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A comparison of haemodynamic changes under subarachnoid blockade in pre-eclampsia and normal parturients during caesarean section

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Abstract
Background: Preeclampsia poses significant maternal and fetal risks during cesarean delivery due to hypertension and hemodynamic instability. Due to rapid and minimal airway complications, Subarachnoid blockade (SAB) is preferred over general anesthesia. Interestingly, preeclamptic parturients often demonstrate more stable blood pressure and require fewer vasopressors compared to normotensive women under SAB. Understanding these hemodynamic differences is crucial for optimizing anesthetic management and improving maternal and neonatal outcomes. Therefore, this study aimed to compare the hemodynamic changes under subarachnoid blockade in preeclamptic and normotensive parturients undergoing cesarean section.
Methodology: In this study, Sixty parturients scheduled for elective cesarean section were randomly allocated into normal (n=30) and preeclamptic (n=30) groups. All received spinal anaesthesia with 10 mg 0.5% hyperbaric bupivacaine at L3-L4, preloaded with 10 ml/kg normal saline. Hemodynamics were monitored intraoperatively, hypotension treated with mephentermine, and neonatal outcomes assessed using APGAR scores at 1 and 5 minutes.
Results: "Preeclamptic parturients were older (31.8±2.1 vs 25.4±3.3 years) and had higher baseline SBP (149.2±4.9 vs 117.2±10.4 mmHg). They experienced less hypotension following spinal anesthesia (lowest MAP 88.6±5.8 vs 73.6±5.8 mmHg) and required no vasopressors, while neonatal APGAR scores were slightly lower but remained within clinically acceptable limits (1 min 7.0±0.37 vs 8.17±0.38; 5 min 8.87±0.35 vs 9.17±0.38)."
Conclusion: Subarachnoid block in preeclamptic parturients provides better perioperative hemodynamic stability with less hypotension and reduced vasopressor requirement compared to normotensive parturients. With appropriate monitoring and fluid management, spinal anesthesia is a safe and effective technique for cesarean section in preeclampsia.

Keywords: Preeclampsia, Cesarean section, Spinal anesthesia, Subarachnoid block, Hemodynamic stability, Hypotension, Vasopressor, APGAR score

Introduction
Preeclampsia is a hypertensive disorder of pregnancy and remains one of the leading causes of maternal morbidity and mortality worldwide [1]. It complicates approximately 3-8% of pregnancies and poses significant risks to both mother and fetus, particularly during cesarean delivery, where hemodynamic instability can compromise uteroplacental perfusion [2].
Over the past decade, there has been a shift in obstetric anesthesia practice from general anesthesia to spinal anesthesia (subarachnoid block, SAB) for cesarean sections [3]. This transition is driven by the risks associated with general anesthesia in preeclamptic patients, including airway edema, difficult or failed intubation, exaggerated hypertensive responses during laryngoscopy, and the potential for aspiration. SAB provides rapid, reliable surgical anesthesia while avoiding airway manipulation, making it a preferred technique in this high-risk population [4, 5].
While SAB is generally safe, maternal hypotension remains the most common and clinically relevant complication. Interestingly, recent evidence suggests that normotensive parturients are more prone to significant hypotension and require higher vasopressor support than preeclamptic patients [6]. A 2023 prospective cohort study reported that preeclamptic parturients experienced smaller drops in blood pressure and required lower doses of vasopressors compared to normotensive women. This relative hemodynamic stability in preeclampsia may be attributed to

baseline vasoconstriction and altered vascular responsiveness associated with endothelial dysfunction [3].

Despite these, contemporary data from the last five years remain limited, particularly regarding real-time cardiac output monitoring, optimal fluid management, and neonatal outcomes in diverse populations. Understanding the hemodynamic responses to SAB in both preeclamptic and normotensive parturients is essential to guide anesthetic management and improve maternal and fetal safety. Therefore, this study aims to directly compare the hemodynamic effects of SAB in preeclamptic versus normotensive parturients undergoing cesarean section.

Materials and Methods

This randomized prospective comparative study was carried out over a period of 18 months in the Department of Anaesthesia at a tertiary care government medical college and hospital, following approval from the Institutional Ethics Committee. The study included 60 parturients scheduled for elective lower segment caesarean section under spinal anaesthesia.

