

The effect of preoperative anxiety on post-operative pain in patients undergoing elective surgery

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Abstract

Objective: To evaluate the effect of preoperative anxiety on postoperative pain scores, and postoperative analgesic requirements in adult surgical patients.

Methods: This prospective cohort study included 370 patients undergoing elective surgery, equally divided into low and high preoperative anxiety groups (n = 185 each) based on standardized anxiety assessment. Demographic characteristics, clinical variables, type of surgery, anesthesia technique, intraoperative opioid consumption, duration of surgery, postoperative Numerical Rating Scale (NRS) pain scores at 2, 4, 6, 12, and 24 hours, and total 24-hour postoperative tramadol consumption were recorded. Comparisons between groups were performed using independent *t*-tests and chi-square tests, with $p < 0.05$ considered statistically significant.

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Results: The mean age was comparable between the low and high anxiety groups (41.78 ± 9.48 vs 40.50 ± 9.40 years; $p = 0.191$), with no significant differences in gender distribution or educational status. A significantly higher proportion of rural patients ($p = 0.048$) and ASA III status ($p = 0.042$) was observed in the high anxiety group. General anesthesia was used more frequently in patients with high anxiety (67.0% vs 56.8%; $p = 0.042$). Mean intraoperative opioid consumption was significantly higher in the high anxiety group (105.71 ± 17.44 mg vs 95.79 ± 15.38 mg; $p < 0.001$). Postoperative NRS pain scores were significantly higher in the high anxiety group at all time points (2–24 h; all $p < 0.001$). Total 24-hour postoperative tramadol consumption was also significantly greater in patients with high preoperative anxiety (159.86 ± 15.88 mg vs 135.04 ± 23.44 mg; $p < 0.001$).

Conclusion: High preoperative anxiety is associated with increased intraoperative

opioid use, higher postoperative pain scores, and greater postoperative analgesic requirements. Routine assessment and management of preoperative anxiety may improve postoperative pain outcomes and optimize perioperative analgesic strategies.

Introduction

Pre-operative anxiety is a normal psychological phenomenon in patients who are being subjected to some elective surgical procedure and is a major health issue facing the world today¹. According to international research, clinically significant anxiety preceding surgery is observed in about 40-80%² of patients with a higher rate observed between patients having major surgery and patients who have had little surgical exposure. Post-operative pain has still been one of the most common and uncomfortable side effects of surgery with moderate to severe pain being experienced by almost 30-50 percent³ of the patients worldwide even after the improvement in surgery methods including anesthetic and analgesic methods.

Pre-operative anxiety is a multidimensional phenomenon that is dependent on fear of anesthesia, fear of surgical outcomes, anticipated pains, loss of autonomy, and past negative experiences with healthcare⁴. It has been demonstrated that demographic and clinical variables like younger age, female gender, lower education level, type of surgery, and absence of sufficient information during pre-operative stages augment the levels of anxiety⁵. The anticipatory period of elective surgery permits the development of anxiety, and, therefore, patients are especially susceptible to psychological damage before the operation⁶.

However, increasing evidence indicates that pre-operative anxiety is a major determinant of the intensity of post-operative pain, and perception thereof. Anxiety causes the hypothalamic-pituitary adrenal axis and sympathetic nervous system to become activated, which results in high release of cortisol and facilitates pain sensitivity⁷. Psychological stress has been depicted to lower pain thresholds, heighten the pain perception and escalate postoperative analgesic intake. As a result, anxious patients tend to have worse pain, slower recovery and less satisfaction with surgical services^{8,9}.

Although pre-operative anxiety is a clinical issue of importance, it is commonly undervalued and under-medicated in the normal state of perioperative practice¹⁰. The current application of pain management tools in most healthcare institutions is based mainly on pharmacological management and the psychological assessment and management are handled minimally. This can be seen especially clearly in the context of resource constrained environments, where time constraints and the absence of standardized screening instruments further impede a thorough perioperative care¹¹.

