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Original Research Article

Comparison of Vasopressor Requirements in Elective versus Emergency Cesarean Section Under Spinal Anesthesia

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Abstract

Background: Spinal anesthesia is the preferred anesthetic technique for cesarean section; however, spinal-induced hypotension frequently necessitates vasopressor use. Emergency cesarean sections are often associated with greater hemodynamic instability compared to elective procedures.

Aim: To compare vasopressor requirements in patients undergoing elective versus emergency cesarean section under spinal anesthesia.

Methodology: This prospective observational study included 100 patients, divided into elective (n = 50) and emergency (n = 50) cesarean section groups. Hypotension was defined as a fall in systolic blood pressure ≥20% from baseline or an absolute systolic blood pressure <90 mmHg. Vasopressor requirement, cumulative dose, and maternal and neonatal outcomes were recorded and analyzed.

Results: Hypotension occurred in 56% of elective and 76% of emergency cesarean sections. Vasopressor support was required in 48% of elective cases compared to 80% of emergency cases. The mean cumulative vasopressor dose was significantly higher in the emergency group (15.8 ± 4.6 mg) than in the elective group (9.4 ± 3.2 mg). Maternal symptoms such as nausea and vomiting were more frequent in emergency cesarean sections, and neonatal outcomes showed a higher incidence of low Apgar scores and NICU admissions in this group.

Conclusion: Emergency cesarean section under spinal anesthesia is associated with significantly higher vasopressor requirements than elective cesarean section. Anticipation of hypotension and early vasopressor preparedness are essential to optimise maternal and neonatal outcomes.

Keywords: Cesarean Section, Spinal Anesthesia, Hypotension, Vasopressor Requirement, Emergency Surgery.

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Introduction

Spinal anesthesia is widely accepted as the anesthetic technique of choice for cesarean section due to its rapid onset, dense sensory blockade, avoidance of airway manipulation, and minimal fetal drug exposure [1]. However, spinal anesthesia commonly produces hypotension due to sympathetic blockade, leading to vasodilatation and reduced venous return [2].

The reported incidence of spinal anesthesia–induced hypotension during cesarean section ranges from 60–80% in the absence of prophylactic measures [3,4]. Maternal hypotension can cause nausea, vomiting, dizziness, and altered consciousness and may compromise uteroplacental perfusion, resulting in fetal acidosis and low Apgar scores [5,6]. Vasopressors are the cornerstone for managing spinal-induced hypotension [7]. Emergency cesarean sections often present with inadequate preoperative optimization, hypovolemia, and heightened maternal stress, contributing to greater hemodynamic instability compared with elective procedures [8]. Limited studies have directly compared vasopressor requirements between elective and emergency cesarean sections. This study aims to address this gap.

Methodology

Study Design and Setting: A prospective observational study was conducted in the Department of Anesthesiology at a tertiary care teaching hospital after institutional ethics committee approval.

Sample Size Calculation: Based on an expected prevalence of spinal-induced hypotension of 70%

reported in previous studies [3,4], sample size was calculated using:

$$n=Z^2\times p\times q/d^2$$

Where $Z = 1.96$, $p = 70$, $q = 30$, and $d = 10\%$.The calculated sample size was 81. To allow equal comparison and account for dropouts, 100 patients were included (50 elective, 50 emergency).

Study Population: Patients aged 18–40 years, ASA physical status II, undergoing elective or emergency cesarean section under spinal anesthesia were enrolled [9].

Anesthetic Technique: Spinal anesthesia was administered using hyperbaric bupivacaine. Patients were positioned supine with left uterine displacement. Standard monitoring was applied according to obstetric anesthesia guidelines [10].

Definition of Hypotension: Hypotension was defined as systolic blood pressure <90 mmHg or ≥20% fall from baseline [11].

Data Collection and Statistical Analysis: Data were collected using a pre-designed questionnaire, entered into Microsoft Excel, and analyzed using SPSS version 26.0. Appropriate statistical methods were applied based on data distribution. A p-value < 0.05 was considered significant.