Participants were randomly allocated into two equal groups. Group N consisted of normal parturients with ASA physical status I, while Group PE included preeclamptic parturients with adequately controlled blood pressure and belonging to ASA physical status II or III. Parturients were included if their systolic blood pressure was ≤150 mmHg and diastolic blood pressure ≤90 mmHg at the time of surgery, if they were willing to participate, and if they met the required ASA physical status criteria. Patients with gestational diabetes mellitus, HELLP syndrome, fetal distress, antipartum hemorrhage, significant cardiac disease, spinal deformity, height less than 140 cm, ongoing anticoagulant therapy, or those who developed intraoperative complications, required blood transfusion, or had inadequate analgesia necessitating supplementation were excluded from the study.

All patients underwent thorough preoperative assessment. Standard premedication was administered to all participants in the form of intravenous metoclopramide 10 mg and ondansetron 4 mg prior to the procedure. Intravenous preloading was performed using 10 ml/kg of 0.9% normal saline before administering spinal anaesthesia.

Spinal anaesthesia was administered under strict aseptic conditions with the patient in the sitting position at the L3-L4 interspace using a 25-gauge Quincke spinal needle. A uniform dose of 10 mg (2 ml) of 0.5% hyperbaric bupivacaine was used for all patients. Following the block, patients were immediately placed in the supine position with a 10 cm wedge positioned under the right hip to minimize aortocaval compression. An adequate sensory block level of T5-T6 was achieved in all cases.

Hemodynamic parameters, including heart rate and blood pressure, were recorded before the initiation of spinal anaesthesia, immediately thereafter, at 2-minute intervals for the first 10 minutes, and subsequently at 5-minute intervals for the next two hours. Continuous monitoring of electrocardiography, oxygen saturation, body temperature, and urine output was maintained throughout the perioperative period. After delivery of the neonate, all patients received intravenous oxytocin 10 units along with midazolam 1 mg.

Intraoperative hypotension was defined as a systolic blood pressure below 100 mmHg, a reduction of 25% or more from baseline systolic blood pressure, or a corresponding decrease in mean arterial pressure. Hypotensive episodes were managed using incremental doses of intravenous mephentermine 6 mg as clinically indicated. Neonatal well-being was assessed using APGAR scores at 1 and 5 minutes after birth. Postoperative monitoring was continued at 30-minute intervals until the effects of spinal anaesthesia had fully resolved.

Collected data were entered into Microsoft Excel and statistically analyzed using SPSS version 25. Categorical variables were analyzed using Pearson's chi-square test, while continuous variables were expressed as mean± standard deviation and compared using Student's t-test. A p value of less than 0.05 was considered statistically significant.

Results

Table 1: Demographic and Obstetric Characteristics.

Variable	Normal Parturients (n = 30)	Preeclamptic Parturients (n = 30)	P value
Age (years)	25.37±3.32	31.80±2.07	<0.01
Weight (kg)	59.93±6.17	60.27±7.64	0.85
Height (cm)	154.73±7.39	156.07±7.13	0.42
Gravida	1.90±0.48	1.27±0.52	<0.01
Gestational age (weeks)	38.40±0.40	33.93±0.64	<0.01

The mean age of normal parturients was 25.37±3.32 years, whereas preeclamptic parturients had a significantly higher mean age of 31.80±2.07 years ($p< 0.01$). Mean weight (59.93±6.17 kg vs 60.27±7.64 kg) and mean height (154.73±7.39 cm vs 156.07±7.13 cm) were comparable between the two groups and were not statistically significant. Gravida was significantly higher in normal parturients (1.90±0.48) compared to preeclamptic parturients (1.27±0.52) ($p< 0.01$). Gestational age was significantly lower in the preeclamptic group (33.93±0.64 weeks) compared to the normal group (38.40±0.40 weeks) ($p< 0.01$).

Table 2: Baseline Hemodynamic Parameters before Subarachnoid Block

Parameter	Normal	Preeclamptic	P value
Heart Rate (beats/min)	75.4±8.16	76.9±5.78	0.40
Mean Arterial Pressure (mmHg)	89.9±5.34	101.3±4.48	<0.01
Systolic BP (mmHg)	117.2±10.36	149.2±4.91	<0.01
Diastolic BP (mmHg)	76.3±5.27	77.4±6.08	0.40

