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COMPLICATION OF SPINAL ANESTHESIA IN PATIENT UNDERGOING CEASEREAN SECTION

Original Research

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ABSTRACT

Background: Spinal anesthesia is widely regarded as the technique of choice for cesarean sections due to its rapid onset, minimal airway manipulation, reduced stress response, and effective postoperative pain control. Despite these advantages, spinal anesthesia is not without risks. Common complications such as hypotension, nausea, and vomiting are frequently encountered, while rare but serious events like high spinal block, spinal hematoma, and respiratory compromise remain critical concerns. Understanding these complications and their associated risk factors is essential for ensuring maternal and fetal safety during cesarean deliveries.

Objective: To assess the frequency and types of complications associated with spinal anesthesia in patients undergoing cesarean section.

Methods: A descriptive cross-sectional study was conducted at Bahria International Hospital, Lahore, from September 2024 to February 2025. A total of 100 female patients aged 18–45 years undergoing cesarean section under spinal anesthesia were recruited. Data were collected using a standardized, pre-validated questionnaire through face-to-face interviews and direct observation. Parameters assessed included demographic characteristics, type and frequency of complications, and associated clinical findings. Data analysis was performed using SPSS version 25, with descriptive statistics presented as frequencies and percentages.

Results: The mean patient age was 35 years, with 65% between 18–30 years and 37% classified as obese. The most common complications reported were hypotension (41%), nausea and vomiting (48%), headache (50%), pain at injection site (55%), and shivering (31%). Severe complications included high spinal block (2.1%), complete spinal block (1.4%), spinal hematoma (0.7%), cardiac arrest (0.2%), respiratory arrest (0.1%), and anaphylaxis (0.1%). Neurological symptoms such as tingling (48%) and prolonged numbness (29%) were also observed.

Conclusion: Spinal anesthesia remains a safe and effective method for cesarean sections; however, careful patient selection, vigilant monitoring, and early recognition of complications are crucial. Integrating preventive strategies and evidence-based management can significantly improve maternal and neonatal outcomes.

Keywords: Anaphylaxis, Cesarean Section, Headache, Hypotension, Neurological Symptoms, Spinal Anesthesia, Vomiting.

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INTRODUCTION

Spinal anesthesia has emerged as the anesthetic technique of choice for cesarean deliveries, primarily due to its rapid onset, technical simplicity, and lower maternal mortality compared to general anesthesia. This regional technique offers the unique advantage of allowing mothers to remain conscious during childbirth while achieving effective analgesia, thereby transforming obstetric anesthesia practice in recent decades (1). Its widespread adoption, however, does not come without challenges. Despite its favorable profile, spinal anesthesia is associated with a range of complications that may significantly affect maternal and fetal outcomes (2,3). Among these, hypotension remains one of the most frequently encountered and clinically significant adverse events, with the potential to compromise uteroplacental perfusion and fetal well-being if not promptly recognized and managed (4). The pathophysiology underlying spinal anesthesia-induced hypotension is multifactorial, primarily involving a blockade of sympathetic fibers, which results in vasodilation, decreased venous return, and reduced cardiac output. This leads to a marked drop in systemic vascular resistance, with a broad reported incidence of hypotension ranging from 7.4% to 74.1% across various studies (5,6). Notably, recent clinical data have delineated hypotension into mild, moderate, and severe forms, with respective prevalences of 31.4%, 23.9%, and 30.1%, thus underscoring its frequent and often underestimated impact (3,4). In addition to hypotension, bradycardia—a result of unopposed parasympathetic activity—has been observed in a significant number of patients (15.1%), necessitating close perioperative surveillance (7,8). A growing body of literature has highlighted several contributing risk factors that predispose patients to these hemodynamic disturbances. Maternal characteristics such as advanced age, high body mass index (BMI), and elevated sensory level of spinal blockade have all been independently associated with increased susceptibility to hypotension.