Thus, this study is design to reflect on the impact of the pre-operative anxiety on the postoperative pain among patients undergoing elective surgery. Through this relationship, the study aims at presenting facts that justify the inclusion of anxiety evaluation and specific psychological treatment in the perioperative care. Pre-operative anxiety could be handled and help in controlling pain and decreasing analgesic needs, improving recovery, and eventually producing better surgical outcomes.

Methodology

This prospective cohort study was conducted in the Department of General Surgery PAF Hospital, Islamabad. Adult patients aged 18–65 years scheduled for elective surgical procedures under general or regional anesthesia were recruited

using consecutive sampling. Patients with a history of chronic pain disorders, psychiatric illness, current use of anxiolytics or antidepressants, cognitive impairment, emergency surgery, or inability to comprehend the assessment tools were excluded from the study. Sample size was calculated by using openepi.com with 95% confidence interval, 80% power of study, $156.49 \pm 23.368\text{mg}^{12}$ total consumption of Tramadol in high anxiety group and $147.12 \pm 38.996\text{mg}^{12}$ Tramadol consumption in low anxiety group.

The pre-operative anxiety was measured on the day of surgery, which was about one hour before the induction of anesthesia, using the State-Trait Anxiety Inventory (STAI), a recognised and standardised instrument of assessing anxiety in surgical patients. Current anxiety levels were

measured by use of the state anxiety component (STAI-S) where higher scores showed higher levels of anxiety. According to the scores of STAI-S, patients were divided into low and high anxiety based on the pre-established cutoff values. To reduce confounding all patients were given standardized anesthetic and postoperative analgesic protocols.

The intensity of post-operative pain was assessed with the help of the Visual Analog Scale (VAS) which was measured by 0 (no pain) to 10 (worst imaginable pain). Pain measurement of 6, 12 and 24 hours after operation was conducted. The total analgesic intake within the first 24 hours of surgery was documented and then converted to the equivalent doses where necessary.

The analysis of data was followed by the use of Statistical Package of the Social Sciences (SPSS) version 25. Continuous variables were represented as mean and standard deviation, and categorical variables were represented as frequencies and per cent. The correlation between the level of pre-operative anxiety and the score of post-operative pain was evaluated. Chi square and t test were used to perform comparisons between anxiety groups. The p-value below 0.05 was taken to be statistically significant.

Results

A total of 370 patients were included in this study, with 185 patients in each anxiety group (low and high preoperative anxiety). The mean age of patients in the low anxiety group was 41.78 ± 9.48 years, compared with 40.50 ± 9.40 years in the high anxiety group, with no statistically significant difference ($t = 1.31$, $p = 0.191$). gender distribution, with males comprising 43.2% of the low anxiety group and 41.1% of the high anxiety group ($\chi^2 = 0.17$, $p = 0.674$). Higher proportion of rural patients in the high anxiety group (54.6% vs 44.3%, $\chi^2 = 3.91$, $p = 0.048$). Educational status did not differ significantly between the two groups ($\chi^2 = 5.55$, $p = 0.136$). The patients in the low anxiety group had a history of previous surgery (41.1% vs 32.4%), ($\chi^2 = 2.98$, $p = 0.084$). ASA status differed significantly between groups ($\chi^2 = 6.33$, $p = 0.042$), with a higher proportion of ASA III patients in the high anxiety group (14.6% vs 9.2%). (Table. 1).

Cholecystectomy was more common among patients with high anxiety (63.2%) compared to low anxiety (49.2%). In contrast, appendectomy and hemorrhoidectomy were relatively more frequent in the low anxiety group. Thyroidectomy showed a nearly similar distribution between the two anxiety categories. Overall, preoperative anxiety varied across surgical procedures, and the association was statistically significant ($\chi^2 = 12.06$, $p = 0.007$). (Table. 2).

