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Original Article

Exploring the Relationship between the Impact of Preoperative Anxiety on Post Operative Recovery of Patients Undergoing Anesthesia - An Observational Study

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ABSTRACT

Background: Preoperative anxiety is common and may impede surgical recovery, yet it is seldom addressed in routine peri-operative care. **Materials and Methods:** The sample consisted of 100 adult patients (mean age 39.1±12.5 years, 56% females) undergoing surgical procedures at VIMS Hospital, Salem. The type of anaesthesia used comprised general (28%), regional (20%) and local (52%) anaesthesia. Amsterdam Preoperative Anxiety and Information Scale (APAIS) and Quality of Recovery-40 (QoR-40) scores were determined. **Results:** The cohort was characterized by moderate anxiety (APAIS 18.0±4.1). Patients with higher anxiety had worse perceived support (ρ=-0.26; p<0.01) and postoperative emotional state (ρ=-0.44). For each point of APAIS, emotional recovery decreased by 0.18 units (p=0.005). Baseline positive affect facilitated recovery (B=0.46, p=0.001). Men scored better on emotional (B=2.10) and comfort (B=2.50). Age, previous exposure to anaesthetics and anaesthetic technique were insignificant predictors. **Conclusion:** Preoperative anxiety has a negative impact on early recovery, but a positive effect and male gender contribute to resilience. Anxiety screening and subsequent interventions may lead to better recovery.

Keywords: Anaesthesia, Postoperative recovery, Preoperative anxiety, Quality of Recovery-40.

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INTRODUCTION

One of the fundamental requirements of surgery is that it should be performed without pain; therefore, anaesthetics are used to produce a temporary and reversible loss of consciousness or sensation (Hafeezulla *et al.*, 2023). Since the introduction of anaesthesia in 1846, rapid advances have been made in pharmacological agents and physiological monitoring techniques (Mohammadifard *et al.*, 2026). Various anaesthetic techniques are available for different surgical procedures, including general anaesthesia, in which the patient is rendered completely unconscious through medication; regional anaesthesia, which anesthetizes a specific part of the body (e.g., epidural or spinal block); and local anaesthesia, which is used for minor surgical procedures (Tseng *et al.*, 2025).

Although the physical management of these procedures is highly sophisticated, the psychological impact of surgery and anaesthesia on patients is often overlooked in perioperative care. Preoperative anxiety can be defined as a response to an impending operation and anaesthetic (Ji *et al.*, 2022). Approximately 60%-80% of surgical patients experience preoperative anxiety (Kassahun *et al.*, 2022). Patients may manifest this response physically through palpitations, hypertension, and rapid breathing, as well as psychologically through persistent worry, loss of control, and an overwhelming sense of dread (Naveen *et al.*, 2024). Both manifestations are primarily attributed to activation of the sympathetic nervous system and the Hypothalamic-Pituitary-Adrenal (HPA) axis (Ivascu *et al.*, 2024).

A recent study reported that patients' knowledge of the anaesthetic procedure and the anaesthetic provider significantly contribute to factors influencing preoperative anxiety (Arefayne *et al.*, 2022). It can have far-reaching consequences that extend into the postoperative period (Oteri *et al.*, 2021). Patients with higher levels of preoperative anxiety experienced greater pain perception, required more analgesics, and exhibited poorer wound healing (Hyland *et al.*, 2021). Stressful circumstances can trigger the release of catabolic hormones such as cortisol and catecholamines. These stress hormones downregulate the host immune response, impair tissue repair, and increase the risk of surgical site infections (Yaseen *et al.*, 2025).

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Furthermore, hormone release during preoperative anxiety can result in altered cardiovascular dynamics during anesthetic induction and maintenance (Ivascu *et al.*, 2024). The cognitive effects of preoperative anxiety include an increased incidence of postoperative cognitive dysfunction and confusion, as well as poorer adherence to postoperative instructions, thereby adversely affecting recovery and quality of care (Oteri *et al.*, 2021). Anxious patients are also more reluctant to participate in postoperative rehabilitation exercises, resulting in prolonged hospitalization (Sharif-Nia *et al.*, 2025). This is particularly detrimental in frail patients and those with co-morbid mental disorders (Scott *et al.*, 2024). Given these risks, effective strategies such as preoperative education, patient information, relaxation techniques, and pharmacological interventions should be considered to manage preoperative anxiety (Niyonkuru *et al.*, 2025).

Recent evidence suggests that interventions such as preoperative education and patient information can reduce postoperative pain and improve physical function (Wang *et al.*, 2024). Similarly, educational interventions have been shown to improve outcomes following cardiac surgery and enhance immunological parameters in patients with cancer (Hanalis-Miller *et al.*, 2022; Ng *et al.*, 2022).

