

Effect of single-dose intravenous dexamethasone on postoperative pain and postoperative nausea and vomiting in patients undergoing lower segment cesarean section under spinal anesthesia



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ABSTRACT

Background: Lower segment caesarean sections (LSCS) are commonly done under spinal anaesthesia. Although spinal anaesthetic techniques are relatively safe and associated with quick and uneventful recovery, post-operative pain is a major concern after effect of spinal anaesthesia wears off. Other than pain postoperative nausea and vomiting (PONV) is one of the important side effects of spinal anaesthesia. Steroids by virtue of their anti-inflammatory effect is expected to reduce pain consequent upon inflammation and many studies have shown their efficacy in reducing pain as well as PONV in post-operative patients. **Aims and Objectives:** Primary objective of the study was to evaluate efficacy of single-dose dexamethasone in reducing post-operative pain. The secondary objectives were to analyse effect of single-dose dexamethasone on hemodynamic stability as well as incidence of nausea and vomiting in patients undergoing LSCS under spinal anesthesia. **Materials and Methods:** This was a double-blind comparative study in which 60 patients undergoing LSCS under spinal anaesthesia were included on the basis of a predefined inclusion and exclusion criteria. Written informed consent was obtained from all patients. The patients were divided into two groups: Group D: 30 patients who received IV dexamethasone 8 mg (2 ml) intravenously just before giving spinal anesthesia. Group N: 30 patients who received Normal saline (2 ml) immediately before spinal anesthesia. In both groups, hemodynamic parameters, respiratory rate, severity of post-operative pain, and incidence of PONV was compared. P value less than 0.05 was taken as statistically significant. **Results:** Patients in Group D had significantly less severe post-operative pain (as assessed by the Visual analog scale) and incidence of PONV ($P < 0.05$). Significantly less post-operative rescue analgesia was required in patients who received single dose of intravenous dexamethasone ($P < 0.05$). In terms of hemodynamic stability, both groups were found to be comparable with no statistically significant difference. **Conclusion:** Single-dose dexamethasone is effective in reducing post-operative pain as well as incidence of PONV in patients undergoing LSCS under spinal anesthesia.

Key words: Cesarean section; Dexamethasone; Post-operative pain; Post-operative nausea and vomiting

INTRODUCTION

With advances in obstetric care, there has been an increase in cesarean sections for emergency as well as elective

purposes. In addition to the usual indications such as fetal distress, non-progression of labor, Cephalo-pelvic disproportion it is also being done on patients request. Lower segment cesarean section (LSCS) is usually done

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under spinal anesthesia. It is having a distinct advantage such as simple technique, quick onset of anesthesia as well as reduced risk of aspiration. The absence of complication associated with intubation as well as early recovery are its other advantages.¹ For spinal anesthesia in patients undergoing LSCS the most common anesthetic agent used is hyperbaric Bupivacaine (0.5%). It usually takes care of anesthetic requirements during LSCS and supplementation with other anesthetic drugs are usually not required with Bupivacaine.²

Pain is an integral consequence of any surgery. Chemical mediators responsible for pain includes proinflammatory cytokines, serotonin, bradykinin as well prostaglandins. Control of post-operative pain is an important part of the management of any surgery. It becomes more important in cases of LSCS because post-operative pain, if severe, may affect the ability of woman to lactate the newborn which may have catastrophic consequences such as hypoglycaemic seizures in new-born. Moreover, studies have also suggested that inadequate pain control in post LSCS patients is associated with increased incidence of post-traumatic stress disorder. Therefore adequate post-operative pain relief is the cornerstone of the management of these patients.³

After pain, the other common side effect of spinal anesthesia include post-operative nausea and vomiting (PONV) which may be seen in up to 15–20% of the patients. PONV are more common in patients undergoing LSCS and major orthopedic surgeries. The mechanism of PONV is complex and many studies have found that it's not significantly associated with any particular drug or dose. Various factors which may contribute to PONV include hypotension, vagal stimulation, handling of the uterus during surgery, and use of drugs such as uterotonics and antibiotics. After adequate pain control minimizing severity of PONV is one of the important aspects of management of patients undergoing LSCS.⁴

