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ASSESSMENT OF INTRAOPERATIVE SPINAL ANESTHESIA INDUCED COMPLICATIONS IN CESAREAN SECTION PATIENTS

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Abstract

Background

Spinal anesthesia is commonly employed in gynecological surgeries due to its rapid onset, effective analgesia, and minimal drug exposure compared to general anesthesia. Despite its advantages, intraoperative complications such as hypotension, bradycardia, shivering, and nausea are frequently encountered, which may adversely affect patient outcomes.

Materials and methods

A cross-sectional study was conducted at Lady Aitchison Hospital, Lahore, over a period of four months. A total of 107 patients aged 18–45 years (ASA class II–III) undergoing elective cesarean sections under spinal anesthesia were included. Data regarding intraoperative complications such as hypotension, bradycardia, desaturation, nausea/vomiting, and shivering were recorded and analyzed with spss v 27.

Results

Among 107 participants, 53.3% developed intraoperative hypotension, 17.8% experienced bradycardia, 13.1% had desaturation, 33% suffered from nausea and vomiting, and 46.7% experienced shivering. The findings identified hypotension and shivering as the most prevalent intraoperative complications associated with spinal anesthesia during cesarean sections.

Conclusion

The study revealed that spinal anesthesia, though effective and widely preferred for cesarean delivery, frequently leads to complications such as hypotension and shivering. Proper preoperative assessment, fluid management, and vigilant intraoperative monitoring are essential to minimize these complications. The presence of a skilled and experienced anesthesiologist is critical for early detection and prompt management, thereby ensuring maternal safety and improved surgical outcomes.

INTRODUCTION

Spinal anesthesia is widely utilized in gynecological and obstetric surgeries due to its rapid onset, effective sensory and motor block, minimal drug exposure, and avoidance of airway manipulation. It is particularly preferred in Cesarean Sections where general anesthesia poses higher risks. Despite its advantages, spinal anesthesia is not free from intraoperative

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complications, which can significantly affect maternal safety and surgical outcomes.

The most commonly reported complications include hypotension, bradycardia, nausea and vomiting, shivering, and occasionally high spinal block. Hypotension, the most frequent issue, results from sympathetic blockade causing vasodilation and decreased venous return, potentially compromising utero placental perfusion. Bradycardia often accompanies hypotension due to unopposed parasympathetic activity. Nausea and vomiting are typically secondary to hypotension or visceral manipulation. Shivering, while benign, causes discomfort and increases oxygen consumption. Rarely, excessive spread of the local anesthetic may cause high spinal block, leading to severe hypotension, respiratory distress, and even loss of consciousness.

The incidence of intraoperative complications ranges from 20–40%, depending on patient characteristics and clinical settings. Preventive strategies include preloading or co-loading with intravenous fluids, judicious use of vasopressors (such as ephedrine or phenylephrine), maintaining left lateral tilt position, careful dosing of local anesthetics, and continuous hemodynamic monitoring. Early recognition and prompt management—through fluids, vasopressors, oxygen supplementation, and pharmacological interventions—are essential to minimize risks.

Understanding these complications is critical for anesthesiologists, especially in resource-limited and teaching hospitals where trainees often manage such cases. Awareness, vigilance, and adherence to preventive protocols improve safety, reduce morbidity, shorten hospital stays, and enhance patient satisfaction. Moreover, assessing intraoperative spinal anesthesia complications helps formulate evidence- based guidelines and supports patient-centered care through better preoperative counseling. Overall, while spinal anesthesia remains the cornerstone technique for Cesarean Sections, ongoing evaluation and risk mitigation are vital to ensure optimal outcomes and advance anesthetic practice.

Primary objective of the research was to assess intraoperative spinal anesthesia induced complications in Cesarean Section Patients and rationale is that although Spinal anesthesia is widely used in Cesarean Section Patients for its rapid onset and effectiveness, yet it has many intraoperative complications. Despite frequent clinical application, data on the frequency and nature of these intraoperative complications in Cesarean Section Patients remains limited. Assessing frequency of these complications is crucial for improving perioperative strategies and informing safer, evidence-based anesthetic practices.

Materials and methods

The study was a cross-sectional design conducted at Lady Aitchison Hospital, Lahore, and completed over four months following approval of the research synopsis. A total of 107 participants were selected through purposive sampling. Inclusion criteria consisted of women aged 18–45 years, with ASA physical status II–III, scheduled for elective Cesarean Section under spinal anesthesia, and who gave voluntary consent to participate. Exclusion criteria included patients with multiple pregnancies (twins or triplets) and those having preoperative comorbidities.

