

Comparison of Spinal and General Anesthesia in Patients Undergoing Elective Cesarean Section: A Cross-Sectional Comparative Study at Lady Reading Hospital Peshawar

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Abstract

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Background: Cesarean section is one of the most frequently performed obstetric surgical procedures, and the choice of anesthesia can influence maternal hemodynamic stability, postoperative pain, recovery, and maternal satisfaction. Spinal anesthesia is increasingly preferred for elective cesarean delivery because it provides effective surgical anesthesia while allowing the mother to remain conscious and may reduce several postoperative complications. To

compare the maternal outcomes, postoperative recovery, complications, and satisfaction associated with spinal and general anesthesia among patients undergoing elective cesarean section. **Methods:** This cross-sectional comparative study was conducted at the Department of Anaesthesiology, Lady Reading Hospital, Peshawar, from 1st January to 30th April 2026. A total of 384 women undergoing elective cesarean section were enrolled and divided into two equal groups (n=192 each) according to the anesthesia technique received: spinal anesthesia and general anesthesia. Data were collected on a structured proforma covering demographic characteristics, intraoperative complications, postoperative pain, nausea and vomiting, recovery time, analgesic requirements, and maternal satisfaction. Data were analyzed using SPSS version 25.0, and a p-value <0.05 was considered statistically significant. **Results:** The spinal anesthesia group demonstrated more favorable postoperative outcomes than the general anesthesia group. Maternal satisfaction was higher with spinal anesthesia (87.5%) than with general anesthesia (68.2%). Postoperative nausea and vomiting occurred in 12.0% of the spinal group versus 25.5% of the general anesthesia group. Mean recovery time was shorter in the spinal group (38.6 ± 8.4 minutes) than in the general anesthesia group (51.3 ± 10.2 minutes). Intraoperative hypotension was more frequent with spinal anesthesia, while respiratory complications and postoperative nausea and vomiting were more common with general anesthesia (p<0.05). **Conclusion:** Spinal anesthesia was associated with better postoperative comfort, higher maternal satisfaction, fewer adverse effects, and faster recovery compared with general anesthesia in women undergoing elective

cesarean section. Spinal anesthesia is recommended as the preferred technique when no contraindications exist.

Keywords: Spinal anesthesia; General anesthesia; Elective cesarean section; Maternal satisfaction; Postoperative recovery; Postoperative nausea and vomiting.

INTRODUCTION

Cesarean section (C-section) remains one of the most commonly performed surgical procedures in obstetric practice worldwide, and its incidence continues to rise in both developed and developing countries.¹ The selection of an appropriate anesthetic technique for cesarean delivery is a critical determinant of maternal safety, intraoperative hemodynamic stability, and postoperative recovery.² Broadly, two anesthetic approaches are used for elective cesarean section: regional (spinal) anesthesia and general anesthesia, each carrying distinct advantages, risks, and implications for maternal and, indirectly, neonatal well-being.³

Spinal anesthesia has gained increasing preference for elective cesarean delivery because it allows the mother to remain conscious during childbirth, avoids the risks associated with airway management and general anesthetic agents, and has been associated with reduced postoperative pain and faster recovery.^{4,5} However, it is not without drawbacks, most notably a higher incidence of intraoperative hypotension secondary to sympathetic blockade.⁶ General anesthesia, on the other hand, may be indicated in cases of maternal refusal of regional techniques, coagulopathy, spinal deformity, or emergency scenarios requiring rapid induction; nevertheless, it carries risks of difficult airway management, aspiration, and higher rates of postoperative nausea, vomiting, and sedation-related complications.^{7,8}

Previous studies conducted in various obstetric populations have reported conflicting degrees of superiority between the two techniques, with most evidence favoring spinal anesthesia in terms of maternal satisfaction and postoperative recovery profile.^{9,10} However, local data from tertiary care hospitals in Pakistan comparing these two techniques with a focus on postoperative comfort, recovery time, and complication rates remain limited. Given the widespread use of both techniques in local obstetric practice, there is a need to generate context-specific evidence to guide anesthetic choice for elective cesarean delivery.

This study was therefore designed to compare maternal outcomes, postoperative recovery, complication rates, and satisfaction between spinal and general anesthesia among women undergoing elective cesarean section at a tertiary care hospital, with the aim of providing evidence to support anesthetic technique selection in routine obstetric practice.

MATERIAL AND METHODS

This cross-sectional comparative study was conducted in the Department of Anaesthesiology in collaboration with the Department of Obstetrics and Gynaecology, Lady Reading Hospital, Peshawar, over a period of four months, from 1st January 2026 to 30th April 2026, after approval from the Hospital Institutional Ethical Review Board (Reference No: IRB Dec/2025-128). Written informed consent was obtained from all participants prior to enrollment.