Though various individual drugs can be used for the management of post-operative pain as well as PONV various studies have shown that steroids such as dexamethasone can reduce pain as well as PONV in patients undergoing LSCS under spinal anesthesia. Dexamethasone mainly has a strong glucocorticoid and very little mineralocorticoid activity. It has got a potent anti-inflammatory effect. Since post-operative pain is mainly mediated by pro-inflammatory cytokines such as prostaglandins, bradykinin as well as serotonin it is expected that dexamethasone will reduce pain by its anti-inflammatory properties.⁵ Reduced inflammation results in avoidance of nerve compression responsible for the generation of pain thereby reducing pain severity considerably. Many studies have shown that

a single dose of dexamethasone is effective in controlling post-operative pain as well as PONV. Moreover, in selected patients, a single dose of dexamethasone is less likely to cause any harm.⁶

We conducted this study to analyze the effect of single-dose dexamethasone on post-operative pain and PONV in patients undergoing LSCS under spinal anesthesia.

Aims and objectives

1. To evaluate efficacy of single-dose dexamethasone in reducing post-operative pain.
2. Analyse effect of single-dose dexamethasone on hemodynamic stability as well as incidence of nausea and vomiting in patients undergoing LSCS under spinal anesthesia.

MATERIALS AND METHODS

This was a double-blind comparative study conducted in the department of anesthesiology in Dr Shankar Rao Chavan Government Medical College Nanded. 60 patients undergoing lower segment cesarean section for various indications were included in this study on the basis of a predefined inclusion and exclusion criteria. The duration of the study was 1 year extending from June 2020 to May 2021. The institutional ethical committee approved study. An informed written consent was obtained from all the patients.

By using simple random sampling method patients were divided into 2 groups.

Group D: Received 8 mg (2ml) Dexamethasone intravenously just before giving spinal anesthesia.

Group N: Received 2ml Normal Saline intravenously just before giving spinal anesthesia.

A thorough pre-anesthetic evaluation was done including review of history. A thorough general as well systemic examination was done. All patients were kept nil per oral before surgery according to standard protocol. Patients in both the groups received either intravenous dexamethasone or normal saline just before giving spinal anesthesia depending upon the group they belonged to. Other than this conduct of anesthesia was kept similar in both the groups. Patients in both groups received ringers' lactate 10 ml/kg before spinal anesthesia. 2ml Hyperbaric Bupivacaine (0.5%) was used in both the groups for spinal anesthesia. The onset, as well as duration of motor as well as sensory blockade, was noted. Hemodynamic parameters such as heart rate (HR), systolic as well as diastolic pressure and mean arterial pressures were monitored.

In post-operative period severity of pain was monitored using the Visual Analogue Scale (VAS). Patients were given rescue analgesia (Injection Diclofenac sodium 75 mg single dose) on demand or when VAS score was more than 5. Injection ondansetron 4mg was given intravenously if there was any episode of vomiting. Both groups were compared in terms of intraoperative hemodynamic stability, severity of post-operative pain (as assessed on the basis of VAS and need for rescue analgesia), and incidence of PONV. Patient were followed up postoperatively for 24 h.

Sample size calculation was calculated on the basis of pilot studies done for analyzing effects of dexamethasone on postoperative pain as well as PONV. Keeping power (1- Beta error) at 80% and confidence interval (1-alpha error) at 95%, the minimum sample size required in each group was 30 patients therefore we included 30 patients in each group.

Inclusion criteria

1. Patients undergoing LSCS under spinal anesthesia
2. Those who gave written consent to be part of study
3. ASA Grade II patients.

Exclusion criteria

1. Patients who refused consent
2. Patients with a history of allergy or sensitivity to glucocorticoids
3. Patients in whom steroids are contraindicated such as peptic ulcer disease, glaucoma, and fungal infections
4. Serious co-morbid illnesses such as neoplastic diseases, immunodeficiency syndromes, and uncontrolled diabetes and hypertension
5. Patients on long-term steroids and immunosuppressants.

For statistical analysis, SSPS 21.0 software was used. Qualitative and quantitative variables between studied groups were compared using the chi-square test. P value less than 0.05 was taken as statistically significant.