Results

A total of 100 patients undergoing cesarean section under spinal anesthesia were included in the study, wth 50 patients each in the elective and emergency cesarean section groups. Baseline demographic characteristics, including age, body mass index, and baseline systolic blood pressure, were comparable between the two groups (Table 1).

Table 1: Baseline Characteristics

Variable	Elective (n=50)	Emergency (n=50)
Age (years)	27.1 ± 4.0	26.5 ± 4.4
BMI (kg/m²)	24.3 ± 3.0	25.2 ± 3.4
Baseline SBP (mmHg)	120.2 ± 8.6	116.8 ± 9.8

The incidence of spinal anesthesia–induced hypotension was higher in the emergency cesarean section group (76%) compared to the elective group (56%). Correspondingly, vasopressor support was required in a significantly greater proportion of emergency cases (80%) than elective cases (48%) (Table 2).

Emergency cesarean sections required higher cumulative vasopressor doses, with a mean dose of 15.8 ± 4.6 mg, compared to 9.4 ± 3.2 mg in the elective group. Additionally, repeated vasopressor bolus administration was more frequent in the emergency group (52%) than in the elective group (20%) (Table 3).

Table 2: Incidence of Hypotension and Vasopressor Requirement

Parameter	Elective	Emergency	p-value
Hypotension	28 (56%)	38 (76%)	<0.05
Vasopressor required	24 (48%)	40 (80%)	<0.01

Maternal symptoms associated with hypotension were observed more frequently in emergency cesarean sections. Nausea and vomiting occurred in 52% of emergency cases compared to 28% in elective cases. Other symptoms, including dizziness and sweating, were also more common in the emergency group (Table 4).

Table 3: Vasopressor Usage Profile

Variable	Elective	Emergency
Mean cumulative dose (mg)	9.4 ± 3.2	15.8 ± 4.6
Repeated bolus needed	10 (20%)	26 (52%)

Neonatal outcomes demonstrated a higher incidence of Apgar scores less than 7 at 1 minute in the emergency group (20%) compared to the elective group (8%). NICU admission was required in 12% of neonates in the emergency group, whereas 4% of neonates in the elective group required NICU care (Table 4).

Overall, emergency cesarean section under spinal anesthesia was associated with a higher incidence of hypotension, increased vasopressor requirement, higher cumulative vasopressor doses, and a greater frequency of maternal symptoms and adverse neonatal indicators compared to elective cesarean section.

Table 4: Maternal and Neonatal Outcomes

Outcome	Elective	Emergency
Nausea / vomiting	14 (28%)	26 (52%)
APGAR < 7 at 1 min	4 (8%)	10 (20%)
NICU admission	2 (4%)	6 (12%)

Discussion

The present study demonstrates significantly higher vasopressor requirements in emergency cesarean sections compared to elective procedures. The overall incidence of hypotension in emergency cases (76%) was higher than in elective cases (56%), consistent with earlier reports [3,4].

Carpenter et al. reported hypotension in nearly 75% of patients undergoing spinal anesthesia [2]. Emergency procedures are often associated with inadequate intravascular volume optimization and heightened stress responses, leading to exaggerated hypotensive episodes [8,12].

Mercier et al. and Ngan Kee et al. reported increased vasopressor consumption in situations associated with rapid-onset hypotension and reduced cardiovascular reserve [13,14]. Our findings of higher cumulative vasopressor dose and repeated bolus requirement in emergency cases are in agreement with these studies. Higher incidence of nausea, vomiting, and lower Apgar scores in emergency cases further underscores the clinical relevance of maintaining maternal hemodynamic stability [5,6].

Conclusion

Emergency cesarean section under spinal anesthesia is associated with significantly greater vasopressor requirements than elective cesarean section. Anticipation of hypotension and early vasopressor preparedness are essential to improve maternal and neonatal outcomes.

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