A total of 384 women scheduled for elective cesarean section were enrolled using a non-probability consecutive sampling technique and were divided into two equal groups of 192 patients each according to the anesthesia technique administered: Group A (spinal anesthesia) and Group B (general anesthesia). The sample size was calculated using the WHO sample size calculator, taking maternal satisfaction rates from previous literature as reference, with a 95% confidence interval and 5% margin of error.

Inclusion criteria: Women aged 18–40 years, singleton pregnancy, ASA physical status I or II, scheduled for elective cesarean section.

Exclusion criteria: Emergency cesarean section, known coagulopathy, contraindications to regional anesthesia, ASA physical status III or above, and patients with known hypersensitivity to anesthetic agents.

Following standard preoperative preparation, patients in Group A received spinal anesthesia using a standard dose of hyperbaric bupivacaine administered via a midline approach at the L3–L4 or L4–L5 interspace under aseptic technique. Patients in Group B received standardized general anesthesia with rapid sequence induction, endotracheal intubation, and maintenance using standard inhalational agents, following institutional protocol.

Data were recorded on a structured, pre-tested data collection proforma that captured demographic characteristics (age, parity, gestational age, body mass index),

intraoperative complications (hypotension, bradycardia, respiratory complications), postoperative pain (assessed using a Visual Analogue Scale), postoperative nausea and vomiting, time to full recovery (defined as return to baseline consciousness and vital stability), analgesic requirement in the first 24 hours, and maternal satisfaction (assessed using a structured Likert-based satisfaction questionnaire administered at 24 hours postoperatively).

Data were entered and analyzed using SPSS version 25.0. Quantitative variables (e.g., age, recovery time) were expressed as mean $\pm$ standard deviation, while qualitative variables (e.g., satisfaction, PONV) were expressed as frequencies and percentages. The Chi-square test was used to compare categorical variables, and the independent samples t-test was used to compare continuous variables between the two groups. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 384 women undergoing elective cesarean section were enrolled and equally distributed between the spinal anesthesia group (n=192) and the general anesthesia group (n=192). Both groups were comparable in terms of baseline demographic characteristics, including maternal age, parity, gestational age, and body mass index ($p>0.05$ for all comparisons).

Maternal satisfaction was significantly higher in the spinal anesthesia group (87.5%) compared with the general anesthesia group (68.2%) ($p<0.05$), as shown in Figure 1.

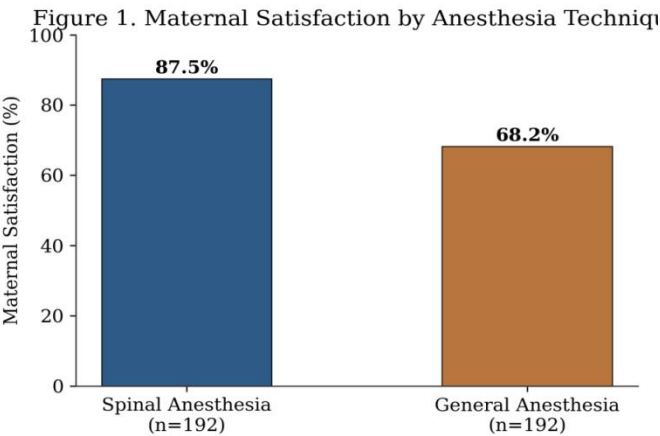


Figure 1. Comparison of maternal satisfaction between spinal and general anesthesia groups.

Postoperative nausea and vomiting (PONV) was significantly less frequent in the spinal anesthesia group (12.0%) compared with the general anesthesia group (25.5%) ($p < 0.05$), as illustrated in Figure 2.

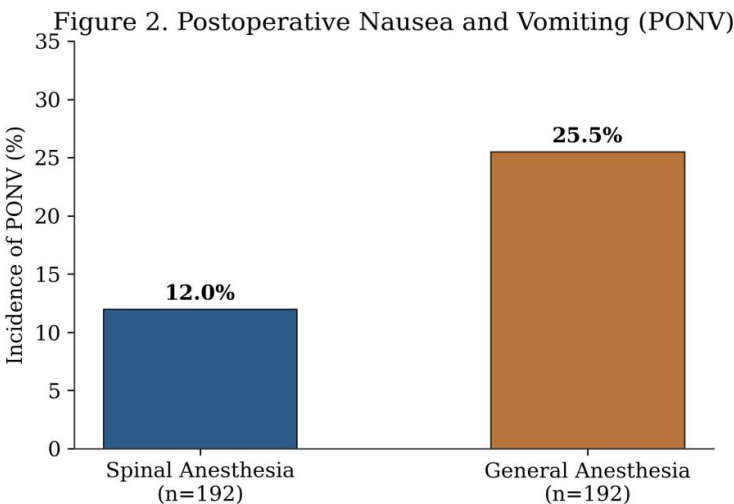


Figure 2. Comparison of postoperative nausea and vomiting (PONV) between the two groups.