RESULTS

Sixty patients of ASA II posted for elective as well as emergency LSCS were selected on the basis of a predefined criteria. They were randomly divided into two groups. Group D and Group N in which Group D denotes patients who received intravenous dexamethasone and group S denotes patients who received normal saline just before spinal anesthesia.

In our study, the most common age group of the studied cases was found to be between the age group of 21–30 years. The mean age of patients in Group P and Group S was found to be 25.03 ± 4.52 and 25.76 ± 5.04 years

respectively. The mean age of both groups was found to be comparable in both groups. Duration of surgery was found to be 41.46 ± 10.12 and 44.20 ± 12.10 in Group P and Group S Respectively. Both groups were found to be comparable in terms age and duration of surgery with no statistically significant difference ($P > 0.05$) (Table 1).

Comparison of HR, systolic as well as diastolic blood pressures, mean arterial pressure, SPO₂, and respiratory rates (RRs) showed that these parameters were comparable in both the groups with no statistically significant difference ($P > 0.05$) (Figures 1-6).

The comparison of mean VAS scores in immediate postoperative period as well as till 90 min showed that there

Table 1: Age and duration of surgery in both the groups

	Group D n (%)	Group S n (%)
Age (years)		
18–20	2 (6.67)	1 (3.33)
21–30	21 (70)	19 (63.33)
31–35	6 (20)	9 (30.00)
>35	1 (3.33)	1 (3.33)
Mean±SD	25.03 ± 4.52	25.76 ± 5.04
P value	0.55 (Not significant)	
Duration of surgery (from start to end of surgery)	41.46 ± 10.12	44.20 ± 12.10
$P = 0.34$ (not significant)		

Table 2: Comparison of mean VAS scores in studied cases

	Group D	Group S	P-value
Immediate post-operative period	00	00	-
30 min	00	00	-
60 min	00	00	-
90 min	00	00	-
120 min	0.26 ± 0.08	1.42 ± 0.76	<0.05 (significant)
150 min	0.32 ± 0.32	2.26 ± 0.90	<0.05 (significant)
180 min	1.84 ± 0.48	3.86 ± 0.34	<0.05 (significant)
4 h	2.82 ± 0.72	3.92 ± 0.38	<0.05 (significant)
6 h	4.20 ± 0.46	4.32 ± 0.44	>0.05 (not significant)

Table 3: Incidence of post-operative nausea and vomiting

Post-operative nausea and vomiting	Group D n (30) (%)	Group S n (30) (%)
Present	2 (6.66)	7 (23.33)
Absent	28 (93.33)	23 (76.66)
$P \leq 0.0001$ (Highly significant)		

