaesthesia shivering with prophylactic intravenous dexamethasone.[23,24] This additional effect supports the overall benefit of 8 mg dexamethasone in improving perioperative comfort.

Clinical Implications: The present study suggests that 8 mg intravenous dexamethasone, administered before spinal anaesthesia, is more effective than 4 mg in improving postoperative analgesic outcome after lower segment caesarean section. It reduced early postoperative pain scores, prolonged analgesic duration, and decreased nausea, vomiting, and shivering. As an intravenous drug, dexamethasone is easy to administer, does not require additional technical skill, and avoids neuraxial drug-related concerns. These features make it a practical adjuvant in routine obstetric anaesthesia. [6,16,18,25]

Strengths and Limitations: The strength of this study lies in its randomized controlled design, equal group allocation, and assessment of pain at multiple postoperative time intervals. Important secondary outcomes, including duration of analgesia, nausea, vomiting, and shivering, were also evaluated. Limitations include the single-center design, small sample size, and follow-up limited to 24 hours. Maternal satisfaction, breastfeeding comfort, neonatal outcomes, and long-term adverse effects were not assessed.

Conclusion

The present study demonstrates that 8 mg intravenous dexamethasone is more effective than 4 mg intravenous dexamethasone in prolonging postoperative analgesia after lower segment caesarean section under spinal anaesthesia. Patients receiving 8 mg dexamethasone had lower postoperative pain scores during the early postoperative period and a significantly longer duration of analgesia.

The study also showed that 8 mg dexamethasone was associated with fewer episodes of nausea, vomiting, and shivering, thereby improving overall perioperative comfort. In conclusion, 8 mg intravenous dexamethasone given before spinal anaesthesia appears to be a simple, effective, and useful adjuvant for enhancing postoperative analgesia and recovery in patients undergoing lower-segment caesarean section.

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