Furthermore, studies have identified a positive correlation between higher BMI and hypotensive episodes, reinforcing the need for individualized anesthetic planning (5,6). The administration of vasopressors remains central to the management of spinal-induced hypotension. In this regard, recent comparative studies have demonstrated the superiority of phenylephrine over ephedrine in maintaining hemodynamic stability and reducing the need for rescue interventions (9,10). This evidence-based approach facilitates safer maternal and fetal outcomes when tailored to patient-specific needs. Beyond hemodynamic complications, spinal anesthesia may contribute to other adverse effects such as nausea, vomiting, and pruritus, all of which can diminish the overall patient experience. Recent advancements in pharmacologic management, including the use of multimodal antiemetic regimens and opioid antagonists, have shown promise in improving maternal comfort. Moreover, the incorporation of ultrasound-guided techniques for needle placement has been linked to reduced rates of traumatic punctures and post-dural puncture headaches, further enhancing the safety and precision of the procedure (11). Despite the established benefits of spinal anesthesia, it is imperative that anesthesiologists and obstetric teams maintain a high index of suspicion for potential complications and adopt proactive strategies for risk mitigation. A comprehensive understanding of the physiological mechanisms, patient-related risk factors, and evidence-based management options is essential to ensure optimal care. While spinal anesthesia continues to be the cornerstone of obstetric anesthetic practice, continuous refinement of protocols and ongoing research are critical to improving outcomes and elevating the standard of maternal and neonatal care. The objective of this study is to evaluate the incidence and associated risk factors of hypotension and other complications following spinal anesthesia in cesarean sections, with an aim to identify preventive strategies that enhance maternal and fetal safety.

METHODS

A cross-sectional descriptive study design was employed to evaluate the incidence and associated risk factors of complications arising from spinal anesthesia in patients undergoing cesarean sections. The study was conducted at Bahria International Hospital, Lahore, over a six-month period from September 2024 to February 2025, following the formal approval of the research synopsis by the institutional ethical review committee. A sample of 100 patients was selected based on the sample size estimation formula: $n = (N z^2 P(1–P)) / (E^2(N–1) + z^2 P(1–P))$ (12). Participants were selected using predefined inclusion and exclusion criteria. Eligible participants included women aged 18 to 45 years undergoing elective cesarean section under spinal anesthesia with singleton pregnancies, who provided informed written consent for participation (12). Patients were excluded if they were receiving general anesthesia, were outside the defined age range, had multiple pregnancies, or declined to participate in the study (13).

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Data collection was conducted after obtaining permission from the scientific superintendent of the hospital and formal ethical clearance. The ethical approval was obtained from the relevant institutional review board (IRB). Data were gathered through face-to-face interviews using a structured questionnaire. The researcher also observed perioperative care segments to enhance data validity. Sociodemographic details such as age, education level, and weight were documented alongside clinical intraoperative and postoperative parameters. Each session with the participants lasted approximately 20 minutes. The nursing superintendent assisted in coordinating participant availability to ensure smooth data collection. All responses were recorded directly by the researcher to maintain consistency and reduce response bias. The collected data were analyzed using IBM SPSS Statistics version 25. Descriptive statistics such as frequency and percentage were applied to categorical variables. For continuous variables, mean, median, and standard deviation were calculated, assuming a normal distribution of the data (14). The statistical analysis strategy was designed to provide a comprehensive overview of the variables under study and to facilitate identification of key risk factors.

RESULTS

The study involved 100 women who underwent cesarean section under spinal anesthesia. The demographic analysis revealed that 55% of the participants were between 18 to 30 years of age, while 45% were in the 31 to 45 age group. Educational status showed that 59% of the women were literate and 41% were illiterate. Regarding body weight distribution, 30% had normal weight, 33% were underweight, and 37% were classified as obese. Notably, cesarean sections were more frequently observed among patients with higher BMI. In terms of postoperative complications, 41% of the respondents strongly agreed to experiencing significant hypotension following spinal anesthesia, while 31% agreed and 25% remained neutral. Nausea and vomiting were reported by 48% of patients as a strong complaint, with an additional 16% agreeing to its occurrence. Headache emerged as the most prevalent issue, with 50% of participants strongly agreeing and 8% agreeing. Pain or discomfort at the injection site was reported by 55% strongly and 29% in agreement. Dizziness or lightheadedness affected 58% of patients strongly, and 20% agreed with the symptom, making it one of the most frequent complications. Burning or tingling in the lower limbs post-procedure was reported by 48% strongly and 16% agreed. Shivering was experienced by 31%, and a prolonged numbness in the lower limbs was indicated by 9% strongly and 20% agreed. Muscle pain and backache were each reported strongly by 50% of participants.