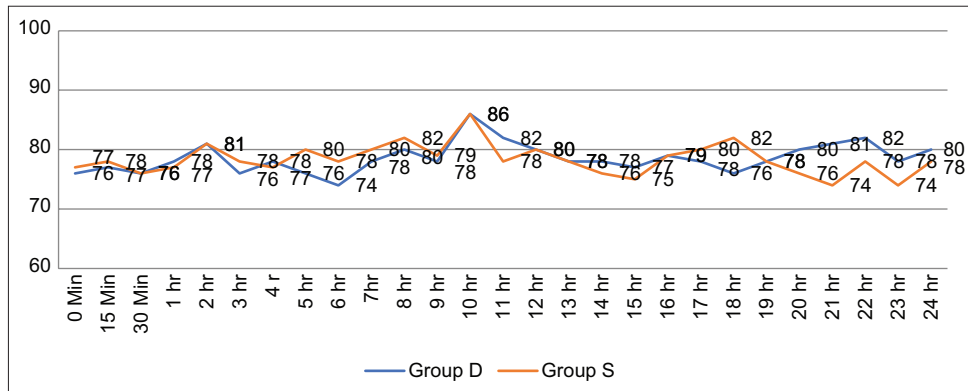


Figure 1: Comparison of mean heart rates in the studied groups

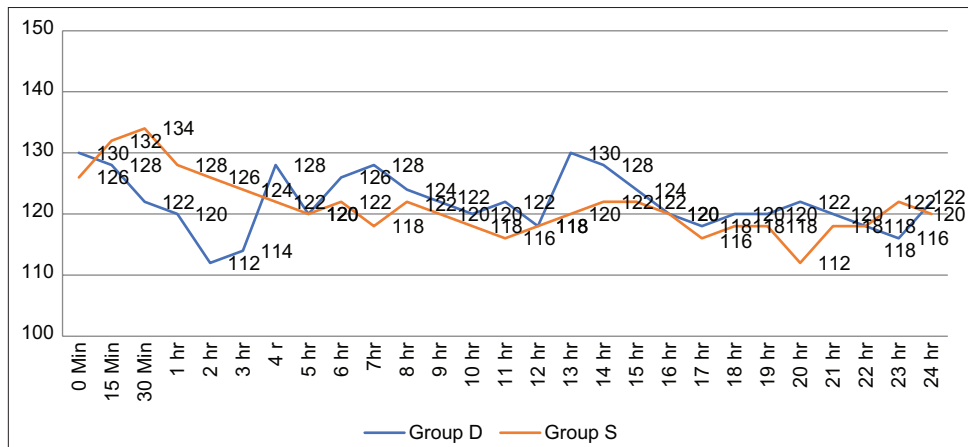


Figure 2: Comparison of systolic Blood pressure in both the groups

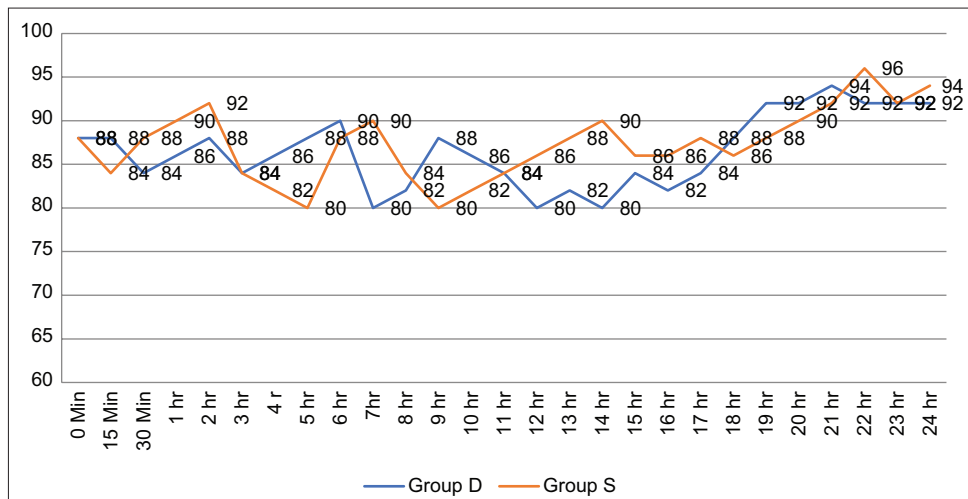


Figure 3: Comparison of Diastolic Blood pressure in both the groups

was no pain in patients of either group till 90 min after surgery. After 90 min Patients in Group D were found to have less severe pain as assessed by VAS scores as compared to patients in group and the difference was found to be statistically significant ($P < 0.05$). However, at 6 h post-operatively the severity of pain was found to be comparable

in both the groups with no statistically significant between patients of both the groups ($P > 0.05$) (Table 2).

The analysis of need to give analgesics in Group A and Group B revealed that there was a statistically significant difference between average requirements of analgesics

