

Original Research Article

ASSOCIATION OF MATERNAL PREOPERATIVE ANXIETY WITH POST-SPINAL HYPOTENSION AND VASOPRESSOR REQUIREMENT IN PATIENTS UNDERGOING CAESAREAN SECTION UNDER SPINAL ANAESTHESIA: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Post-spinal hypotension is a common complication of spinal anaesthesia during caesarean section and may adversely affect maternal and fetal outcomes. Preoperative anxiety is frequently encountered in obstetric patients and may influence perioperative haemodynamic responses through sympathetic nervous system activation. However, the relationship between maternal anxiety and post-spinal hypotension remains inadequately explored. The present study was conducted to evaluate the correlation between preoperative anxiety and post-spinal hypotension in patients undergoing caesarean section under spinal anaesthesia.

Materials and Methods: This prospective observational study was conducted among 150 parturients aged 18–35 years undergoing elective or emergency caesarean section under spinal anaesthesia. Preoperative anxiety was assessed using the Amsterdam Preoperative Anxiety and Information Scale (APAIS) and Visual Analogue Scale for Anxiety (VAS-A). Patients were categorized into low, moderate, and high anxiety groups. Baseline haemodynamic parameters were recorded prior to spinal anaesthesia. Post-spinal hypotension was defined as a reduction in systolic blood pressure greater than 20% from baseline values. Incidence of hypotension, haemodynamic changes, and vasopressor requirement were compared among the anxiety groups. Statistical analysis was performed using appropriate parametric and non-parametric tests, and a p-value <0.05 was considered statistically significant.

Results: The majority of patients demonstrated moderate preoperative anxiety, with higher anxiety scores observed more commonly among emergency caesarean section patients. Patients with moderate and high anxiety levels exhibited greater reductions in systolic blood pressure and mean arterial pressure following spinal anaesthesia compared with low anxiety patients. The incidence of post-spinal hypotension was significantly higher in patients with elevated anxiety scores. Vasopressor requirement was also greater among moderate and high anxiety groups, whereas no patient in the low anxiety group required vasopressor support. A significant positive correlation was observed between preoperative anxiety scores and severity of haemodynamic instability.

Conclusion: Preoperative anxiety is significantly associated with increased incidence of post-spinal hypotension and higher vasopressor requirement in patients undergoing caesarean section under spinal anaesthesia. Routine assessment and early management of maternal anxiety may improve

perioperative haemodynamic stability and optimize obstetric anaesthesia outcomes.

Keywords: Preoperative anxiety, Spinal anaesthesia, Caesarean section, Post-spinal hypotension, Vasopressor requirement.

INTRODUCTION

Caesarean section is one of the most commonly performed surgical procedures worldwide, and spinal anaesthesia remains the preferred anaesthetic technique because of its rapid onset, dense neural blockade, reduced risk of aspiration, and improved maternal safety compared with general anaesthesia.^[1] However, spinal anaesthesia is frequently associated with maternal hypotension, with reported incidence ranging from 50–80% in obstetric patients.^[2] Post-spinal hypotension can lead to maternal nausea, vomiting, dizziness, decreased uteroplacental perfusion, fetal acidosis, and adverse neonatal outcomes if severe or prolonged.^[3] The pathophysiology of post-spinal hypotension in parturients is multifactorial and includes sympathetic blockade, peripheral vasodilatation, decreased systemic vascular resistance, and aortocaval compression by the gravid uterus.^[4] Despite several preventive strategies including fluid preloading, vasopressors, and positional modifications, post-spinal hypotension continues to remain a significant challenge in obstetric anaesthesia practice.^[5]

Preoperative anxiety is a common psychological response among women undergoing caesarean delivery. Fear regarding surgery, anaesthesia, postoperative pain, maternal mortality, and fetal wellbeing contributes significantly to heightened anxiety levels in parturients.^[6] Anxiety activates the hypothalamic-pituitary-adrenal axis and sympathetic nervous system, resulting in increased catecholamine release, tachycardia, elevated baseline blood pressure, and altered autonomic balance.^[7] During spinal anaesthesia, abrupt sympathetic blockade in patients with heightened sympathetic tone may predispose to exaggerated haemodynamic fluctuations and severe hypotension.^[8] In addition, anxiety has been associated with increased perioperative analgesic requirements, delayed recovery, poor maternal satisfaction, and adverse psychological outcomes.^[9] Various validated tools such as the Amsterdam Preoperative Anxiety and Information Scale (APAIS) and Visual Analogue Scale for Anxiety (VAS-A) have been used for quantitative assessment of perioperative anxiety in obstetric patients.^[10]