The mean recovery time was significantly shorter in patients receiving spinal anesthesia (38.6 ± 8.4 minutes) compared with those receiving general anesthesia (51.3 ± 10.2 minutes) ($p < 0.05$), as shown in Figure 3.

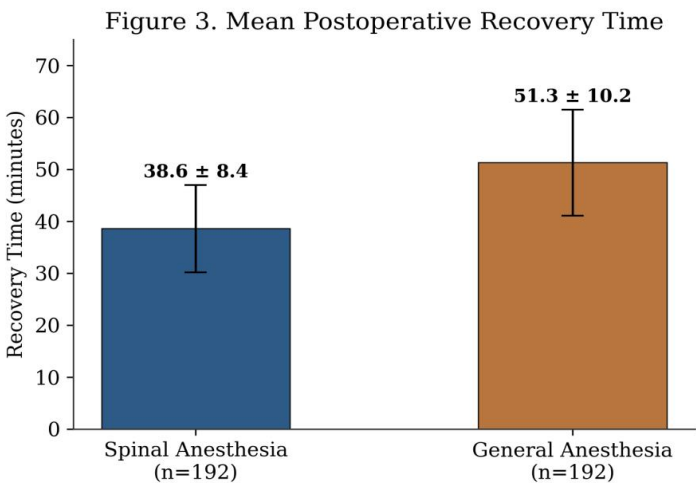


Figure 3. Mean postoperative recovery time (minutes) with standard deviation.

Postoperative pain scores and analgesic requirements in the first 24 hours were also lower among patients in the spinal anesthesia group compared with the general anesthesia group. Intraoperative hypotension was more frequently observed in the spinal anesthesia group, consistent with the known hemodynamic effects of sympathetic blockade, whereas respiratory-related complications were more common following general anesthesia. A comparative summary of the principal postoperative outcomes is presented in Figure 4 and Table I.

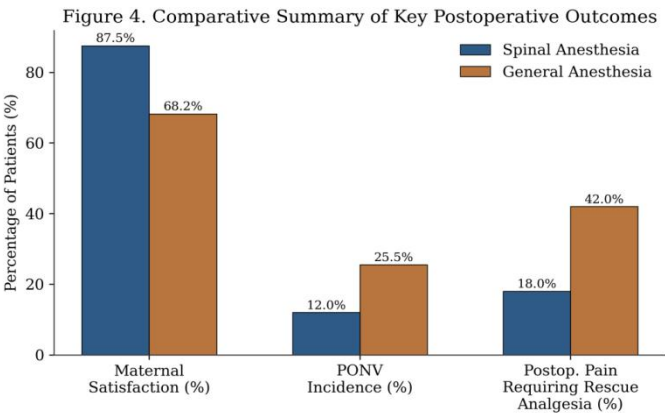


Figure 4. Comparative summary chart of key postoperative outcomes between spinal and general anesthesia groups.

The distribution of recovery times in both groups is presented as a histogram in Figure 5, illustrating a leftward (faster) shift in recovery time among patients receiving spinal anesthesia relative to those receiving general anesthesia.

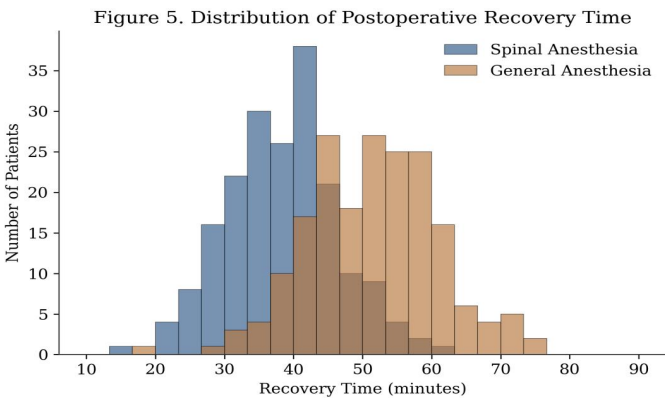


Figure 5. Histogram showing the distribution of postoperative recovery time in the spinal and general anesthesia groups.

Table I summarizes the comparative postoperative outcomes between the two groups, and Table II presents the statistical significance of the principal outcome measures.