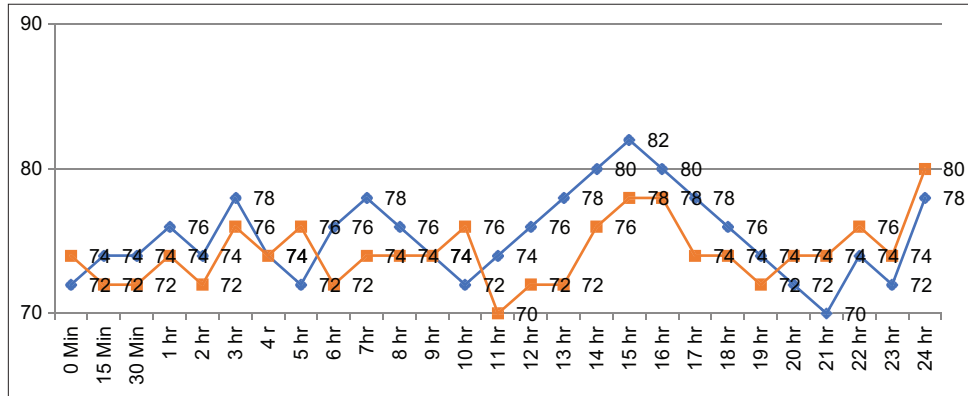


Figure 4: Comparison of mean arterial pressure in studied cases

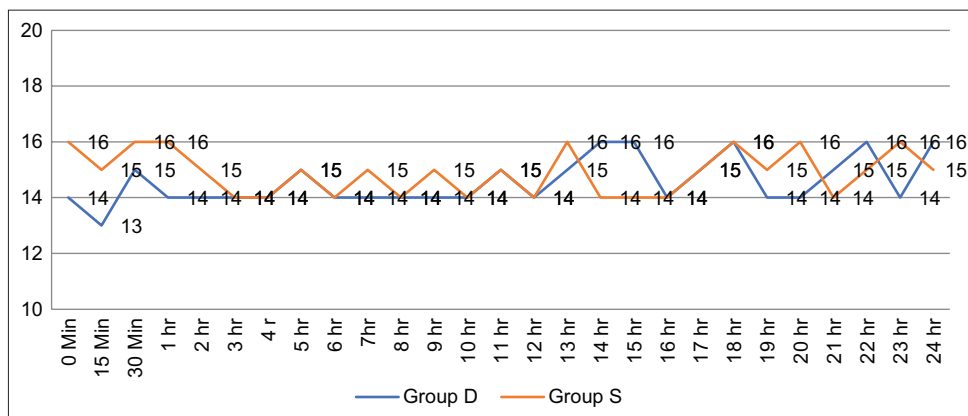


Figure 5: Comparison of respiratory rates in studied cases

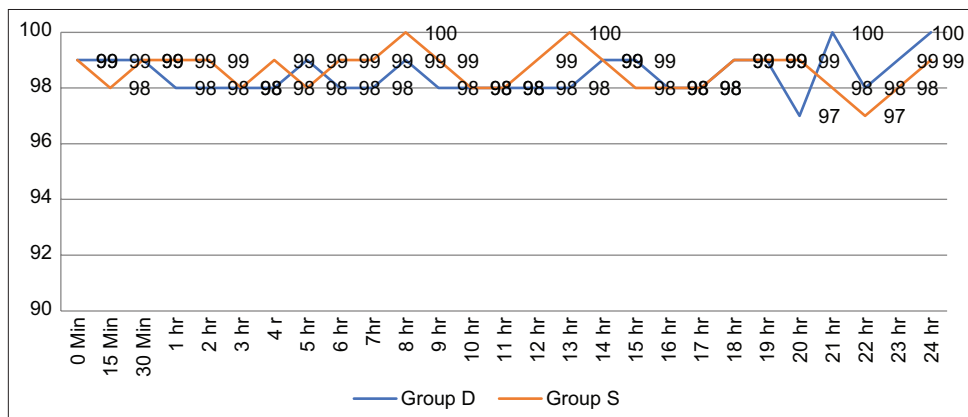


Figure 6: Comparison of SPO2 in studied cases

in post-operative period in these 2 groups. The average requirement of analgesics (Inj Diclofenac sodium) was 62 ± 28.4 mg and 132 ± 74.2 mg in Group D and Group S respectively. The statistical analysis showed this difference to be significant ($P < 0.05$) (Figure 7).

The incidence of postoperative nausea vomiting was higher in group S (16.67%) than Group D (3.33%) and the difference was found to be statistically highly significant ($P < 0.0001$) (Table 3).

DISCUSSION

The study comprised of 60 patients who were delivered by lower segment cesarean section under spinal anesthesia. The main endpoint of our study was to analyze effectiveness of a single dose intravenous dexamethasone on post-operative pain and PONV. Since inflammation as well as release of pro-inflammatory cytokines is one of the key factors in causation of pain and PONV steroids by their anti-inflammatory effect are expected to reduce the pain as well as PONV.

