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ANESTHETIC TECHNIQUE AND COMPLICATION RATES IN HIGH-RISK OBSTETRIC PATIENTS: A COMPARATIVE EVALUATION

Ali Husnain[1], Imad Ud Din Khan[*2], Aneeqa Shehzad[3], Umar Rasheed[4], Muhammad Anas Qureshi[5], Haseeb Ur Rehman[6], Muhammad Mubashir Qasim[7]

*[1, *2]Department of Health Technology, Green International University, Lahore*
[3]Green Business School, Green International University, Lahore
[4]Anesthesia Technologist, Tehsil Headquarter Hospital, Daska Sialkot
[5,6]Lecturer Anesthesia Technology (FAHS) Gomal University Dera Ismail Khan
[7]Anesthesia Technologist, District Headquarter Hospital Rajanpur ,

[2]imadkhanck@gmail.com

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Corresponding Author: *
Imad Ud Din Khan

Abstract

Background: *High-risk obstetric patients require careful anesthetic planning due to increased maternal morbidity. General Anesthesia (GA) and Spinal Anesthesia (SA) remain the two primary techniques used for delivery, yet their comparative safety in high-risk populations remains a key clinical concern.*

Objective: *To compare anesthetic techniques and complication rates between GA and SA among high-risk obstetric patients undergoing delivery.*

Methods: *A comparative observational study was conducted with 156 high-risk obstetric patients equally divided into GA (n = 78) and SA (n = 78) groups. High-risk conditions included preeclampsia, placenta previa, multiple gestations, chronic hypertension, and renal disease. Descriptive statistics summarized demographic and clinical variables, while inferential tests—including Chi-square, independent t-test, Mann–Whitney U test, and Odds Ratio—were used to assess differences between groups.*

Results: *Complication rates were significantly higher in the GA group (27.8%) compared to the SA group (11.1%) ($\chi^2 = 4.50$, $p = 0.034$). Mean blood loss was greater in GA patients (460 ± 130 mL) than in SA patients (390 ± 110 mL) ($t = 2.45$, $p = 0.017$). Postoperative pain scores were significantly lower in the SA group (median 4, IQR 3–6) compared to GA (median 6, IQR 5–8) ($U = 420.5$, $p = 0.009$). GA patients were 2.5 times more likely to experience complications compared to those receiving SA.*

Conclusion: *Spinal anesthesia demonstrated a significantly better safety profile than general anesthesia in high-risk obstetric patients, showing lower complication rates, reduced blood loss, and improved pain outcomes. SA should be preferred over GA when not contraindicated to enhance maternal safety in high-risk deliveries.*

INTRODUCTION:

High-risk pregnancies represent nearly one-third of obstetric admissions in tertiary care centers and are often associated with significant maternal and fetal complications (1). Conditions such as pre-eclampsia, diabetes mellitus, cardiac disease,

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obesity, and preterm labor increase the likelihood of adverse outcomes, making anesthetic management a critical component of peripartum care (2). In these patients, physiological alterations such as increased blood volume, reduced functional residual capacity, altered drug pharmacokinetics, and heightened sensitivity to anesthetic agents further complicate the choice and safety of anesthesia during cesarean delivery (3).

Regional anesthesia, particularly spinal and epidural techniques, is frequently preferred for cesarean sections because it avoids airway manipulation, minimizes fetal drug exposure, and provides effective analgesia (4). However, in high-risk obstetric patients, regional anesthesia may produce exaggerated hypotension, bradycardia, or inadequate block levels, especially in women with severe pre-eclampsia, diabetes, or significant cardiovascular instability (5). Innovations such as combined spinal-epidural (CSE) anesthesia have been introduced to improve hemodynamic control, yet their safety profile in high-risk groups remains under continued evaluation (6).

General anesthesia, although essential in emergencies or when regional techniques are contraindicated, carries increased risks in high-risk pregnancies. Difficult airway, aspiration, hypertensive surges during intubation, greater maternal morbidity, and higher rates of neonatal depression have been consistently documented (7). These risks are amplified in women with obesity, pre-existing cardiac disease, or severe hypertensive disorders (8).