General anesthesia was used more frequently in patients with high preoperative anxiety (67.0%) compared with low anxiety (56.8%), ($p = 0.042$). Mean intraoperative opioid consumption was significantly higher in the high anxiety group (105.71 ± 17.44 mg) than in the low anxiety group (95.79 ± 15.38 mg) ($p < 0.001$). The duration of surgery was slightly longer in the low anxiety group (72.76 ± 11.84 minutes) compared with the high anxiety

group (69.76 ± 12.14 minutes), with a statistically significant difference ($p = 0.017$). (Table. 3).

Postoperative NRS pain scores were significantly higher in patients with high preoperative anxiety at all time points. At 2 hours, pain scores were 5.02 ± 1.05 in the high anxiety group compared with 3.24 ± 0.98 in the low anxiety group ($p < 0.001$). Similar significant differences were observed at 4 hours (4.83 ± 0.97 vs 3.02 ± 0.98), 6 hours ($4.43 \pm$

0.99 vs 2.88 ± 0.89), 12 hours (3.96 ± 0.91 vs 2.47 ± 0.81), and 24 hours (3.01 ± 0.85 vs $2.23 \pm$

0.75), with all comparisons yielding $p < 0.001$. (Table. 4).

Total tramadol consumption within the first 24 hours postoperatively was significantly higher in patients with high anxiety (159.86 ± 15.88 mg) compared with those with low anxiety (135.04 ± 23.44 mg) ($p < 0.001$). (Table. 5).

Table. 1

Baseline demographic and perioperative clinical characteristics stratified by preoperative anxiety level

Variable	Category	Anxiety		Test of sig.
		Low	High	
Age (years)		41.78 ± 9.48	40.50 ± 9.40	$t=1.31, p=0.191$
Sex	Male	80 (43.2)	76 (41.1)	$\chi^2=0.17, p=0.674$
	Female	105 (56.8)	109 (58.9)	
Area of residence	Urban	103 (55.7)	84 (45.4)	$\chi^2=3.91, p=0.048$
	Rural	82 (44.3)	101 (54.6)	
Educational status	Illiterate	29 (15.7)	44 (23.8)	$\chi^2=5.55, p=0.136$
	Primary	56 (30.3)	61 (33.0)	
	Secondary	65 (35.1)	53 (28.6)	
	College and above	35 (18.9)	27 (14.6)	
Previous surgery	Yes	76 (41.1)	60 (32.4)	$\chi^2=2.98, p=0.084$
	No	109 (58.9)	125 (67.6)	
ASA status	I	104 (56.2)	81 (43.8)	$\chi^2=6.33, p=0.042$
	II	64 (34.6)	77 (41.6)	
	III	17 (9.2)	27 (14.6)	

Table. 2

Distribution of elective general procedures according to preoperative anxiety status

General Procedure	Anxiety		Test of sig.
	Low	High	
Appendectomy	33 (17.8)	16 (8.6)	$\chi^2=12.06, p=0.007$
Cholecystectomy	91 (49.2)	117 (63.2)	
Thyroidectomy	29 (15.7)	32 (17.3)	
Hemorrhoidectomy	32 (17.3)	20 (10.8)	

Table. 3

Comparison of intraoperative anesthetic management and surgical variables by preoperative anxiety level

Variable	Category	Anxiety		Test of sig.
		Low	High	

Type of anesthesia	General anesthesia	105 (56.8)	124 (67.0)	$\chi^2=4.13$, p=0.042
	Spinal anesthesia	80 (43.2)	61 (33.0)	
Intra-operative opioids intake (mg)		95.79±15.38	105.71±17.44	t=-5.8, p<0.001
Duration of surgery (minutes)		72.76±11.84	69.76±12.14	t=2.4, p=0.017

Table. 4

Postoperative pain intensity (NRS scores) at different time intervals according to preoperative anxiety level