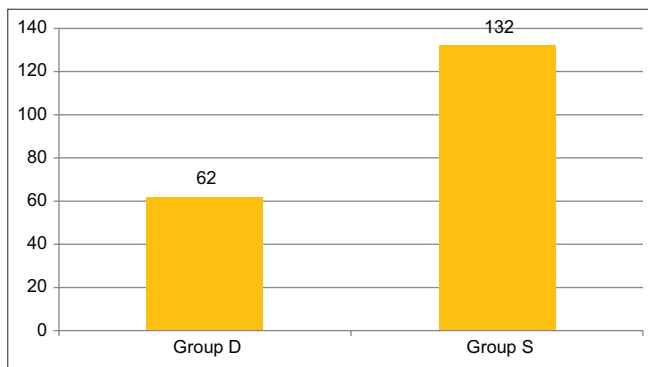


Figure 7: Requirement of analgesic in Group A and Group B

Shahraki et al. conducted a study of 60 patients posted for elective caesarean section. Patients were randomly assigned into two groups: A (treatment: 8 mg IV Dexamethasone) and B (control: 2 mL normal saline). In both groups, variables such as mean arterial blood pressure (MAP), HR, RR, pain and vomiting severity (based on visual analog scale [VAS]) were recorded in different time points during first 24 h after operation. The authors found that within-group comparisons including severity of pain, MAP, RR and HR had significant differences ($P < 0.001$ for all variables) during the study period. Between group comparisons indicated significant differences in terms of pain severity ($P < 0.001$), MAP ($P = 0.048$) and HR ($P = 0.078$; marginally significant), which in case group were lower than the control group. On the basis of these findings the authors concluded that IV Dexamethasone efficiently reduces post-operative pain severity and the need for analgesic consumption after cesarean section.⁷ Similar beneficial effects of dexamethasone was also reported by authors such as Coloma et al.,⁸ and Romundstad et al.,⁹ after various ambulatory surgeries.

Another aspect of our study was to find out the effectiveness of dexamethasone in reducing PONV. Wakamiya et al., analyzed data of 98 patients undergoing various surgeries. The 72-h incidence of PONV was significantly lower in the dexamethasone group than in the control group (62.5% vs. 84.0%; RR 0.74, 95% CI 0.58–0.96, $P = 0.02$). During the first and second 24-h postoperative intervals, fewer patients in the dexamethasone group received rescue antiemetics. Visual analog scale scores for nausea and pain were lower in the dexamethasone group than in the control group during the first 24 h postoperatively. On the basis of these findings, the authors concluded that single dose of intravenous dexamethasone is effective in reducing post-operative pain as well as PONV.¹⁰ Similar beneficial effects of intravenous dexamethasone on the occurrence of PONV are also reported by the authors such as De Oliveira Jr et al.,¹¹ and Henzi et al.¹²

Single dose of intravenous dexamethasone in otherwise healthy individuals is less likely to alter hemodynamic stability of the patients and virtually does no harm to the patients. Many authors reported that while single dose of dexamethasone is effective in reducing post operative pain as well as incidence of nausea and vomiting it doesn't have any harmful effect on hemodynamic stability of the patients. Aldivia-Sánchez et al., conducted a study in which 92 patients were evaluated with an average age of 47 years. The outcome was analyzed on the basis of VAS and hemodynamic stability in patients undergoing various surgeries and receiving intravenous Dexamethasone. The authors concluded that dexamethasone better controlled postsurgical pain and had adequate hemodynamic stability.¹³ Similar hemodynamic stability was also reported by the authors such as Buland et al.,¹⁴ and Ituk et al.,¹⁵

Limitations of the study

Since patients were followed up for 24 h post-operatively the benefits of giving single-dose intravenous dexamethasone can be ascertained for up to 24 h post-operatively. Although a single dose of intravenous dexamethasone is less likely to have any significant effect however this aspect was not analyzed and this was limitation of our study.

CONCLUSION

Single dose of intravenous dexamethasone is effective in reducing post-operative pain, need for rescue analgesics and incidence of PONV and doesn't have any adverse impact on hemodynamic stability.

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Authors' Contributions:

NM- Concept and design of the study, prepared first draft of manuscript, Interpreted the results; reviewed the literature and manuscript preparation;
JB- Concept, coordination, statistical analysis and interpretation, preparation of manuscript and revision of the manuscript.

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