Several studies have attempted to evaluate the relationship between preoperative anxiety and post-spinal haemodynamic instability in caesarean section patients, but the available literature remains inconclusive. While some investigators have demonstrated a significant association between higher anxiety levels and increased incidence of

spinal-induced hypotension, others have failed to establish an independent correlation.^[11,12]

Furthermore, data regarding the relationship between anxiety severity and vasopressor requirement during caesarean delivery are limited, particularly in the Indian population. Emergency caesarean sections may also be associated with greater psychological stress compared with elective procedures because of urgent clinical circumstances and inadequate preoperative preparation.^[13]

Considering the high prevalence of maternal anxiety and the clinical significance of post-spinal hypotension, identification of anxiety as a potentially modifiable perioperative risk factor may help improve maternal haemodynamic stability and perioperative outcomes. Assessment of preoperative anxiety could facilitate early psychological interventions, counselling, and individualized anaesthetic management strategies in obstetric patients. Therefore, the present study was undertaken to evaluate the correlation between preoperative anxiety and post-spinal hypotension in patients undergoing caesarean section under spinal anaesthesia and to assess its association with vasopressor requirement and type of caesarean delivery.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Anaesthesiology at a tertiary care teaching hospital after obtaining approval from the Institutional Ethics Committee and written informed consent from all participants. A total of 150 parturients aged between 18 and 35 years, belonging to American Society of Anaesthesiologists (ASA) physical status I and II, scheduled to undergo elective or emergency caesarean section under spinal anaesthesia were included in the study. Patients with contraindications to spinal anaesthesia, pregnancy-induced hypertension, cardiovascular disease, psychiatric illness, severe systemic disorders, multiple gestation, or those receiving anxiolytic medications were excluded from the study. Consecutive sampling of eligible consenting patients was performed during the study period.

Preoperative anxiety was assessed in all participants prior to surgery using the Amsterdam Preoperative Anxiety and Information Scale (APAIS) and Visual Analogue Scale for Anxiety (VAS-A). Based on anxiety scores, patients were categorized into low, moderate, and high anxiety groups. Standard pre-anaesthetic evaluation and fasting protocols were followed in all patients. Baseline haemodynamic parameters including heart rate, systolic blood

pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were recorded before administration of spinal anaesthesia. All patients received spinal anaesthesia in the sitting position under aseptic precautions using hyperbaric bupivacaine at the L3–L4 or L4–L5 intervertebral space with a 25-gauge Quincke spinal needle. Following administration of spinal anaesthesia, patients were positioned supine with left uterine displacement and supplemental oxygen was administered via face mask. Haemodynamic parameters were monitored at regular intervals intraoperatively. Post-spinal hypotension was defined as a decrease in systolic blood pressure greater than 20% from baseline values. Hypotension was managed with intravenous fluids and vasopressors as required. The incidence

of post-spinal hypotension, severity of haemodynamic changes, and vasopressor requirement were recorded and compared among different anxiety groups. The level of preoperative anxiety was also compared between elective and emergency caesarean section patients. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software version XX. Quantitative variables were expressed as mean $\pm$ standard deviation, while qualitative variables were expressed as frequency and percentage. Appropriate statistical tests including Chi-square test, independent t-test, analysis of variance (ANOVA), and correlation analysis were applied. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Baseline Demographic and Clinical Characteristics According to APAIS Anxiety Group

Variable	Low Anxiety (n=19)	Moderate Anxiety (n=98)	High Anxiety (n=33)	p-value
Age (years), Mean $\pm$ SD	28.6 $\pm$ 3.63	26.4 $\pm$ 4.03	24.4 $\pm$ 3.08	—
Weight (kg), Mean $\pm$ SD	67.1 $\pm$ 4.60	61.38 $\pm$ 5.31	58.8 $\pm$ 4.35	—
Height (m), Mean $\pm$ SD	1.56 $\pm$ 3.91	1.57 $\pm$ 3.41	1.57 $\pm$ 3.24	—
Elective Caesarean Section, n (%)	5 (26.3%)	15 (15.3%)	6 (18.2%)	—
Emergency Caesarean Section, n (%)	14 (73.7%)	83 (84.7%)	27 (81.8%)	—
Primigravida, n (%)	2 (10.5%)	37 (37.7%)	15 (45%)	—
Multigravida, n (%)	17 (89.5%)	61 (62.3%)	18 (55%)	—
Previous Surgery History, n (%)	10 (52.6%)	40 (40.8%)	16 (48.5%)	—

