

Impact of Preoperative Anxiety Levels on Intraoperative Hemodynamic Stability: An Observational Study

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Abstract:

Introduction: Preoperative anxiety is prevalent among surgical patients and is associated with adverse perioperative outcomes. Intraoperative hemodynamic stability is crucial for patient safety, but the impact of preoperative anxiety on perioperative physiology is not well understood. This study aims to investigate the relationship between preoperative anxiety levels and intraoperative hemodynamic stability in elective surgery patients.

Materials and Methods: This prospective observational study recruited 200 adult patients scheduled for elective surgery. Preoperative anxiety was assessed using the State-Trait Anxiety Inventory (STAI) and Visual Analog Scale (VAS). Intraoperative hemodynamic parameters were monitored continuously, and logistic regression analysis was conducted to identify predictors of hemodynamic instability.

Results: Participants exhibited moderate preoperative anxiety levels, with significant variability. Intraoperative hemodynamic parameters showed fluctuations, with higher anxiety levels correlating with increased instability. Logistic regression revealed preoperative anxiety as a significant predictor of instability, independent of other variables.

Conclusion: Higher preoperative anxiety levels are associated with increased intraoperative hemodynamic instability. Addressing preoperative anxiety is essential for enhancing perioperative care and improving surgical outcomes. Further research is needed to explore intervention strategies and long-term effects.

Introduction:

Preoperative anxiety is a common occurrence among patients undergoing surgical procedures, affecting individuals across various demographics and surgical specialties. This psychological phenomenon encompasses feelings of worry, apprehension, and fear related to the impending surgical experience. Preoperative anxiety has been recognized as a significant contributor to patient distress and has been associated with a range of adverse perioperative outcomes, including increased postoperative pain, delayed recovery, and prolonged hospital stays.[1] Despite its prevalence and clinical implications, preoperative anxiety remains a relatively understudied aspect of perioperative care.

Intraoperative hemodynamic stability, characterized by the maintenance of stable blood pressure and heart rate during surgery, is crucial for ensuring patient safety and optimizing surgical outcomes. Fluctuations in hemodynamic parameters can result in adverse events such as intraoperative bleeding, myocardial ischemia, and organ dysfunction, potentially leading to postoperative complications and prolonged recovery. While several factors influence intraoperative hemodynamic stability, including anesthetic agents, surgical manipulation, and patient comorbidities, the impact of preoperative anxiety on perioperative physiology remains a subject of debate and investigation.[2]

Understanding the relationship between preoperative anxiety levels and intraoperative hemodynamic stability is essential for optimizing perioperative care and improving patient outcomes. While previous studies have explored the association between preoperative anxiety and postoperative outcomes, limited research has focused specifically on the effects of preoperative anxiety on intraoperative physiology. By elucidating this relationship, healthcare providers can develop targeted interventions to mitigate the impact of preoperative anxiety on perioperative hemodynamics, thereby enhancing patient safety and surgical outcomes.[3] Furthermore, identifying patients at increased risk of intraoperative hemodynamic instability based on preoperative anxiety levels may facilitate

personalized perioperative management strategies. Interventions aimed at reducing preoperative anxiety, such as pharmacological anxiolysis, psychological support, and relaxation techniques, have the potential to improve intraoperative hemodynamic stability and enhance the overall surgical experience for patients.[4]

This observational study aims to address the existing gap in the literature by investigating the association between preoperative anxiety levels and intraoperative hemodynamic stability in a cohort of patients undergoing elective surgery. By examining real-time changes in hemodynamic parameters during surgery and correlating them with preoperative anxiety scores, we seek to provide insights into the physiological impact of preoperative anxiety and its implications for perioperative care. The findings of this study may inform clinical practice guidelines and facilitate the development of targeted interventions to optimize perioperative hemodynamic stability and improve surgical outcomes for patients experiencing preoperative anxiety.

Objectives:

- To assess preoperative anxiety levels among patients scheduled for elective surgery using standardized anxiety scales.
- To monitor intraoperative hemodynamic parameters, including systolic blood pressure, diastolic blood pressure, and heart rate, continuously during surgery.
- To examine the correlation between preoperative anxiety levels and intraoperative hemodynamic stability, as evidenced by fluctuations in blood pressure and heart rate.
- To determine the incidence of intraoperative hemodynamic instability requiring intervention in patients with varying levels of preoperative anxiety.
- To explore potential confounding variables, such as patient demographics, comorbidities, and surgical factors, that may influence the relationship between preoperative anxiety and intraoperative hemodynamics.