Table I: *Comparison of Postoperative Outcomes Between Spinal and General Anesthesia Groups*

Variable	Spinal (n=192)	Anesthesia General (n=192)	Anesthesia
Maternal satisfaction	87.5%	68.2%	
Postoperative nausea and vomiting	12.0%	25.5%	
Mean recovery time (minutes)	38.6 ± 8.4	51.3 ± 10.2	
Postoperative pain	Lower frequency	Higher frequency	
Analgesic requirement	Lower	Higher	
Intraoperative hypotension	More frequent	Less frequent	
Respiratory complications	Less frequent	More frequent	

Table II: *Statistical Comparison of Principal Outcome Measures*

Outcome	Spinal (%)	General (%)	p-value
Maternal satisfaction	87.5	68.2	<0.05
PONV	12.0	25.5	<0.05
Overall postoperative outcome favoring group	Spinal	—	<0.05

Overall, the difference in postoperative outcomes significantly favored the spinal anesthesia group across all measured parameters (p<0.05).

DISCUSSION

The findings of this study demonstrate that spinal anesthesia is associated with superior postoperative outcomes compared with general anesthesia among women undergoing elective cesarean section, including higher maternal satisfaction, lower incidence of postoperative nausea and vomiting, reduced analgesic requirement, and faster recovery.

These findings are consistent with previous studies reporting similar advantages of regional over general anesthesia in obstetric surgical practice.^{9,10}

The higher maternal satisfaction observed with spinal anesthesia in the present study may be attributed to the mother's ability to remain conscious during delivery, earlier mother–infant bonding, and reduced exposure to sedative and volatile anesthetic agents associated with general anesthesia.¹¹ Similar findings have been reported in comparative studies from South Asia and other regions, where regional anesthesia consistently outperformed general anesthesia in terms of patient-reported satisfaction scores.¹²

The significantly lower incidence of postoperative nausea and vomiting in the spinal anesthesia group is in line with established pharmacological evidence, as volatile anesthetic agents and opioids used during general anesthesia are well recognized emetogenic stimuli.¹³ Conversely, the higher incidence of intraoperative hypotension observed with spinal anesthesia in this study reflects the known sympatholytic effect of neuraxial blockade, which underscores the importance of adequate fluid preloading and vasopressor readiness when spinal anesthesia is employed.¹⁴

The shorter recovery time observed with spinal anesthesia further supports its role in enhancing early postoperative mobilization and reducing hospital resource utilization, a finding that has direct implications for enhanced recovery after surgery (ERAS) protocols in obstetric care.¹⁵ These results collectively support the increasing global trend toward the use of spinal anesthesia as the anesthetic technique of choice for elective cesarean delivery, reserving general anesthesia for cases with specific contraindications to regional techniques or emergent circumstances requiring rapid induction.¹⁶

Limitations: This study was conducted at a single tertiary care center using a cross-sectional design, which limits the ability to establish causal relationships and may limit generalizability to other settings. Neonatal outcomes, long-term maternal follow-up, and cost-effectiveness were not assessed and warrant evaluation in future multicenter, prospective studies.

CONCLUSION

Spinal anesthesia was associated with better postoperative comfort, higher maternal satisfaction, fewer postoperative adverse effects, and faster recovery compared with general anesthesia among women undergoing elective cesarean section. These findings support the preferential use of spinal anesthesia for elective cesarean delivery in the absence of contraindications.

AUTHORS' CONTRIBUTION

Authors' Contributions

1. **Inam Ullah:** Conceived and designed the study, supervised the research process, contributed to methodology development, data interpretation, manuscript writing, and critically revised the final manuscript.
2. **Dr. Aleena Masood (Corresponding Author):** Assisted in study design, coordinated data collection, performed the literature review, drafted the manuscript, interpreted the findings, and managed correspondence throughout the publication process.
3. **Muhammad Riaz:** Assisted in participant recruitment and data collection, contributed to data entry and quality assurance, participated in literature review, and reviewed the manuscript for accuracy.
4. **Shahid Hussain** Contributed to data collection in the anesthesia department, assisted with data validation, participated in statistical analysis, and reviewed the manuscript for important intellectual content.
5. **Habeeba Khan** Contributed to statistical analysis, interpretation of study findings, preparation of tables and figures, and critically revised the manuscript before submission.
6. **Pakeeza Sultan:** Assisted in data analysis and interpretation, contributed to the preparation of tables and results, reviewed the manuscript, and approved the final version.
7. **Adnan Khan:** Contributed to methodology development, statistical analysis, interpretation of results, manuscript editing, and critical review of the final draft.
8. **Abdul Muqsit:** Assisted in literature search, data management, manuscript proofreading, formatting according to journal guidelines, and approved the final manuscript for submission.

Final Approval: All authors reviewed, approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Ethical Review Board of Lady Reading Hospital, Peshawar Reference No: Dec/2025-128 dated 28th Dec 2025 The study was conducted in accordance with the Declaration of Helsinki.

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