However, an important gap remains in the existing literature. Most existing studies have focused on postoperative pain or specific patient subgroups. Very few studies have evaluated the overall quality of postoperative recovery using comprehensive outcome measures such as the Quality of Recovery-40 (QoR-40) in relation to perioperative anxiety. Additionally, limited evidence is available regarding this issue in the Indian population.

This study aimed to assess the association between preoperative anxiety and the total quality of postoperative recovery following elective surgery in an Indian context. The primary objective of this study was to assess the quality of recovery 24 hr after elective surgery among adult patients and determine its association with the degree of preoperative anxiety. The secondary objectives were to evaluate the role of demographic variables (age and gender) and intraoperative variables (type of anaesthesia) as potential modifiers of the association between preoperative anxiety and the overall quality of recovery. It was hypothesized that there would be a significant inverse relationship between preoperative anxiety and the total quality of recovery 24 hr postoperatively, regardless of the type of anaesthesia.

MATERIALS AND METHODS

Study Design and Setting

The hospital-based, observational, cross-sectional study carried out over 1 year at VIMS Hospital, Salem, sought to find out the correlation between preoperative anxiety and the quality of postoperative recovery among 100 adult elective surgical patients (18 to 70 years) chosen by purposive sampling methodology. This study sample was higher than the minimum sample size of 84 computed on the basis of a power analysis calculation for a medium effect size (r=0.30) with 80% power.

Study population

Patients above 18 years and below 70 years of age, scheduled for elective surgery and classified as ASA physical status I-III, were included after providing written informed consent. Patients requiring emergency surgery, those with psychiatric illness, learning disability, cognitive impairment, or those anticipated to require postoperative Intensive Care Unit admission were excluded from the study.

Study Instruments

Amsterdam Preoperative Anxiety and Information Scale (APAIS) and Quality of Recovery-40 (QoR-40) scales are valid and reliable instruments to measure preoperative anxiety and postoperative recovery. Both scales are known for their high construct validity, good internal consistency (Cronbach's alpha: APAIS 0.72 - 0.92; QoR-40 ≈0.93) and wide applicability.

Ethical Approval

The research was approved by the Institutional Ethics Committee of the School of Allied Health Sciences, VMRF-DU (No. VMKVM&H/IEC/24/276).

Statistical Analysis

IBM SPSS Statistics software was used for data analysis. Continuous variables were expressed as mean ± Standard Deviation (SD) and categorical variables were expressed as counts and percentages. Spearman rank correlation coefficient was used to investigate the relationship between preoperative anxiety (APAIS), baseline well-being and postoperative recovery (QoR-40 sub-scores). One-way Analysis of Covariance (ANCOVA) was applied to evaluate independent predictors of emotional well-being and physical comfort postoperatively after adjustment for preoperative anxiety and baseline well-being. Assumptions for ANCOVA including normality of residuals, homogeneity of variances (Levene's test), linearity and homogeneity of regression slopes were checked prior to analysis. The final multivariable model was built using a stepwise backward elimination procedure, starting with an initial model containing all potential predictor variables (age, sex, previous anaesthesia, and type of anaesthesia). Variables with a $p>0.10$ were excluded iteratively. For these models, unstandardized coefficients (B), 95% Confidence Intervals (CI), and associated p-values are reported to improve the interpretation of findings and effect sizes. A two-tailed $p<0.05$ was taken to represent statistical significance.

RESULTS

Preoperative Anxiety assessment

The study cohort included 100 adult participants with an average age of 39.1±12.5 years. The study cohort comprised slightly more females (56%) and almost half the participants had prior anaesthetic exposure (44%). The most commonly used anaesthesia techniques for the index procedure included local anaesthesia (52%), followed by general (28%), and regional (20%). We assessed preoperative anxiety levels with use of the Amsterdam Preoperative Anxiety and Information Scale (APAIS) in Table 1. Our cohort had moderate anticipatory anxiety (APAIS total score mean=18.0±4.1), with anxiety pertaining to worry about the procedure and the procedure "continually on the mind" being the highest scores (mean±SD of 3.56±0.82, 3.41±0.97, respectively) in Table 1.

Correlation between Preoperative Anxiety and Postoperative Recovery

There were significant negative correlations found on Spearman's correlation analysis between preoperative anxiety and the recovery domains as shown in Table 2.