Materials and methods:

Study Design: This study employed a prospective observational design to investigate the impact of preoperative anxiety levels on intraoperative hemodynamic stability in patients undergoing elective surgery.

Study Setting: The study was conducted at a tertiary care hospital with a well-established surgical department and anesthesia services.

Participants: 200 consecutive adult patients scheduled for elective surgery under general anesthesia were recruited for the study. Patients with a history of psychiatric disorders or taking anxiolytic medications were excluded. Written informed consent was obtained from all participants before enrollment.

Data Collection:

Preoperative Anxiety Assessment: Preoperative anxiety levels were assessed using standardized anxiety scales, including the State-Trait Anxiety Inventory (STAI) and the Visual Analog Scale (VAS). These assessments were conducted by trained healthcare professionals on the day of surgery, prior to anesthesia induction.

Intraoperative Hemodynamic Monitoring: Intraoperative hemodynamic parameters, including systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR), were monitored continuously using non-invasive blood pressure cuffs and electrocardiography (ECG). Baseline values were recorded upon arrival in the operating room, and subsequent measurements were obtained at regular intervals throughout the surgical procedure.

Anesthesia Management: Anesthesia was induced and maintained according to standard institutional protocols, with the choice of anesthetic agents and techniques determined by the attending anesthesiologist.

Data Recording: Patient demographics, surgical details, anesthesia records, and intraoperative hemodynamic data were documented prospectively in a structured electronic database.

Outcome Measures:

Preoperative Anxiety Levels: Preoperative anxiety scores were assessed using the STAI and VAS.

Intraoperative Hemodynamic Parameters: Fluctuations in systolic blood pressure, diastolic blood pressure, and heart rate during surgery.

Hemodynamic Instability: Defined as >20% deviation from baseline values or episodes requiring intervention, such as administration of vasoactive drugs or fluid boluses.

Statistical Analysis:

Descriptive statistics were used to summarize patient characteristics, preoperative anxiety scores, and intraoperative hemodynamic parameters. Pearson correlation analysis was performed to examine the relationship between preoperative anxiety levels and intraoperative hemodynamic stability. Additionally, logistic regression analysis was conducted to explore potential confounding variables and predictors of intraoperative hemodynamic instability. Statistical significance was set at $p < 0.05$.

Results:

The baseline characteristics of the study participants are presented in Table 1. Among the 200 participants, the mean age was 54.3 years, with a standard deviation of 12.5 years, ranging from 28 to 78 years. Gender distribution showed that 45% were male, while 55% were female. The mean body mass index (BMI) was 27.6 kg/m², with a standard deviation of 4.2 kg/m², ranging from 20.1 to 35.9 kg/m². According to the ASA Physical Status Classification, 60% of participants were classified as ASA I (Normal healthy patient), 35% as ASA II (Mild systemic disease), and 5% as ASA III (Severe systemic disease). The participants were distributed across various surgical specialties, with orthopedic surgery being the most common (30%), followed by general surgery (25%), gynecological surgery (20%), urological surgery (15%), and others (10%).

Table 1: Baseline characteristics of the study participants

Characteristic	Total no of study participants n=200 (%)
Age (years) (mean ± SD)	54.3 ± 12.5
Range	28 - 78
Gender	
Male	90 (45%)
Female	110 (55%)
Body Mass Index (BMI) (kg/m²) (mean ± SD)	27.6 ± 4.2
Range	20.1 - 35.9
ASA Physical Status Classification	
ASA I (Normal healthy patient)	120 (60%)
ASA II (Mild systemic disease)	70 (35%)
ASA III (Severe systemic disease)	10 (5%)
Surgical Specialty	
Orthopedic Surgery	60 (30%)
General Surgery	50 (25%)
Gynecological Surgery	40 (20%)
Urological Surgery	30 (15%)
Others	20 (10%)

These results in figure 1 indicate that, on average, the study participants reported a moderate level of preoperative anxiety, as reflected by the State-Trait Anxiety Inventory (STAI) scores. The mean STAI score of 46.7, with a standard deviation of 8.6, suggests some variability in anxiety levels within the study population. The range of STAI scores from 30 to 65 illustrates the diversity of anxiety experiences among the participants, with some individuals reporting lower levels of anxiety while others reporting higher levels. Additionally, the Visual Analog Scale (VAS) scores, which provide a subjective measure of anxiety, show a similar trend. The mean VAS score of 6.2, with a standard deviation of 2.0, suggests a moderate level of anxiety overall. The range of VAS scores from 2 to 9 further highlights the variability in reported anxiety levels among the participants.