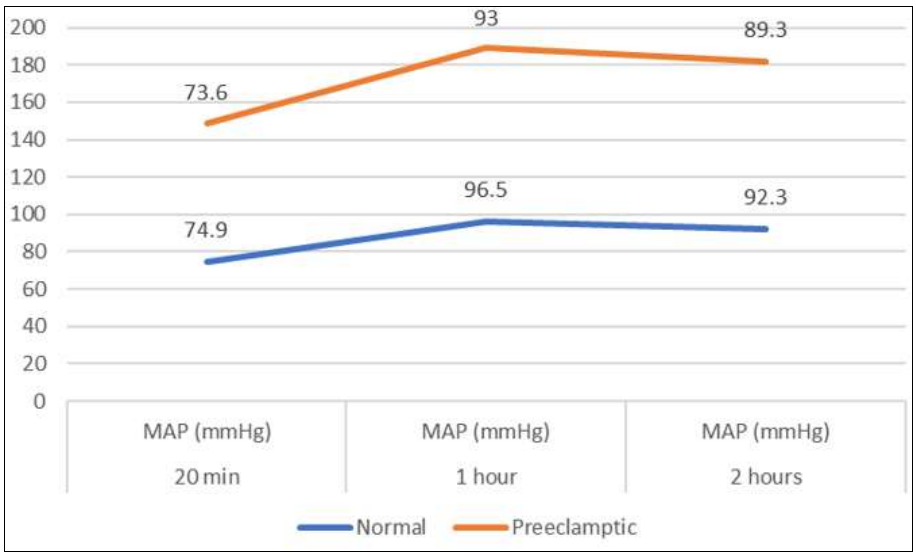
Baseline heart rate was similar in both groups, with values of 75.40±8.16 beats/min in normal parturients and 76.90±5.78 beats/min in preeclamptic parturients (p = 0.40). Mean arterial pressure was significantly higher in the preeclamptic group (101.33±4.48 mmHg) compared to the normal group (89.91±5.34 mmHg) ($p< 0.01$). Similarly, systolic blood pressure (149.20±4.91 mmHg vs 117.20±10.36 mmHg) was significantly elevated in preeclamptic parturients ($p< 0.01$). Diastolic blood pressure was comparable between groups and not statistically significant.

Table 3: Hemodynamic Changes Following Subarachnoid Block after 2 hrs.

Parameter	Normal	Preeclamptic	P value
Lowest MAP (mmHg)	73.6±5.77	88.6±5.78	<0.01
Lowest SBP (mmHg)	93.9±6.51	118.5±9.73	<0.01
Lowest DBP (mmHg)	61.8±5.79	73.7±5.49	<0.01
Lowest HR (beats/min)	68.9±5.08	69.2±4.86	0.38

Following subarachnoid block, both groups showed a reduction in blood pressure. The lowest mean arterial pressure recorded was 73.55±5.77 mmHg in normal parturients and 88.62±5.78

mmHg in preeclamptic parturients, which was statistically significant ($p< 0.01$). The lowest systolic blood pressure was 93.87±6.51 mmHg in the normal group compared to 118.53±9.73 mmHg in the preeclamptic group ($p< 0.01$). Diastolic blood pressure also remained significantly higher in preeclamptic patients (73.67±5.49 mmHg) compared to normal patients (61.80±5.79 mmHg). Heart rate changes were similar between the two groups and not statistically significant.



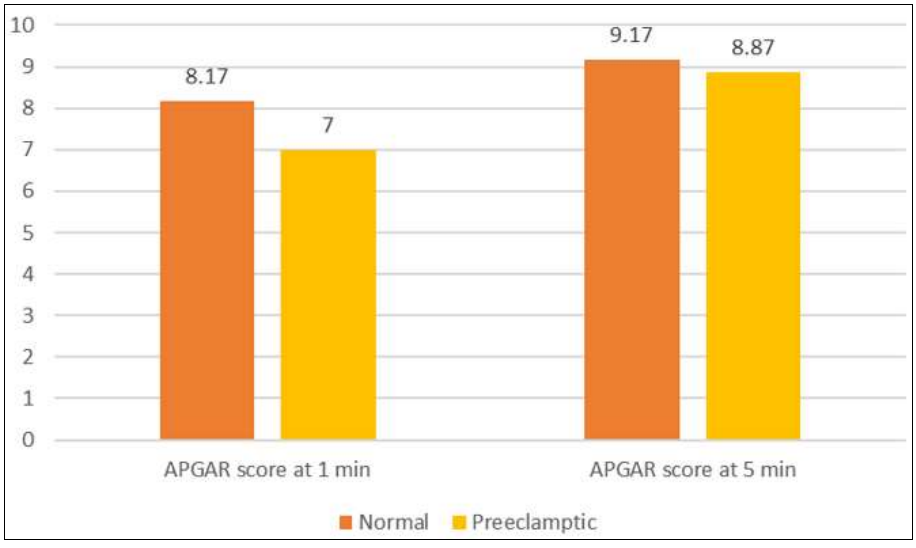
Graph 1: Post-Induction Hemodynamic Stability

