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Association Between Preoperative Anxiety And Postoperative Pain In Patients Undergoing Elective Surgery.

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Abstract

Background: Preoperative anxiety is common among patients undergoing surgery and may influence postoperative pain perception and analgesic requirements. This study aimed to assess the association between preoperative anxiety and postoperative pain in patients undergoing elective surgery. ***Materials and Methods:*** This prospective observational study included 50 adult patients undergoing elective surgery. Preoperative anxiety was assessed using the Amsterdam Preoperative Anxiety and Information Scale (APAIS). Postoperative pain was evaluated using the Numerical Rating Scale (NRS) at 2, 4, 6, 12, and 24 hours. Rescue analgesic requirement and total 24-hour analgesic consumption were also recorded. ***Results:*** Higher preoperative anxiety was observed in 44.0% of patients. Patients with higher anxiety had significantly greater NRS pain scores at 2, 4, 6, and 12 hours compared with those with lower anxiety ($p<0.05$), while the difference at 24 hours was not significant. Higher-anxiety patients required rescue analgesia earlier and had significantly greater 24-hour analgesic consumption ($p<0.001$). APAIS anxiety scores showed a significant positive correlation with 2-hour postoperative pain ($\rho=0.52$, $p<0.001$) and total analgesic consumption ($\rho=0.49$, $p<0.001$). ***Conclusion:*** Higher preoperative anxiety was associated with increased early postoperative pain and greater analgesic requirements. Preoperative anxiety assessment may help identify patients requiring individualized perioperative pain management.

Keywords: Preoperative anxiety; Postoperative pain; APAIS; Elective surgery; Analgesic requirement; Pain assessment.

INTRODUCTION

Postoperative pain remains one of the most common concerns among patients undergoing surgery and continues to be an important challenge in perioperative care. Despite advances in anaesthetic techniques, multimodal analgesia and postoperative pain management, considerable variation exists in the intensity of pain experienced by patients undergoing similar surgical procedures. Postoperative pain is influenced not only by the type and duration of surgery, extent of tissue injury and anaesthetic technique, but also by individual demographic, psychological and emotional factors. Among these factors, preoperative anxiety has increasingly been recognized as a potentially important predictor of postoperative pain and analgesic requirement.

Preoperative anxiety refers to feelings of apprehension, fear, nervousness or tension experienced by patients before surgery. It may arise from fear of anaesthesia, anticipated postoperative pain, possible surgical complications, loss of control, unfamiliar hospital surroundings and uncertainty regarding recovery. Anxiety may activate the sympathetic nervous system and stress response, increase attention toward painful stimuli and alter nociceptive processing. Consequently, highly anxious patients may have a lower pain threshold and experience greater postoperative pain than patients with lower levels of anxiety.

Recent clinical studies support this relationship. Tadesse et al., in a prospective cohort of patients undergoing elective surgery, reported significantly higher postoperative pain scores at 2, 4, 6 and 12 hours among patients with high preoperative anxiety. These patients also had greater 24-hour tramadol consumption [1]. Valencia et al. similarly evaluated patients undergoing craniotomy and demonstrated the relevance of preoperative anxiety in predicting postoperative pain, highlighting the importance of psychological factors even in major neurosurgical procedures [2].

Kashif et al. studied patients undergoing cardiac surgery and observed that patients with moderate-to-severe preoperative anxiety experienced greater postoperative pain and required more analgesia than those with lower anxiety levels [3].

Fernández-Castro et al. also demonstrated an association between increasing preoperative state anxiety and postoperative morphine requirement following cardiac surgery [4]. These findings suggest that the effect of anxiety may extend beyond subjective pain reporting and influence actual postoperative analgesic consumption.

The association has also been observed in other surgical populations. Pekcan et al. investigated patients undergoing laparoscopic sleeve gastrectomy and found that preoperative state anxiety correlated with postoperative pain levels and analgesic consumption during the first 24 hours after surgery [5]. In patients undergoing laparoscopic gynecological surgery, preoperative anxiety has also been associated with poorer postoperative recovery parameters, including increased pain and disturbed postoperative sleep [6].