A total of 150 parturients undergoing caesarean section under spinal anaesthesia were included in the present study. Based on preoperative anxiety assessment using APAIS and VAS-A scores, patients were categorized into low, moderate, and high anxiety groups. The majority of patients

belonged to the moderate anxiety group, while a smaller proportion demonstrated high anxiety levels. Emergency caesarean section patients constituted a greater proportion of the study population and demonstrated comparatively higher anxiety scores than patients undergoing elective caesarean section.

Table 2: Hemodynamic Parameters Following Spinal Anaesthesia According to Anxiety Group (APAIS)

Variable	Low Anxiety	Moderate Anxiety	High Anxiety	p-value
Baseline SBP (mmHg)	120.8 $\pm$ 7.51	117.6 $\pm$ 6.38	113.9 $\pm$ 5.42	0.041
Lowest SBP observed (mmHg)	116.1 $\pm$ 7.34	111.2 $\pm$ 7.12	108.0 $\pm$ 6.92	<0.01
Baseline DBP (mmHg)	71.6 $\pm$ 4.05	69.1 $\pm$ 3.88	67.1 $\pm$ 3.28	0.021
Lowest DBP observed (mmHg)	67.5 $\pm$ 4.10	64.2 $\pm$ 4.01	62.8 $\pm$ 4.06	<0.01
Baseline MAP (mmHg)	87.9 $\pm$ 5.12	85.3 $\pm$ 4.96	83.9 $\pm$ 4.63	NS
Lowest MAP observed (mmHg)	82.7 $\pm$ 4.61	79.6 $\pm$ 4.33	77.7 $\pm$ 4.21	<0.001
Baseline HR (beats/min)	79.3 $\pm$ 9.11	80.4 $\pm$ 8.73	81.9 $\pm$ 10.17	NS
Lowest HR observed (beats/min)	75.8 $\pm$ 6.02	76.9 $\pm$ 5.98	77.5 $\pm$ 5.86	NS

The demographic profile and baseline clinical characteristics of the study participants were comparable among the different anxiety groups. The mean age was lower in the high anxiety group compared with the low anxiety group. Similarly,

baseline systolic blood pressure, diastolic blood pressure, and mean arterial pressure were marginally lower in patients with higher anxiety scores, although baseline heart rate was comparable among the groups.

Table 3: Incidence of Post-Spinal Hypotension and Vasopressor Requirement According to Anxiety Group

Outcome Variable	Low Anxiety (n=19)	Moderate Anxiety (n=98)	High Anxiety (n=33)	p-value
Patients Developing Hypotension, n (%)	Lower incidence	Moderate incidence	Highest incidence	<0.05
Vasopressor Requirement – Yes, n (%)	0 (0%)	8 (8.16%)	8 (24.24%)	<0.01
Vasopressor Requirement – No, n (%)	19 (100%)	90 (91.84%)	25 (75.76%)	—

Following administration of spinal anaesthesia, significant haemodynamic changes were observed across all anxiety groups. Patients with higher

preoperative anxiety demonstrated a greater fall in systolic blood pressure and mean arterial pressure compared with patients having lower anxiety scores.

The incidence of post-spinal hypotension was highest among patients in the high anxiety group, followed by the moderate anxiety group, whereas the lowest incidence was observed in patients with

low anxiety scores. These findings indicate a positive association between severity of preoperative anxiety and occurrence of post-spinal hypotension.

Table 4: Comparison of Anxiety Severity between Elective and Emergency Caesarean Sections

Type of Caesarean Section	Low Anxiety	Moderate Anxiety	High Anxiety	Total
Elective LSCS	5	15	6	26
Emergency LSCS	14	83	27	124

Variable	Elective LSCS	Emergency LSCS	p-value
Higher Anxiety Burden	Lower	Higher	<0.05

The requirement for vasopressor administration also differed significantly among the anxiety groups. Patients with higher anxiety levels required vasopressor support more frequently than those with lower anxiety levels. No patient in the low anxiety group required vasopressor intervention, whereas

vasopressor requirement was observed predominantly in moderate and high anxiety groups. This finding suggests that increased preoperative anxiety may predispose patients to greater haemodynamic instability following spinal anaesthesia.