At 20 minutes after induction, mean arterial pressure was comparable between normal (74.86±2.67 mmHg) and preeclamptic parturients (73.55±2.74 mmHg) (p = 0.06). At 1 hour, mean arterial pressure was significantly higher in normal parturients (96.53±1.83 mmHg) compared to preeclamptic parturients (93.02±2.39 mmHg) ($p< 0.01$). A similar significant difference persisted at 2 hours, with mean arterial pressure values of 92.33±2.59 mmHg in the normal group and 89.33±2.39 mmHg in the preeclamptic group ($p< 0.01$).

Table 5: Intraoperative Fluid Requirement, Blood Loss, and Vasopressor Use

Variable	Normal	Preeclamptic	P value
IV fluids (ml)	1430±89.6	1250±118.9	<0.01
Blood loss (ml)	488.7±19.4	496.7±22.2	0.14
Duration of surgery (min)	61.2±3.4	45.3±2.2	<0.01
Mephentermine use (mg)	1.83±0.38	0	<0.01

Normal parturients required significantly higher volumes of intravenous fluids (1430.00±89.64 ml) compared to preeclamptic parturients (1250.00±118.90 ml) ($p< 0.01$). Mean blood loss was comparable between normal (488.67±19.43 ml) and preeclamptic groups (496.67±22.18 ml) and was not statistically significant. Duration of surgery was significantly longer in normal parturients (61.17±3.40 minutes) compared to preeclamptic parturients (45.33±2.25 minutes) ($p< 0.01$). Mephentermine was required only in normal parturients, with a mean dose of 1.83±0.38 mg, while none of the preeclamptic patients required vasopressor support.



Graph 2: Neonatal Outcomes

Neonates born to normal parturients had significantly higher APGAR scores at 1 minute (8.17±0.38) compared to those born to preeclamptic mothers (7.00±0.37) ($p< 0.01$). Similarly, APGAR scores at 5 minutes were higher in the normal group (9.17±0.38) than in the preeclamptic group (8.87±0.35) ($p< 0.01$). Although scores were lower in the preeclamptic group, they remained within clinically acceptable limits.

Discussion

In the present study, we compared the hemodynamic responses to SAB in preeclamptic and normotensive parturients undergoing cesarean section. Our findings demonstrate that preeclamptic parturients exhibit greater perioperative hemodynamic stability, with less hypotension and reduced vasopressor requirement, despite having higher baseline blood pressure values.

We observed that preeclamptic parturients were significantly older than normotensive women (31.80±2.07 vs 25.37±3.32 years, $p< 0.01$), while weight and height remained comparable between groups. We also noted a significantly lower gestational age in the preeclamptic group (33.93±0.64 weeks), which aligns with the findings of Patil *et al.* [8] (2020), who reported a progressive reduction in gestational age with increasing severity of preeclampsia. In contrast, Kumar *et al.* [1] (2022) reported no significant difference in gestational age between groups, highlighting variations in obstetric practice and disease severity across populations.

Before SAB, preeclamptic parturients demonstrated significantly higher systolic blood pressure (149.20±4.91 mmHg) and mean arterial pressure (101.33±4.48 mmHg) compared to normotensive women, while baseline heart rate and diastolic blood pressure were similar. These findings reflect the increased systemic vascular resistance associated with preeclampsia and are consistent with observations by Chowdhury *et al.* [9] (2018) and Sivevski *et al.* [10] (2019).

Following SAB, both groups experienced a decline in blood pressure; however, normotensive parturients exhibited a significantly greater magnitude of hypotension.

In this study, a lower mean arterial pressure of 73.55±5.77 mmHg in normotensive women compared to 88.62±5.78 mmHg in preeclamptic parturients ($p< 0.01$) was observed. Similarly, systolic and diastolic pressures declined more markedly in the normotensive group. These findings support those of Sivevski *et al.* [10] (2019), who reported significantly greater percentage reductions in SBP, DBP, and MAP among healthy parturients than among preeclamptic patients.

We found no significant difference in heart rate changes between groups after SAB, a result that agrees with Kumar *et al.* [1] (2022) and Belachew *et al.* [3] (2023), both of whom reported comparable heart rate responses during the early post-spinal period.