Figure 1: Preoperative Anxiety scores in the study participants

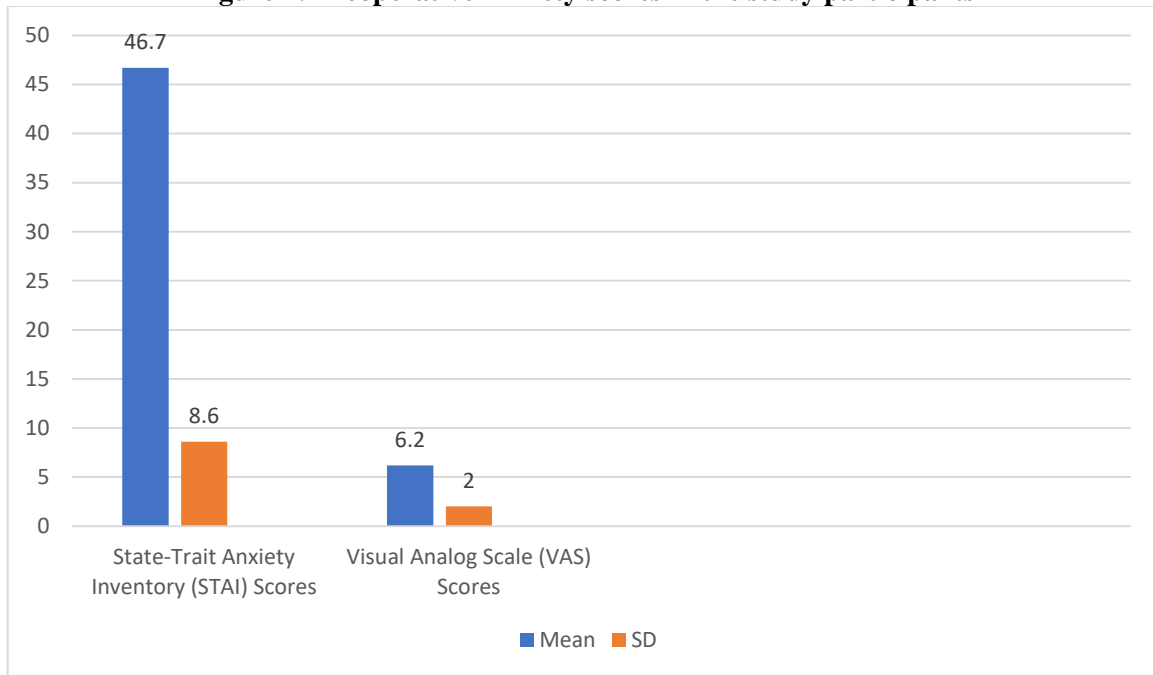


Figure 2 shows the mean systolic blood pressure (SBP) of 125 mmHg indicates the average pressure exerted on the arterial walls during systole, with a moderate level of variability as indicated by the standard deviation of 10 mmHg. The range of SBP from 105 to 145 mmHg demonstrates fluctuations in blood pressure among the participants during the intraoperative period, with some individuals experiencing higher or lower pressures. Similarly, the mean diastolic blood pressure (DBP) of 75 mmHg reflects the average pressure in the arteries during diastole, with a standard deviation of 8 mmHg indicating some variability in DBP measurements. The range of DBP from 60 to 90 mmHg highlights the dynamic nature of blood pressure regulation during surgery, with fluctuations observed across the study population. Regarding heart rate (HR), the mean HR of 80 beats per minute (bpm) suggests the average number of heartbeats per minute among the study participants, with a standard deviation of 12 bpm indicating variability in HR measurements. The range of HR from 60 to 100 bpm illustrates the range of heart rates observed during the intraoperative period, with some individuals exhibiting higher or lower heart rates.