Predictors of Postoperative Emotional Recovery

In the multivariable regression model for emotional recovery, male gender emerged as the strongest positive predictor, with an effect size of 2.095 units (95% CI [0.748, 3.442], p=0.001). Conversely, preoperative anxiety was a significant negative predictor; for every one-point increase in the APAIS score, the emotional recovery score decreased by 0.180 units (95% CI [-0.317, -0.043], p=0.005). Preoperative emotions (B=0.459, 95% CI [0.226, 0.692], p=0.001) and postoperative pain management (B=0.459, 95% CI [0.245, 0.673], p=0.001) also contributed significantly to better emotional outcomes (Table 3).

Predictors of postoperative physical comfort

For physical comfort (Table 4), being male was associated with a 2.500 unit increase in comfort scores (95% CI [1.269, 3.731], p=0.001). Postoperative pain scores were also a positive predictor of comfort (B=0.412, 95% CI [0.198, 0.626], p=0.010), likely reflecting effective clinical response to reported pain. Age, previous anaesthetic history, and the type of anaesthesia used did not serve as significant predictors in the final model.

Overall regression findings

In regression models predicting subjective recovery, positive outcomes were always predicted by being male in sex (with postoperative emotional score and postoperative comfort scores being higher by approximately 2 points) and it is of interest to note that a high degree of preoperative anxiety decreased positive outcomes and high positive emotions increased these outcomes. All measures of higher pain correlated positively with both outcomes, possibly reflecting successful pain management and/or modification of patient's criteria of success and between-patient variability was largely accounted for by these factors, with age, pre-anaesthetic history and anesthesia-type not proving to have independent effects.

DISCUSSION

One of the primary findings of this study was that preoperative anxiety had a significant negative correlation with postoperative recovery. This finding was consistent with that of Bedaso *et al.*'s who reported that women tend to be more susceptible to anxiety and stress when undergoing surgical procedures (Bedaso *et al.*, 2022). Furthermore, the observation that psychological stress negatively affects surgical outcomes is consistent with the findings of Mavridou *et al.* They demonstrated that anaesthesia-related stress negatively alters neuroendocrine function and pain thresholds (Mavridou *et al.*, 2013).

Although several studies have described the physiological effects of different anaesthetic techniques, our data suggest that the type of anaesthesia, whether general, regional, or local, does not influence postoperative recovery as strongly as individual patient-related factors, such as the level of psychological preparedness. This supports the contemporary perspective highlighted in a systematic review, which reported that preoperative education leads to greater improvements in both functional recovery and pain outcomes than changes in the anaesthetic technique itself (Wang *et al.*, 2024).

The present study demonstrates that high preoperative anxiety adversely affects postoperative recovery through physiological mechanisms. Anxiety induces a psychophysiological stress response mediated by the sympathetic nervous system, resulting in activation of the Hypothalamic-Pituitary-Adrenal (HPA) axis. This activation results in increased cortisol and catecholamine levels, reduced immune function, delayed tissue repair, and consequently, increased susceptibility to postoperative infection. Behavioural mechanisms, such as poor preoperative cognitive function and reluctance to follow postoperative mobilization protocols among anxious patients, may also contribute to poorer

Table 1: Amsterdam Preoperative Anxiety and Information Scale (APAIS) Scores.

Preoperative Statement	Mean ± SD
I am worried about the anaesthetic	3.29±1.13
The anaesthetic is on my mind continually	2.91±1.00
I would like to know as much as possible about the anaesthetic	2.79±0.99
I am worried about the procedure	3.56±0.82
The procedure is on my mind continually	3.41±0.97
I would like to know as much as possible about the procedure	2.87±1.00

SD: Standard Deviation.

Table 2: Spearman's ρ (|ρ| ≥ 0.25) for Anxiety and Recovery Variables.

Variable 1	Variable 2	ρ	Significance
Amsterdam Anxiety	Postoperative Emotions	-0.44	$p<0.01$
Amsterdam Anxiety	Preoperative Emotions	-0.292	$p<0.01$
Amsterdam Anxiety	Postoperative Support	-0.264	$p<0.01$
Gender	Postoperative Emotions	-0.465	$p<0.01$

ρ: Spearman's rank correlation coefficient.

Table 3: Regression Analysis for Postoperative Emotions.

Parameter	B	SE	95% CI	*t*	*p*-value
Intercept	6.789	3.278	[0.364, 13.214]	1.909	0.053
Gender (Male)	2.095	0.687	[0.748, 3.442]	3.165	0.001
Preoperative Anxiety	-0.180	0.070	[-0.317, -0.043]	-2.576	0.005
Preoperative Emotions	0.459	0.119	[0.226, 0.692]	3.981	0.001
Postoperative Pain	0.459	0.109	[0.245, 0.673]	4.361	0.001

B: Unstandardized regression coefficient; **SE:** Standard error; **CI:** Confidence interval.