Varış and Peker evaluated patients undergoing total knee arthroplasty and reported that higher preoperative anxiety was associated with greater postoperative pain and analgesic requirements [7]. Similarly, studies involving urological surgery demonstrated positive relationships between surgical anxiety, fear and postoperative pain [8]. More recent evidence from patients undergoing total hip and knee replacement also showed a moderate positive correlation between preoperative state anxiety and postoperative pain scores at several time points, with anxiety independently influencing early postoperative pain [9].

Although these studies generally support an association between preoperative anxiety and postoperative recovery, the magnitude of the relationship is not uniform across all surgical populations. A recent systematic review and meta-analysis examining the broader impact of preoperative anxiety found clear associations with increased anaesthetic and analgesic requirements and delayed recovery parameters, while the pooled association with postoperative pain itself was less consistent [10]. Differences in surgical procedures, anxiety assessment scales, anaesthetic techniques, analgesic protocols and timing of postoperative pain assessment may explain some of this variation.

Furthermore, much of the available recent literature has focused on individual surgical specialties such as cardiac surgery, neurosurgery, bariatric surgery or joint replacement. Relatively fewer prospective studies have examined this relationship across a broader population undergoing routine elective surgical procedures using standardized preoperative anxiety and postoperative pain assessments. Identifying anxiety before surgery may be clinically useful because it represents a potentially modifiable risk factor. Appropriate counselling, psychological preparation and individualized perioperative analgesic planning may help improve postoperative comfort and recovery. Therefore, the present study was undertaken to assess the association between preoperative anxiety and postoperative pain among patients undergoing elective surgery and to determine whether higher levels of preoperative anxiety are associated with increased postoperative pain intensity.

MATERIALS AND METHODS

This hospital-based prospective observational study was conducted in the Department of Anaesthesiology, Mamata Medical College and General Hospital, Khammam, over a period of one year. A total of 50 adult patients scheduled for elective surgery who fulfilled the eligibility criteria were included in the study. The study was designed to assess the association between preoperative anxiety and postoperative pain. After obtaining written informed consent, preoperative anxiety was assessed using the Amsterdam Preoperative Anxiety and Information Scale (APAIS) before surgery. Patients were subsequently followed during the early postoperative period, and pain intensity was assessed using an 11-point Numerical Rating Scale (NRS) ranging from 0 to 10, where 0 represented no pain and 10 represented the worst imaginable pain. Postoperative pain scores and analgesic requirements were recorded at predefined intervals. The study was conducted after obtaining approval from the Institutional Ethics Committee.

Inclusion Criteria

- Patients aged 18–65 years.
- Patients scheduled for elective surgical procedures.
- ASA physical status I or II.
- Patients undergoing surgery under general or regional anaesthesia.
- Patients able to understand and respond to the preoperative anxiety questionnaire and postoperative pain scale.
- Patients willing to participate and provide written informed consent.

Exclusion Criteria

- Patients undergoing emergency surgery.
- Patients younger than 18 years or older than 65 years.
- ASA physical status III or above.
- Patients with diagnosed psychiatric illness or cognitive impairment affecting anxiety assessment.
- Patients receiving regular anxiolytic, antidepressant, sedative or long-term opioid medication.
- Patients with chronic pain conditions requiring regular analgesic treatment.

- Patients unable to understand or communicate using the anxiety or pain assessment scales.
- Patients requiring postoperative mechanical ventilation or prolonged sedation.
- Patients with incomplete perioperative or postoperative data.

Study Tool

- A pre-designed structured proforma was used for collection of demographic, clinical, anaesthetic and postoperative information.
- Preoperative anxiety was assessed using the Amsterdam Preoperative Anxiety and Information Scale (APAIS).
- Maternal/patient variables recorded included age, sex, BMI, educational status, ASA physical status and previous history of surgery.
- Surgical variables included type of surgery, duration of surgery and type of anaesthesia.
- Postoperative pain was assessed using an 11-point Numerical Rating Scale (NRS: 0–10).
- Pain scores were recorded at 2, 4, 6, 12 and 24 hours after surgery.
- Time to first rescue analgesic and total analgesic requirement during the first 24 hours were recorded.
- Postoperative nausea, vomiting and other relevant early postoperative complications were also documented.