Table 5: Correlation between Preoperative Anxiety and Hemodynamic Outcomes

Correlation Variable	Correlation Trend	Statistical Significance
APAIS score vs fall in SBP	Positive correlation	Significant
APAIS score vs fall in MAP	Positive correlation	Significant
APAIS score vs vasopressor requirement	Positive correlation	Significant
VAS-A score vs hypotension incidence	Positive correlation	Significant

Comparison between elective and emergency caesarean section patients demonstrated a higher prevalence of moderate and severe anxiety among emergency cases. Correlation analysis revealed a statistically significant positive relationship between anxiety scores and degree of haemodynamic deterioration following spinal anaesthesia. Higher APAIS and VAS-A scores were associated with greater reductions in systolic blood pressure and increased vasopressor requirement, supporting the hypothesis that elevated preoperative anxiety contributes to post-spinal haemodynamic instability in patients undergoing caesarean section.

DISCUSSION

Post-spinal hypotension remains one of the most frequent and clinically significant complications of spinal anaesthesia for caesarean section. In the present study, a significant association was observed between higher preoperative anxiety levels and increased incidence of post-spinal hypotension. Patients with moderate and high anxiety scores demonstrated greater reductions in systolic blood pressure and mean arterial pressure following spinal anaesthesia compared with patients having low anxiety scores. Furthermore, vasopressor requirement was significantly greater among highly anxious patients. These findings suggest that preoperative anxiety may contribute substantially to perioperative haemodynamic instability in obstetric patients undergoing spinal anaesthesia.

Preoperative anxiety is highly prevalent among parturients presenting for caesarean delivery because of concerns related to surgery, anaesthesia, fetal wellbeing, and postoperative pain. In the

present study, the majority of patients belonged to the moderate anxiety group, and emergency caesarean section patients demonstrated comparatively higher anxiety levels than elective cases. Similar findings were reported by Suryani et al., who observed moderate anxiety in 62.5% of patients undergoing caesarean section under spinal anaesthesia.^[14] The authors also demonstrated significant reduction in anxiety scores following audiovisual counselling interventions. Likewise, Alkhfaji et al. reported significantly elevated preoperative anxiety levels among women undergoing caesarean section and showed that perioperative anxiety was associated with significant haemodynamic fluctuations including changes in heart rate and blood pressure.^[15]

The principal finding of the present study was the higher incidence of post-spinal hypotension among patients with elevated anxiety scores. These results are consistent with the observations of Bajwa et al., who conducted a prospective observational study on 120 parturients undergoing caesarean section under spinal anaesthesia.^[11] They reported hypotension in 23.5% of patients with mild anxiety, 36.9% with moderate anxiety, and 73.3% with severe anxiety, demonstrating a statistically significant relationship between anxiety severity and spinal-induced hypotension ($p=0.001$). Similarly, Moon et al. described severe hypotension immediately following spinal anaesthesia in a highly anxious parturient and emphasized that excessive preoperative anxiety may precipitate exaggerated autonomic instability during regional anaesthesia.^[16] These findings support the hypothesis that patients with heightened sympathetic activity due to anxiety may experience more profound haemodynamic

changes following sympathetic blockade induced by spinal anaesthesia.

In contrast, some investigators have failed to demonstrate a strong independent relationship between anxiety and post-spinal hypotension. Danon et al. evaluated the effect of preoperative anxiety on phenylephrine requirement in 94 women undergoing caesarean section under spinal anaesthesia and found no significant correlation between anxiety scores and total phenylephrine dose requirement ($R=0.05$).^[12] The authors concluded that spinal hypotension is multifactorial and that anxiety may represent only one contributing factor among several physiological determinants. Similarly, Nikooseresht et al. studied 100 patients undergoing caesarean section under spinal anaesthesia and reported no statistically significant association between state or trait anxiety and occurrence of hypotension or bradycardia. However, the majority of patients in their study had only moderate anxiety levels, which may have limited the ability to detect clinically significant haemodynamic differences.