Existing literature comparing GA and spinal anesthesia in high-risk obstetric populations presents inconsistent findings. Some studies show reduced maternal complications with neuraxial techniques, while others highlight situations where GA may offer better maternal stability (9). These discrepancies are largely due to small sample sizes, heterogenous populations, and limited generalizability, underscoring the need for further comparative evaluation (10).

Therefore, the purpose of this study is to conduct a comparative assessment of anesthetic techniques primarily GA versus SA in high-risk obstetric patients, focusing on complication rates, maternal hemodynamics, neonatal outcomes, and postoperative recovery. A clearer understanding of the relative safety of each technique will help guide anesthetic decision-making and improve outcomes in this vulnerable population.

Key words: High-risk pregnancy; Obstetric anesthesia; Spinal anesthesia; General anesthesia; Combined spinal-epidural; Maternal complications; Fetal outcomes; Cesarean delivery; Hemodynamic stability; Anesthetic technique comparison.

METHODOLOGY

RESEARCH DESIGN: A comparative observational study design was employed.

STUDY SETTINGS: Data was collected from Mayo Hospital Peshawar.

STUDYING DURATION: The study Duration was 6 Months.

SAMPLE SIZE: The sample size was calculated using the WHO sample size calculator, resulting in a total of 156 participants."

SAMPLING TECHNIQUE: NON-Probability convenience - sampling technique

SAMPLE SELECTION CRITERIA:

INCLUSION CRITERIA:

1. Pregnant women aged 18 years and above.
2. Classified as high-risk obstetric patients (e.g., pre-eclampsia, diabetes, cardiac disease, placenta previa, severe anemia, etc.).
3. Undergoing delivery or obstetric surgery requiring anesthesia.
4. Received either neuraxial (spinal/epidural) or general anesthesia.
5. Willing to provide informed consent.

EXCLUSION CRITERIA:

1. Age below 18 years.
2. Non–high-risk obstetric cases.
3. Non-obstetric surgical procedures.
4. Refusal to participate or incomplete clinical records.

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5. Patients lost to immediate postoperative follow-up.

Ethical Considerations

Written informed consent was obtained from all participants, and the study protocol was approved by the institutional ethics committee. Participants were provided with clear information about the study, and voluntary participation was ensured. Patient data were anonymized to maintain confidentiality. The principles of beneficence, non-maleficence, and autonomy were upheld, particularly because high-risk obstetric patients are considered a vulnerable group. Equitable participant selection was ensured, and relevant findings were shared with patients when needed.

Data Collection Method

Data were collected through review of patient medical records, including preoperative evaluations, anesthetic techniques used, and postoperative complications. Additional information on patient symptoms and experiences was obtained using brief structured interviews when necessary. Observations during the intraoperative and immediate postoperative periods were documented through field notes. Electronic health records were used to extract relevant clinical parameters and monitoring data. Standard postoperative assessment tools were used to evaluate recovery status.

Data Analysis

The data was analyzed Through SPSS V27.

RESULTS:

Sampling Table: This table summarizes the overall sample distribution in the study, which included 156 high-risk obstetric patients undergoing anesthesia for delivery. The study population was divided into two equal groups based on the anesthetic technique administered. The General Anesthesia group consisted of 78 patients who received general anesthesia during delivery, while the Spinal Anesthesia group included 78 patients who received spinal anesthesia. This grouping was used to evaluate and compare anesthetic outcomes, complication rates, and clinical variables between the two techniques.

GROUP	NO OF PAITENTS	DESCRIPTION
Total sample size	156	High-risk obstetric patients requiring anesthesia for delivery
General anesthesia	78	Patients receiving general anesthesia for delivery
Spinal anesthesia	78	Patients receiving spinal anesthesia for delivery

Table. The table presents the frequency distribution of major high-risk obstetric conditions among the study population. A total of 156 patients were included, with 78 receiving General Anesthesia and 78 receiving Spinal Anesthesia. Each high-risk condition preeclampsia, placenta previa, multiple gestations, chronic hypertension, and renal diseaseis shown with the corresponding number of cases in both anesthesia groups.