Among the more severe complications, 0.2% of patients reportedly experienced cardiac arrest, 0.1% had respiratory arrest, and 0.1% suffered anaphylaxis. Anxiety and discomfort during the cesarean procedure were strongly felt by 41% of the women, with 17% agreeing and 8% neutral. Difficulty urinating was less frequently reported, with 9% strongly agreeing and 3% agreeing. Chest discomfort or breathing difficulty post-anesthesia was strongly noted by 41% of patients. Additionally, 58% of respondents strongly felt that the complications impacted their ability to care for their newborn, while 20% agreed. Importantly, 24% strongly felt they were not adequately informed about potential anesthesia-related complications. Despite the wide array of reported side effects, only 9% of participants expressed strong satisfaction with their overall spinal anesthesia experience, whereas 58% strongly disagreed with being satisfied. Subgroup analysis revealed distinct patterns in complication prevalence across different demographic categories. Among patients aged 18–30 years, hypotension was reported in 18 individuals, whereas 23 cases were recorded in the older age group of 31–45 years. Headache and nausea/vomiting were slightly more frequent in the younger group. Obesity emerged as a prominent risk factor, with 21 obese patients experiencing hypotension, 19 reporting nausea and vomiting, and 23 suffering from headaches, all significantly higher than those with normal or underweight status. Shivering and injection site pain were also more commonly reported among obese participants. Underweight patients showed moderate complication rates, notably for headaches and nausea, whereas normal-weight patients reported comparatively lower rates of all complications. These findings indicate that higher BMI and older maternal age may be associated with an increased risk of complications following spinal anesthesia in cesarean sections.

Table 1: Demographic Characteristics of Patients Undergoing Cesarean Section Under Spinal Anesthesia

Responder	Category	Frequency	Percentage
1: Age	a)18-30 years old	a) 55	a) 55%
	b) 31-45 years old	b) 45	b) 45%
2: Education	a) Literate	a) 59	a) 59%
	b) illiterate	b) 41	b) 41%
3: Weight	a) Normal	a) 30	a) 30%

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Responder	Category	Frequency	Percentage
	b) Under weight	b) 33	b) 33%
	c)Obese	c) 37	c) 37%

Table 2: Patient-Reported Complications and Experiences Following Spinal Anesthesia During Cesarean Section

Sr. No.	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	I experienced a significant drop in blood pressure (hypotension) after receiving spinal anesthesia.	41	31	25	0	3
2	I felt severe nausea and/or vomiting following the spinal anesthesia.	48	16	18	10	8
3	I experienced shivering or chills after the administration of spinal anesthesia.	31	0	25	41	3
4	The spinal anesthesia caused me discomfort or anxiety during the cesarean section.	41	17	8	16	18
5	I felt pain or discomfort at the injection site after the procedure.	55	29	16	0	0
6	I experienced a severe headache following the cesarean section.	50	8	9	33	0
7	The spinal anesthesia caused numbness in my lower limbs that lasted longer than expected.	9	20	35	25	16
8	I felt dizziness or lightheadedness after the spinal anesthesia.	58	20	13	5	4
9	The anesthesia caused a delayed reaction in my ability to move my legs post-surgery.	24	5	40	22	9
10	I had difficulty urinating following the spinal anesthesia.	9	3	30	0	58
11	I experienced a drop in body temperature, feeling cold during or after the procedure.	31	41	20	5	3
12	I felt any burning or tingling sensation in my legs or feet post-procedure.	48	16	18	10	8
13	The spinal anesthesia made me feel anxious about the outcome of the cesarean section.	31	11	25	31	3
14	I experienced any chest discomfort or difficulty breathing after the anesthesia was administered.	41	17	8	16	18
15	The anesthesia affected my level of awareness or made me feel overly sedated.	55	29	16	0	0
16	I had any muscle pain or backache after the spinal anesthesia.	50	8	9	20	13
17	I felt that my mobility was restricted for a longer time than I anticipated.	16	25	30	25	9
18	The complications caused by spinal anesthesia affected my ability to care for my newborn.	58	20	13	5	4
19	I felt that I was not adequately informed about the potential complications of spinal anesthesia before the procedure.	24	5	40	22	9
20	I am satisfied with the overall experience of spinal anesthesia despite any complications I experienced.	9	3	30	0	58