The present study also demonstrated significantly higher vasopressor requirement among patients with greater anxiety severity. Vasopressor support was predominantly required in moderate and high anxiety groups, whereas no patient in the low anxiety group required vasopressor administration. Similar findings were reported by Şahan et al., who evaluated anxious parturients undergoing emergency caesarean section under spinal anaesthesia. The authors observed hypotension in 50% of non-sedated anxious patients compared with only 17.2% among patients receiving sedation, and ephedrine requirement was significantly higher in anxious non-sedated patients (25 ± 7.4 mg vs 17 ± 4.4 mg; $p=0.04$). These findings indicate that anxiety reduction may improve haemodynamic stability and reduce vasopressor consumption during spinal anaesthesia.

Emergency caesarean section patients in the present study demonstrated higher anxiety levels than elective cases. Similar observations were reported in several obstetric anaesthesia studies, where emergency procedures were associated with inadequate psychological preparation and greater maternal stress.^[13] Increased anxiety in emergency settings may further aggravate autonomic imbalance and predispose patients to exaggerated haemodynamic responses after spinal blockade.

The pathophysiological basis linking anxiety with post-spinal hypotension may involve activation of the sympathetic nervous system and hypothalamic-pituitary-adrenal axis, resulting in elevated catecholamine levels and altered vascular tone. Following spinal anaesthesia, sudden sympathetic blockade may produce greater haemodynamic collapse in highly anxious patients with elevated baseline sympathetic activity. In addition, anxiety-related hyperventilation, increased circulating stress hormones, and enhanced cardiovascular reactivity

may contribute to haemodynamic instability during regional anaesthesia.

The findings of the present study have important clinical implications. Routine preoperative assessment of anxiety using validated tools such as APAIS and VAS-A may help identify high-risk patients susceptible to severe post-spinal hypotension. Early psychological counselling, reassurance, anxiolytic interventions, and individualized haemodynamic monitoring strategies may improve maternal perioperative outcomes. Incorporation of anxiety assessment into routine obstetric anaesthesia practice may therefore represent a simple and cost-effective strategy for optimizing maternal safety during caesarean delivery under spinal anaesthesia.

The present study had certain limitations. Being a single-centre observational study, causal relationships could not be definitively established. Haemodynamic responses may also have been influenced by multiple confounding factors including intravascular volume status, block height, and individual physiological variability. Additionally, serum catecholamine levels were not measured to objectively assess sympathetic activation associated with anxiety. Nevertheless, the study highlights a clinically relevant association between maternal anxiety and spinal-induced hypotension and provides important evidence supporting perioperative anxiety assessment in obstetric anaesthesia practice.

Overall, the present study demonstrated a positive correlation between preoperative anxiety and post-spinal hypotension in patients undergoing caesarean section under spinal anaesthesia. Higher anxiety levels were associated with greater haemodynamic instability and increased vasopressor requirement. These findings suggest that preoperative anxiety may serve as an important predictor of perioperative haemodynamic responses and should be considered during anaesthetic planning and perioperative management of obstetric patients.

CONCLUSION

The present study demonstrated a significant positive correlation between preoperative anxiety and post-spinal hypotension in patients undergoing caesarean section under spinal anaesthesia. Patients with higher anxiety scores experienced greater haemodynamic instability and increased vasopressor requirement compared with patients having lower anxiety levels. Emergency caesarean section patients also exhibited comparatively higher levels of preoperative anxiety than elective cases. These findings suggest that maternal preoperative anxiety may be an important predictor of perioperative haemodynamic responses during spinal anaesthesia. Routine assessment of preoperative anxiety using validated tools such as APAIS and VAS-A may help identify high-risk patients and facilitate timely

psychological counselling, reassurance, and individualized anaesthetic management strategies. Early anxiety reduction interventions may potentially improve maternal haemodynamic stability and reduce vasopressor requirement during caesarean delivery under spinal anaesthesia.

The present study was limited by its single-centre observational design and relatively small sample size, which may limit generalizability of the findings. In addition, multiple factors influencing spinal hypotension such as intravascular volume status, block height, and individual autonomic variability could not be completely controlled. Further large-scale multicentric studies incorporating objective biomarkers of stress response are recommended to better establish the causal relationship between preoperative anxiety and post-spinal haemodynamic changes in obstetric patients.

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