Normotensive parturients required significantly higher volumes of intravenous fluids (1430±89.6 ml vs 1250±118.9 ml, $p< 0.01$) and vasopressor support, while none of the preeclamptic patients required mephentermine. Kumar *et al.* [1] (2022) similarly reported significantly higher phenylephrine consumption in normotensive parturients (150.1±71.1 µg) compared to preeclamptic patients (49.3±34.35 µg). These findings suggest that the elevated baseline vascular tone in preeclampsia attenuates the sympathetic blockade induced by SAB.

Regarding neonatal outcomes, we observed lower APGAR scores at 1 and 5 minutes in neonates born to preeclamptic mothers; however, these scores remained within clinically acceptable limits. Blood loss during surgery was comparable between groups, further supporting the safety of SAB in preeclamptic parturients. Chowdhury *et al.* [9] (2018) and Kumar *et al.* [1] (2022) also reported no significant differences in neonatal outcomes between preeclamptic and normotensive groups.

Overall, our study confirms that subarachnoid block provides effective and stable anesthesia in preeclamptic parturients, with less hypotension and reduced vasopressor requirements compared to normotensive women. These findings reinforce the role of SAB as a safe and preferred anesthetic technique for cesarean section in patients with preeclampsia when supported by vigilant monitoring and appropriate fluid management.

Conclusion

This study supports current evidence that subarachnoid block in preeclamptic parturients is associated with better perioperative hemodynamic stability, characterized by less hypotension, reduced vasopressor requirement, and more gradual blood pressure changes compared to normotensive parturients. Despite higher baseline blood pressures, preeclamptic patients experienced smaller declines in arterial pressures following spinal anesthesia. Neonatal outcomes remained clinically acceptable, and intraoperative blood loss was comparable between groups. With appropriate monitoring and judicious fluid management, subarachnoid block is a safe and effective anesthetic technique for cesarean section in preeclamptic women.

Conflict of Interest: Not available

Financial Support: Not available

References

1. Kumar A, Gupta H, Gupta S. Comparison of the hemodynamic changes in normotensive and severe preeclamptic pregnant women posted for cesarean section under spinal anaesthesia. IAR J Anaesthesiol Crit Care. 2022 Jan;3(1):1-4.
2. World Health Organization. Pre-eclampsia [Internet]. 2025 Dec 10 [cited 2026 Jan 12]. Available from: https://www.who.int/news-room/fact-sheets/detail/pre-eclampsia
3. Belachew BG, Dessu BK, Demissie BW, Sintayhu A, Dendir G, Ali A, *et al*. Comparison of the hemodynamic changes between preeclamptic and normotensive parturients who underwent cesarean section under spinal anesthesia at North Showa zone public hospitals, Oromia region, Ethiopia, 2022: a prospective cohort study. BMC Anesthesiol. 2023 Nov 25;23(1):387. doi: 10.1186/s12871-023-02314-7. Erratum in: BMC Anesthesiol. 2025 May 31;25(1):279.
4. Chumpathong S, *et al*. Maternal and neonatal outcomes in women with severe pre-eclampsia undergoing cesarean section: a 10-year retrospective study from a single tertiary care center: anesthetic point of view. J Matern Fetal Neonatal Med. 2016;1-5.
5. Gandhi KA, Jain K. Management of anaesthesia for elective, low-risk (Category 4) caesarean section. Indian J Anaesth. 2018;62(9):667-674.
6. Singariya G, Yuvaraj S, Kamal M, Garg M, Chhabra A, Khatri C. Comparison of hemodynamic changes in normotensive and preeclamptic parturients undergoing cesarean section under spinal anesthesia: a prospective observational study. Indian Anaesth Forum. 2024;25(1):4-8.

7. Sultana R, Yasmin E, Rouf S, Eva SY, Shampa L. Demographic and clinical profile of hypertensive pregnant women. Ann Int Med Dent Res. 2023 Jul-Aug;9(4):52-58.
8. Patil N. Evaluation of thyroid function test in severity of preeclampsia. MedPulse Int J Biochem. 2020;16(3):29-35.
9. Chowdhury ANC, Saikia A, Ray AK, Bharali H, Sen T. Comparison of the hemodynamic changes in normotensive and severe preeclamptic pregnant women posted for cesarean section under subarachnoid block. J Med Sci Clin Res. 2018 Aug;6(8):246-254.
10. Sivevski A, Ivanov E, Karadjova D, Slaninka-Miceska M, Kikerkov I. Spinal-induced hypotension in preeclamptic and healthy parturients undergoing cesarean section. Open Access Maced J Med Sci. 2019;7(6):996.

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