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Table 3: Subgroup Analysis of Complications by Age and BMI

Complication	Age 18–30	Age 31–45	Normal Weight	Underweight	Obese
Hypotension	18	23	8	12	21
Nausea/Vomiting	26	22	10	13	19
Headache	30	20	12	15	23
Shivering	15	16	5	6	20
Pain at Injection Site	32	23	10	12	33

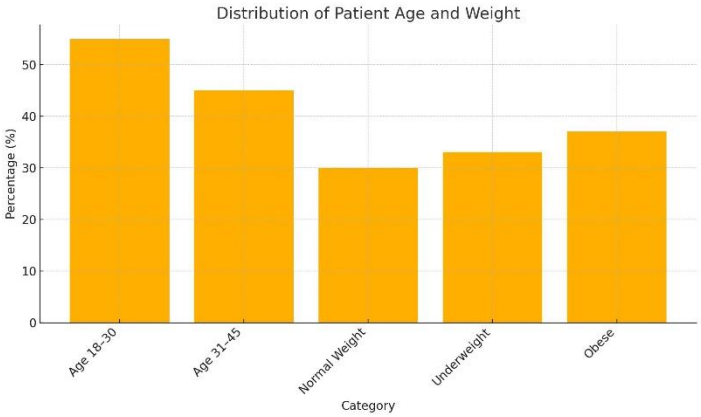

Figure 2 Distribution of Patient Age and Weight

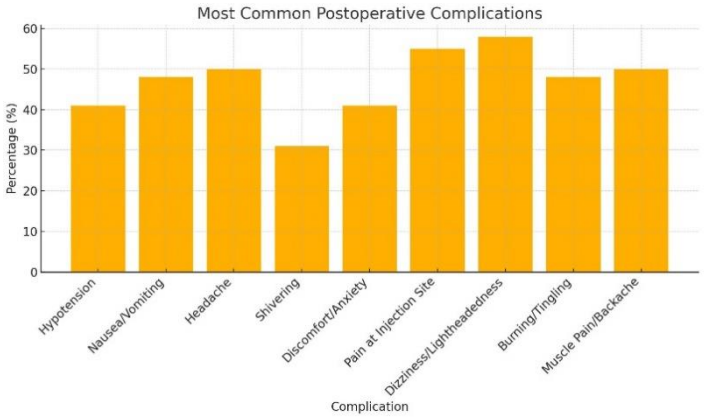

Figure 1 Most Common Postoperative Complications

DISCUSSION

The present study provides a comprehensive analysis of the incidence and severity of complications associated with spinal anesthesia in cesarean section patients, reflecting both clinical trends and the broader implications for obstetric anesthesia. The findings demonstrate that the average age of patients undergoing cesarean sections was 35 years, with a considerable proportion presenting with obesity (37%). These demographic characteristics are consistent with previous reports that associate higher maternal age and BMI with an increased likelihood of operative deliveries and anesthesia-related complications. Spinal anesthesia was associated with a high prevalence of postoperative complications, notably hypotension (41%), nausea and vomiting (48%), and headaches (50%). These rates closely align with findings from previous investigations, reinforcing the recognition of these outcomes as frequent sequelae of spinal blockade during cesarean sections (15,16). The occurrence of preoperative discomfort and anxiety in 41% of patients further emphasizes the psychosomatic burden associated with childbirth under regional anesthesia, with potential negative effects on both maternal and neonatal well-being. Severe but less frequent complications, including complete spinal block (1.4%), high spinal block (2.1%), and spinal hematoma (0.7%), were observed. Although rare, these complications hold clinical significance due to their potential to rapidly progress to life-threatening conditions such as cardiac arrest (0.2%), respiratory arrest (0.1%), and anaphylaxis (0.1%). The rates reported in this study were consistent with prior literature, underscoring the need for vigilance in early recognition and response to such critical events (17,18).