All ethical guidelines of the University of Lahore Ethical Committee were strictly followed. Participants provided written informed consent, and their data were kept confidential and anonymous. They were assured of no risks related to participation and had the right to withdraw at any time. Data were securely stored—both physically and digitally under password protection. Permission for data collection was obtained from the Medical Superintendent of Mayo Hospital, Lahore. Data were collected using a standardized questionnaire from patients admitted for elective C-sections under spinal anesthesia.

The data were entered and analyzed using SPSS version 27. Descriptive statistics such as frequencies and percentages were applied, and findings were presented through tables and graphs to illustrate results clearly and effectively.

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Results

During The study included 107 patients undergoing Cesarean Sections under spinal anesthesia. Most participants were young adults, with 48.6% aged 18–30 years, 35.5% aged 31–39 years, and 15.9% aged 40–45 years, indicating predominance of women in the reproductive age group. Regarding gestational age, most patients were in the late third trimester, with 37.4% at 36 weeks, 30.8% at 37 weeks, and 21.5% at 38 weeks. The BMI distribution showed that 50.5% had a normal BMI, 20.6% were underweight, 16.8% overweight, and 12.1% obese. Fluid preloading before anesthesia was practiced in 64.5% of cases, reflecting adherence to preventive protocols against hypotension. Most patients (74.8%) were non-smokers, indicating a generally healthy lifestyle. In terms of obstetric history, 52.3% were second gravida, while 15% were primi gravida. Parity data revealed that 50.5% had one child, 25.2% had two, and 14% were nulliparous, indicating predominance of multiparous women with low to moderate parity.

The L3–L4 intervertebral space was the most frequent puncture site (56.1%), followed by L2–L3 (29%) and L4–L5 (15%), consistent with standard anesthetic practice. Bupivacaine was the primary drug used, given alone in 58.9% and in combination with adjuvants in 41.1%. The standard 10 mg dose was used in 80.5% of cases. Most patients (61.7%) received over 1000 ml of intraoperative fluids. Among intraoperative medications, vasopressors were used in 47.7%, anticholinergics in 39.3%, and both in 13.1%, reflecting management of hypotension and bradycardia.

The most common intraoperative complication was hypotension, observed in 53.2% of patients, consistent with prior studies reporting incidences of 36–80%. Bradycardia occurred in 17.8%, slightly higher than in other reported studies. Oxygen desaturation was seen in 13.1%, suggesting mild intraoperative respiratory compromise. Nausea and vomiting were reported in 32.7%, aligning with previous literature linking these to hypotension. Shivering occurred in 46.7%, matching published rates of 30–55% in obstetric populations. Overall, the study's findings indicate that hypotension and shivering were the most frequent complications, followed by nausea/vomiting, bradycardia, and desaturation. These results align with established obstetric anesthesia literature and emphasize the need for vigilant monitoring, preventive measures, and prompt management to ensure patient safety during spinal anesthesia in Cesarean Sections.

Table 5.1: Age Distribution

Age (Years)	Frequency	Percentage
18-30	52	48.6%
31-39	38	35.5%
40-45	17	15.9%
Total	107	100%

Table 5.2: Gestational Age Results

Gestational Age (Weeks)	Frequency	Percentage
36	40	37.4%
37	33	30.8%
38	23	21.5%
39	11	10.3%
Total	107	100%

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Table 5.3: Body Mass Index Data

BMI	Frequency	Percentage
Underweight (<18.5)	22	20.6%
Normal (18.5-24.9)	54	50.5%
Overweight (25-29.9)	18	16.8%
Obese (30 or >)	13	12.1%
Total	107	100%

Table 5.4: Pre hydration Fluid Administration

Preload	Frequency	Percentage
Yes	69	64.5%
No	38	35.5%
Total	107	100%

Table 5.5: History of Smoking

Smoking	Frequency	Percentage
Yes	27	25.2%
No	80	74.8%
Total	107	100%

Table 5.6: Gravidity Data

Gravidity	Frequency	Percentage
1	16	15%
2	56	52.3%
3	20	18.7%
>3	15	14%
Total	107	100%

Table 5.7: Parity Data

Parity	Frequency	Percentage
0	15	14%
1	54	50.5%
2	27	25.2%
>2	11	10.2%
Total	107	100%

Table 5.8: Spinal Drug Use

Drug	Frequency	Percentage
Bupivacaine	63	58.8%
Bupivacaine + Dexamethasone	44	41.2%
Total	107	100%