NSR score	Anxiety		Test of sig.
	Low	High	
NSR score at 2 hours	3.24±0.98	5.02±1.05	t=-16.8, p<0.001
NSR score at 4 hours	3.02±0.98	4.83±0.97	t=-17.6, p<0.001
NSR score at 6 hours	2.88±0.89	4.43±0.99	t=-15.8, p<0.001
NSR score at 12 hours	2.47±0.81	3.96±0.91	t=-16.57, p<0.001
NSR score at 24 hours	2.23±0.75	3.01±0.85	t=-9.5, p<0.001

Table. 5

Comparison of 24-hour postoperative tramadol consumption between low and high preoperative anxiety groups

Variable	Anxiety		Test of sig.
	Low	High	
Total tramadol consumption (mg)	135.04±23.44	159.86±15.88	t=-11.93, p<0.001

Discussion

In this study of 370 patients, high preoperative anxiety was significantly associated with greater intraoperative opioid consumption, increased use of general anesthesia, higher postoperative pain scores at all measured time points (2–24 h), and significantly elevated 24-hour tramadol consumption compared with patients with low anxiety. These findings are consistent with a growing body of recent literature suggesting that preoperative psychological state influences postoperative pain intensity and analgesic needs.

Results of this study align closely with the prospective study by Tadesse *et al*¹² who reported that patients with high preoperative anxiety experienced significantly greater postoperative pain at 2, 4, 6, and 12 hours and higher 24-hour tramadol use compared with low anxiety patients (156.5 ± 23.4 mg vs 147.1 ± 39 mg; $p = 0.036$). Similarly, Kashif *et al*¹³ found that moderate-to-severe preoperative anxiety was associated with higher postoperative pain scores at 12 and 24 hours and increased intraoperative and postoperative morphine consumption in cardiac surgery patients.

The association between high anxiety and increased analgesic demand is also reflected in gynecologic oncology patients; a study conducted by Ulha *et al*¹⁴ in 2025 reported that elevated

preoperative STAI scores predicted higher early postoperative VAS pain scores and greater total opioid consumption, as well as earlier need for analgesia.

Findings from a study conducted by Nguyen *et al*¹⁵ also support the link

between anxiety and opioid use. This cohort involving nearly 1800 patients reported that preoperative anxiety increased the likelihood of postoperative opioid use by 40% and was associated with higher surgical site pain, even up to six months after surgery. Conversely, the 2025 meta-analysis by Bakker-Bons *et al*¹⁶ reported mixed evidence regarding pain outcomes, noting significant associations between preoperative anxiety and anesthetic and analgesic requirements overall, but not consistently with postoperative pain across all pooled trials.

The prospective study by Pekcan *et al*¹⁷ observed a correlation between preoperative state anxiety and 24-hour pain scores and analgesic consumption in laparoscopic sleeve gastrectomy patients, indicating that even within specific surgical subgroups, anxiety levels may influence postoperative opioid requirements.

Consistent with these findings, Çalışkan and Aksoy¹⁸ reported moderate positive correlations between preoperative STAI scores and VAS pain scores at 6, 12, and 24 h after total hip and knee arthroplasty, suggesting that higher state anxiety is associated with poorer early postoperative pain outcomes in orthopedic surgery. Qaddumi *et al*¹⁹ also confirmed that elevated preoperative anxiety was linked to increased postoperative pain and higher pethidine consumption in laparoscopic cholecystectomy patients, reinforcing the cross-procedural relevance of anxiety's impact on analgesic needs.

However, not all evidence unanimously supports an anxiety–pain link. The 2025 systematic review and meta-analysis by Shebl *et al*²⁰ found significant associations between preoperative anxiety and increased anesthetic and analgesic requirements, but did not detect a significant association with postoperative pain across all pooled studies, suggesting heterogeneity by outcome measure and surgical context.

Conclusion: High preoperative anxiety is associated with increased intraoperative opioid use, higher postoperative pain scores, and greater postoperative analgesic requirements. Routine assessment and management of preoperative anxiety may improve postoperative pain outcomes and optimize perioperative analgesic strategies.

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