Postoperative shivering affected 31% of patients, which falls within the previously reported range for regional anesthesia but slightly above expected in comparison to general anesthesia cohorts. Neurological symptoms such as numbness and tingling in the lower limbs were reported by approximately 20% to 48% of participants, supporting earlier studies that suggest transient neuraxial effects are a common consequence of spinal blockade (19,20). These symptoms, though often self-limiting, can compromise postoperative recovery and patient satisfaction. While several prior studies reported high satisfaction with spinal anesthesia, this study challenges such assumptions by highlighting potential response bias. Patients may overreport satisfaction to align with perceived expectations of healthcare providers. In this investigation, standardized assessments were conducted by independent personnel, thereby reducing this form of bias and offering a more objective evaluation of patient experience (21,22). Intraoperative hypothermia and associated

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discomfort were reported by 41% of participants. This finding reflects a critical perioperative care gap, emphasizing the necessity of ambient temperature regulation and the use of active warming devices to maintain patient thermal comfort. Furthermore, nearly one-third of the women expressed psychological distress related to the cesarean procedure itself, indicating an unmet need for comprehensive emotional support and patient counseling prior to delivery (23,24).

Respiratory discomfort was another significant observation, with 41% of patients reporting breathing difficulty during or after anesthesia. While spinal anesthesia is generally associated with fewer respiratory complications compared to general anesthesia, high levels of sensory blockade may lead to transient respiratory suppression requiring careful intraoperative monitoring (25). The incidence of postoperative shivering in this study reached 51.8%, exceeding average estimates for regional techniques and reinforcing its multifactorial etiology, including disruption of thermoregulatory mechanisms and level of neuraxial blockade (26). The broader impact of these complications extends beyond physical symptoms. Hypotension, by impairing utero-placental blood flow, poses a direct threat to fetal well-being. Meanwhile, neurological and respiratory sequelae not only prolong recovery but also impair maternal ability to care for the newborn, with emotional consequences such as anxiety, fear, and depression frequently underrecognized. These complications collectively contribute to longer hospitalization, increased financial burden, and a higher demand for postoperative resources (26,27).

The strengths of this study lie in its detailed documentation of both common and rare complications, subgroup analysis based on demographic risk factors, and efforts to reduce observational and response bias. However, it is not without limitations. The single-center design and modest sample size may limit generalizability. Additionally, parity data were not collected, which restricts analysis of outcomes based on obstetric history. The lack of a control group receiving general anesthesia also precludes comparative effectiveness assessments. Future research should aim to include larger, multi-center cohorts and incorporate parity, comorbidity profiles, and longer-term follow-up to better assess the chronic impacts of spinal anesthesia complications. The integration of patient-centered care protocols, including psychological support and active thermoregulation, is also recommended to improve both clinical outcomes and maternal satisfaction.

CONCLUSION

In conclusion, spinal anesthesia remains the preferred and reliable technique for cesarean sections due to its well-established benefits; however, its use demands thorough awareness of potential complications. This study highlights the necessity for vigilant patient assessment, individualized anesthetic planning, and timely intervention to mitigate adverse outcomes. By integrating current evidence-based strategies into clinical practice, healthcare professionals can enhance maternal and neonatal safety. Strengthening the understanding of contributing factors and refining management approaches will support safer obstetric care and foster more positive childbirth experiences.

AUTHOR CONTRIBUTION

Author	Contribution
Nida Mushtaq	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Tooba Ali*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Warsha Haram	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Kaynat Ahmad	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Imad Ud Din Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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