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Table 5.9: Spinal Dose Use

Dose (mg)	Frequency	Percentage
10	86	80.5%
10-12	21	19.5%
Total	107	100%

Table 5.10: Data on Site of Puncture

Site of Puncture	Frequency	Percentage
L2-L3	31	29%
L3-L4	60	56%
L4-L5	16	15%
Total	107	100%

Table 5.11: Intraoperative Other Drugs Use

Intraoperative other Drugs	Frequency	Percentage
Anticholinergic (Atropine)	42	39.3%
Vasopressors (Synephrine)	51	47.7%
Both	14	13.1%
Total	107	100%

Table 5.12: Intraoperative Fluid Administration

Intraoperative Fluid (ml)	Frequency	Percentage
Less than 1000	41	38.3%
More than 1000	66	61.7%
Total	107	100%

Table 5.13: Intraoperative Hypotension

Hypotension	Frequency	% of Total
Yes	57	53.3%
No	50	46.7%
Total	107	100%

Table 5.14: Intraoperative Bradycardia

Bradycardia	Frequency	% of Total
Yes	19	17.8%
No	88	82.2%
Total	107	100%

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Table 5.15: Intraoperative Desaturation

SpO2 Drop (<95%)	Frequency	% of Total
Yes	14	13.1%
No	93	86.9%
Total	107	100%

Table 5.16: Intraoperative Nausea + Vomiting

Nausea + Vomiting	Frequency	% of Total
Yes	35	33%
No	72	67%
Total	107	100%

Table 5.17: Intraoperative Shivering

Shivering	Frequency	% of Total
Yes	50	46.7%
No	57	53.3%
Total	107	100%

Discussion

The study analyzed 107 obstetric and gynecological patients who received spinal anesthesia. Most participants (48.6%) were between 18 and 30 years of age, while 35.5% were aged 31–39, indicating that the majority were young women of reproductive age. The gestational age distribution showed that most procedures were conducted near term, with 37.4% at 36 weeks and 30.8% at 37 weeks, reflecting common timing for cesarean deliveries. Regarding body mass index, 50.5% of the patients were within the normal range, 16.8% were overweight, 12.1% obese, and 20.6% underweight, demonstrating a broad variation in body habitus. Preloading with intravenous fluids was performed in 64.5% of patients, representing adherence to standard preventive measures against spinal anesthesia–induced hypotension. The majority of participants (74.8%) were non-smokers. In terms of obstetric history, most were multiparous but not of very high parity, with 52.3% in their second pregnancy and 50.5% having one live child.

The L3–L4 interspace was the preferred site for spinal puncture (56.1%), followed by L2–L3 (29%) and L4–L5 (15%). Bupivacaine was the principal anesthetic agent used in all patients, administered alone in 58.9% and with adjuvants in 41.1%. The majority (80.5%) received a 10 mg dose, while 19.6% received 10–12 mg, demonstrating individualized dosing based on patient characteristics and procedural needs. Intraoperative fluid administration exceeded 1000 mL in 61.7% of cases, indicating careful management to maintain hemodynamic stability. Vasopressors were administered intraoperatively to 47.7% of patients, anticholinergics to 39.3%, and both drugs to 13.1%, reflecting common management of spinal-induced hypotension and bradycardia. Complications were frequent but manageable. Hypotension was observed in 53.2% of patients, remaining the most common adverse event associated with spinal anesthesia. Bradycardia occurred in 17.8%, oxygen desaturation in 13.1%, nausea and vomiting in 32.7%, and shivering in 46.7%. These rates are consistent with previously published data and represent typical physiological responses to spinal anesthesia. Despite these transient events, spinal anesthesia proved to be a safe and effective technique for obstetric and gynecological

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procedures. The findings confirm that complications are predictable and manageable with proper preventive measures such as preloading, adequate fluid replacement, and timely pharmacological intervention. Overall, the study supports the continued preference for spinal anesthesia as a reliable anesthetic method that ensures patient safety, hemodynamic stability, and satisfactory surgical conditions in obstetric practice.

Conclusion

This study was conducted over the course of 4 months involving 107 patients, and all of them were female because we only focused on Cesarean Section Patients and intraoperative spinal anesthesia induced complications. We mainly focus on hypotension, bradycardia, nausea and vomiting, SpO2 drop and shivering. Our study design was cross-sectional, and objectives were only to assess the intraoperative complications caused by spinal anesthesia in Cesarean Section Patients. Hypotension and shivering were the most frequent complications, consistent with most reports. Our nausea/vomiting rate closely matches pooled estimates, while bradycardia was slightly higher than in most studies.

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