Table 4: Regression Analysis for Post-operative Comfort.

Parameter	B	SE	95% CI	*t*	*p*-value
Intercept	22.219	3.216	[15.916, 28.522]	6.709	0.001
Gender (Male)	2.500	0.628	[1.269, 3.731]	3.983	0.001
Postoperative Pain	0.412	0.109	[0.198, 0.626]	3.766	0.010

B: Unstandardized regression coefficient; **SE:** Standard error; **CI:** Confidence interval.

recovery. The multivariable analysis identified that male gender was a strong, independent, significant factor predicting improved emotional-recovery scores (B=2.095, p=0.001). While some literature suggests this may reflect variations in coping strategies or cultural expectations regarding emotional strength, our study did not specifically measure these factors. The observed advantage among male participants may be attributable to confounding, particularly their significantly lower preoperative anxiety levels. Therefore, this finding should not be interpreted as evidence of a gender-specific benefit but rather as a reflection of greater psychological stability.

The apparent male resilience observed in our results may reflect lower baseline anxiety levels rather than a biologically inherent advantage. These findings support the need for gender-sensitive perioperative interventions that account for differing baseline psychological states. A key finding of the present study is that the association between patient-reported experiences and postoperative outcomes was stronger than that observed for other variables, including anaesthetic technique.

The positive association between greater reported pain and higher reported levels of well-being, emotional support, and pain relief (B=0.459, p=0.001), together with the significant association between improved physical and emotional outcomes and greater perceived support, supports a comprehensive recovery approach that incorporates both pharmacological and non-pharmacological interventions. It is essential to distinguish between the observed statistical significance and its clinical significance for the patient. In our multivariable model, male gender predicted an approximately 2 to 2.5 unit increase in emotional recovery and physical comfort scores. Given the total range of the QoR-40 sub-scores, this represents a modest but tangible improvement in the quality of the patient's early postoperative experience. Similarly, the 0.18-unit decrease in emotional recovery for every one-point increase in APAIS suggests that for high-anxiety patients (e.g., those scoring 10 points higher than average), the cumulative impact on recovery quality becomes clinically relevant and warrants targeted psychological support. Preoperative assessments should not focus solely on physical well-being but should also include psychological screening. Targeted interventions addressing gender-related anxiety patterns, first-time surgical experiences, and individualized anesthetic planning may substantially improve postoperative outcomes. Brief, validated assessment tools such as the APAIS and QoR-40 should be incorporated into routine hospital practice for preoperative screening and postoperative follow-up.

LIMITATIONS

Several limitations of this study are acknowledged in interpretation of findings. Firstly, the present study was a single center study at VIMS Hospital, Salem with a relatively small sample size of 100 participants and hence, limited generalizability to larger populations or various settings. Secondly, the cross-sectional study design allows for the identification of associations between

anxiety and recovery but is unable to make clear causal inferences on the effect of anxiety on recovery. Thirdly, the purposive sampling method may have been associated with selection bias in that the samples selected may not be entirely representative of all the patient's undergone surgery. Fourthly, the data was gathered by the use of self-administered questioners (APAIS and QoR-40), therefore the answers given by respondents are prone to response bias. It is possible that the male group under-reported the level of discomfort due to factors such as cultural acceptance and social desirability, though these sociocultural factors were not formally assessed in this study. Lastly, the study did not include the emergency cases and psychiatric patients and hence, it may not be applicable to patients in such condition in which levels of both anxiety and other factors related to recovery may be higher.

CONCLUSION

The observational study revealed that increased levels of preoperative anxiety were correlated with lower levels of postoperative recovery, especially regarding emotional recovery, physical comfort, and pain management. Subjects who had previous experience undergoing anaesthesia procedures demonstrated more successful recovery, indicating that being familiar with the procedure may be linked to lower levels of anxiety and higher chances of recovery. Although no causal link can be made, this result shows the importance of considering preoperative anxiety and offering patients necessary assistance.

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ABBREVIATIONS

PACU: Post-anesthesia care units; **ASA:** American Society of Anaesthesiologist; **GABA:** Gamma-aminobutyric acid; **NMDA:** N-methyl-D-aspartate; **EEG:** Electroencephalogram; **HPA:** Hypothalamic-pituitary-adrenal; **APAIS:** The Amsterdam Preoperative Anxiety and Information Scale; **QoR- 40:** Quality of recovery- 40; **ANCOVA:** Analysis of covariance; **IBM SPSS:** International Business Machines Statistical Package for the Social Sciences; **SD:** Standard Deviation; **CI:** Confidence Intervals.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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