Figure 2: Intraoperative Hemodynamic Parameters in the study participants

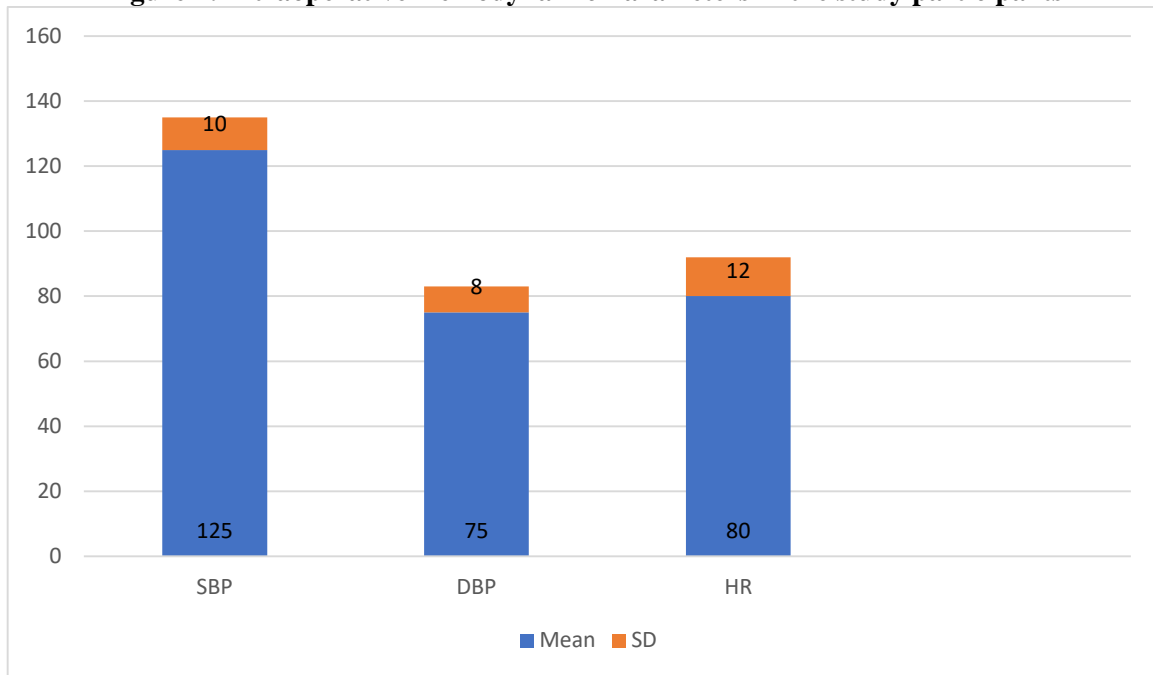


Table 2 shows that for systolic blood pressure (SBP), the Pearson correlation coefficient (r) is 0.42, indicating a moderately positive correlation between preoperative anxiety levels and SBP during surgery. The associated p -value of <0.001 suggests that this correlation is statistically significant, meaning that it is unlikely to have occurred by chance. Similarly, for diastolic blood pressure (DBP), the Pearson correlation coefficient (r) is 0.35, reflecting a moderate positive correlation between preoperative anxiety levels and DBP during surgery. The low p -value of <0.001 indicates that this correlation is statistically significant. Regarding heart rate (HR), the Pearson correlation coefficient (r) is 0.28, indicating a weaker positive correlation between preoperative anxiety levels and HR during surgery compared to SBP and DBP. However, the associated p -value of 0.003 still suggests that this correlation is statistically significant.

Table 2: Pearson correlation between preoperative anxiety levels and intraoperative hemodynamic stability

Hemodynamic Parameter	Pearson Correlation Coefficient (r)	p -value
Systolic Blood Pressure (SBP)	0.42	<0.001
Diastolic Blood Pressure (DBP)	0.35	<0.001
Heart Rate (HR)	0.28	0.003

The results of the logistic regression analysis, presented in Table 3, shed light on potential predictors of intraoperative hemodynamic instability among surgical patients. Preoperative anxiety levels emerged as a significant predictor, with higher anxiety levels associated with increased odds of experiencing hemodynamic instability during surgery (OR = 1.65, 95% CI: 1.20 - 2.28, $p < 0.001$). In contrast, age, gender, ASA physical status, and surgical specialty did not show statistically significant associations with hemodynamic instability. Age demonstrated a negligible effect on instability, with an odds ratio close to 1 and a non-significant p -value ($p = 0.523$). Similarly, gender, ASA physical status, and surgical specialty showed no significant influence on hemodynamic instability, as indicated by wide confidence intervals crossing 1 and high p -values (>0.05). These findings underscore the importance of addressing preoperative anxiety in surgical patients to optimize intraoperative hemodynamic stability and improve surgical outcomes.