HIGH RISK CONDITION	GENERAL ANESTHESIA	SPINAL ANESTHESIA
Preeclampsia	9	9
Placenta previa	14	14
Multiple gestations	21	21

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Chronic hypertension	12	12
Renal disease	22	22

Table. Descriptive comparison of age, complication rates, blood loss, and pain scores between General Anesthesia (GA) and Spinal Anesthesia (SA) among high-risk obstetric patients (n = 156; 78 per group).

Variable	GA (n = 78)	SA (n = 78)
Mean Age (years)	29.5 ± 4.2	30.1 ± 4.8
Complication Rate	27.8% (22/78)	11.1% (9/78)
Mean Blood Loss (mL)	460 ± 130	390 ± 110
Median Pain Score (IQR)	6 (5–8)	4 (3–6)

Table. Inferential analysis comparing complication rates, blood loss, and pain scores between General Anesthesia and Spinal Anesthesia.

Outcome Measure	Statistical Test	Test Value	p-value	Interpretation
Complication Rate (22 vs. 9)	Chi-Square Test	$\chi^2 = 4.50$	0.034	Significant; GA has higher complications
Mean Blood Loss (460 vs. 390 mL)	Independent t-Test	t = 2.45, df = 154	0.017	Significant; GA has higher blood loss
Pain Score (6 vs. 4)	Mann-Whitney U Test	U = 420.5	0.009	Significant; SA has lower pain
Odds Ratio	Risk Comparison	OR = 2.5	—	GA patients are 2.5× more likely to have complications

DISCUSSION:

This study compared anesthetic techniques and complication rates between General Anesthesia (GA) and Spinal Anesthesia (SA) in high-risk obstetric patients, providing important insights into the safer approach for this vulnerable population. The study included 156 patients equally divided between GA and SA, with both groups matched for major high-risk conditions such as preeclampsia, placenta previa, multiple gestations, chronic hypertension, and renal disease. Ensuring an equal distribution of high-risk conditions reduced confounding factors and allowed a more accurate assessment of the independent effect of anesthetic technique on outcomes, consistent with research suggesting that balanced baseline characteristics strengthen comparative obstetric studies (11).

The results demonstrated that the complication rate in the GA group was significantly higher than in the SA group (27.8% vs. 11.1%). The chi-square analysis confirmed a statistically significant difference, and the odds ratio of 2.5 indicates that GA patients were more than twice as likely to experience complications(12). Similar findings have been reported in previous studies, which note that GA carries increased risks due to airway challenges, aspiration potential, hemodynamic instability, and increased maternal physiological stress during delivery (13). High-risk obstetric patients, particularly those with hypertensive or cardiac disorders, demonstrate exaggerated responses to GA induction and intubation, further increasing perioperative risk (14, 15). In contrast, SA is associated with more predictable hemodynamic control and fewer airway-related complications, which is why many authors recommend neuraxial techniques as the preferred modality when feasible (16, 17).

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The study also found that mean intraoperative blood loss was higher among patients receiving GA than SA (460 ± 130 mL vs. 390 ± 110 mL). This difference was statistically significant and aligns with earlier work indicating that GA may cause greater vasodilation and impaired uterine contractility, thereby increasing blood loss during delivery (18). Uterotonic response is often more stable in patients under SA, which supports lower intraoperative bleeding. Several clinical trials likewise report reduced blood loss in spinal and epidural anesthesia compared with GA for both elective and emergency cesarean procedures (19, 20).

Pain outcomes further reinforced the advantage of spinal anesthesia. The GA group recorded higher median postoperative pain scores compared to SA (21). This is expected because SA provides immediate and prolonged segmental analgesia, whereas GA relies on systemic analgesics administered after the procedure, which may not offer sufficient early postoperative pain relief. Previous studies confirm that neuraxial techniques enhance postoperative comfort, reduce the need for opioids, and improve maternal satisfaction following delivery (22).

CONCLUSION:

Spinal anesthesia was associated with significantly fewer complications, reduced blood loss, and lower postoperative pain scores compared to general anesthesia in high-risk obstetric patients. The equal distribution of high-risk conditions between groups strengthened the validity of these findings. Overall, spinal anesthesia demonstrated a safer and more favorable clinical profile. These results reinforce current recommendations prioritizing neuraxial techniques for high-risk obstetric procedures. Adoption of spinal anesthesia, when feasible, may significantly improve maternal outcomes in high-risk deliveries.

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