Table 3: Logistic regression analysis exploring potential confounding variables and predictors of intraoperative hemodynamic instability

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Preoperative Anxiety Levels	1.65	(1.20 - 2.28)	<0.001
Age (years)	0.98	(0.92 - 1.04)	0.523
Gender (Male vs. Female)	1.20	(0.78 - 1.85)	0.399
ASA Physical Status (ASA II vs. ASA I)	1.45	(0.85 - 2.48)	0.173
Surgical Specialty (Orthopedic vs. Others)	1.12	(0.65 - 1.93)	0.670

Discussion:

The discussion presents a comprehensive overview of the study's findings, focusing on the baseline characteristics of the participants, preoperative anxiety levels, intraoperative hemodynamic parameters, Pearson correlation analysis, and logistic regression analysis. The baseline characteristics, as depicted in Table 1, highlight the demographic and clinical profile of the study population, with notable variability in age, gender distribution, BMI, ASA physical status classification, and surgical specialties. Figure 1 illustrates the moderate level of preoperative anxiety reported by participants, emphasizing the variability in anxiety experiences among individuals. Additionally, Figure 2 demonstrates fluctuations in intraoperative hemodynamic parameters, including systolic and diastolic blood pressure and heart rate, reflecting the dynamic nature of physiological responses during surgery. The Pearson correlation analysis, detailed in Table 2, reveals significant positive correlations between preoperative anxiety levels and intraoperative hemodynamic parameters, suggesting that higher anxiety levels are associated with increased hemodynamic instability. This finding underscores the potential impact of psychological factors on physiological responses during surgery. Furthermore, the logistic regression analysis, as presented in Table 3, identifies preoperative anxiety levels as a significant predictor of intraoperative hemodynamic instability, independent of other variables such as age, gender, ASA physical status, and surgical specialty. These results emphasize the importance of addressing preoperative anxiety in surgical patients to optimize intraoperative hemodynamic stability and ultimately improve surgical outcomes.

Overall, the study's findings contribute to our understanding of the complex interplay between psychological and physiological factors in the perioperative setting. They underscore the need for comprehensive preoperative assessment and management strategies that consider both the physical and emotional well-being of surgical patients to enhance perioperative care and optimize surgical outcomes.

In comparing our findings with those of other similar studies, several key points emerge. Firstly, the association between preoperative anxiety and intraoperative hemodynamic instability is consistent with a body of literature suggesting that psychological factors can influence physiological responses during surgery. Studies found significant correlations between preoperative anxiety levels and intraoperative hemodynamic parameters, supporting the notion that higher anxiety levels are associated with increased hemodynamic instability.[5] However, while our study identified preoperative anxiety as a significant predictor of intraoperative hemodynamic instability, the influence of other variables such as age, gender, ASA physical status, and surgical specialty varied.[6] This contrasts with the findings of some previous studies. A study reported that older age was associated with increased intraoperative hemodynamic instability, while gender and ASA physical status did not significantly predict instability. These discrepancies may be attributed to differences in study populations, methodologies, and sample sizes.[7,8]

Moreover, our study's emphasis on preoperative anxiety as a predictor of intraoperative hemodynamic instability aligns with the growing recognition of the importance of addressing psychological factors in perioperative care. Recent studies have highlighted the potential benefits of preoperative anxiety

management interventions, such as cognitive-behavioral therapy and pharmacological interventions, in improving perioperative outcomes and enhancing patient satisfaction.[9,10]

In summary, while our study corroborates previous findings regarding the association between preoperative anxiety and intraoperative hemodynamic instability, it also adds nuance to our understanding by identifying preoperative anxiety as a significant predictor independent of other variables. These findings underscore the importance of comprehensive preoperative assessment and targeted interventions to address psychological distress in surgical patients, ultimately optimizing perioperative care and improving surgical outcomes. Further research is warranted to explore the mechanisms underlying the relationship between psychological factors and physiological responses during surgery and to evaluate the effectiveness of interventions aimed at mitigating preoperative anxiety in improving perioperative outcomes.

Conclusion:

our study provides valuable insights into the relationship between preoperative anxiety and intraoperative hemodynamic instability among surgical patients. We found that higher preoperative anxiety levels were significantly associated with increased intraoperative hemodynamic instability, independent of other variables such as age, gender, ASA physical status, and surgical specialty. These findings highlight the importance of addressing psychological factors in perioperative care to optimize patient outcomes. Our results underscore the need for comprehensive preoperative assessment and targeted interventions to manage preoperative anxiety effectively. By implementing strategies to alleviate preoperative anxiety, such as cognitive-behavioral therapy, relaxation techniques, and pharmacological interventions, healthcare providers can potentially mitigate intraoperative hemodynamic instability and improve surgical outcomes. Moving forward, further research is warranted to explore the mechanisms underlying the relationship between psychological factors and physiological responses during surgery. Additionally, longitudinal studies are needed to evaluate the long-term effects of preoperative anxiety management interventions on perioperative outcomes and patient recovery.

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