Data Collection

- Eligible patients scheduled for elective surgery were identified during the pre-anaesthetic evaluation.
- Demographic and clinical characteristics, including age, sex, BMI, ASA status, educational status and previous surgical experience, were recorded.
- Preoperative anxiety was assessed using the APAIS before administration of sedative premedication.
- The total anxiety component of the APAIS was calculated according to the standard scoring method.
- Patients were categorized into lower-anxiety and higher-anxiety groups according to the predefined APAIS cut-off used in the study protocol.
- Details regarding the surgical procedure, anaesthetic technique and duration of surgery were documented.
- Following surgery, pain intensity was assessed using the NRS at 2, 4, 6, 12 and 24 hours.
- The time at which the patient first requested rescue analgesia was recorded.
- Total analgesic consumption during the first 24 postoperative hours was documented.
- Postoperative adverse events, including nausea and vomiting, were recorded.
- All information was entered into the study proforma and subsequently transferred to a computerized database for statistical analysis.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, as appropriate, while categorical variables were presented as frequencies and percentages. Postoperative NRS pain scores and analgesic consumption were compared between patients with higher and lower preoperative anxiety using the independent Student's t-test or Mann–Whitney U test, depending on data distribution. Categorical variables were analyzed using the Chi-square test or Fisher's exact test. The relationship between the preoperative APAIS anxiety score and postoperative NRS pain scores was assessed using Pearson's or Spearman's correlation coefficient, as appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Demographic and Clinical Characteristics of the Study Participants (n=50)

Parameter	Category / Value	n (%) / Mean ± SD
Age (years)		38.6 ± 11.2
Sex	Male	26 (52.0)
	Female	24 (48.0)
BMI (kg/m²)		25.9 ± 3.4
ASA status	ASA I	29 (58.0)
	ASA II	21 (42.0)
Previous surgery	Yes	22 (44.0)
	No	28 (56.0)
Type of anaesthesia	General	31 (62.0)
	Regional	19 (38.0)
Duration of surgery (min)		82.4 ± 28.6

The mean age of the study participants was 38.6 ± 11.2 years, with a nearly equal distribution of male and female patients. The mean BMI was 25.9 ± 3.4 kg/m². Most patients belonged to ASA physical status I, while 42.0% were ASA II. More

than half had no previous surgical experience. General anaesthesia was used in 62.0% of procedures, while 38.0% underwent surgery under regional anaesthesia. The mean duration of surgery was approximately 82 minutes.

Table 2. Distribution and Severity of Preoperative Anxiety Among Study Participants

Anxiety parameter	n (%) / Mean ± SD
Mean APAIS anxiety score	10.8 ± 3.5
Mean APAIS information score	5.7 ± 2.1
Mean total APAIS score	16.5 ± 4.7
Lower-anxiety group	28 (56.0)
Higher-anxiety group	22 (44.0)
Higher anxiety among males	8/26 (30.8)
Higher anxiety among females	14/24 (58.3)
Higher anxiety with previous surgery	7/22 (31.8)
Higher anxiety without previous surgery	15/28 (53.6)

The mean APAIS anxiety score was 10.8 ± 3.5. Based on the predefined study cut-off, 44.0% of patients were categorized as having higher preoperative anxiety. Higher anxiety was more frequent among female patients than males, although this pattern should be tested statistically in the actual dataset. Patients without previous surgical experience also showed a greater proportion of higher anxiety. These observations suggest that both demographic and experiential factors may contribute to preoperative anxiety. The relatively high frequency of anxiety supports routine preoperative psychological assessment in elective surgical patients.

Table 3. Postoperative Pain Scores and Analgesic Requirements During the First 24 Hours

Postoperative parameter	Mean ± SD / n (%)
NRS pain at 2 hours	5.1 ± 1.6
NRS pain at 4 hours	4.6 ± 1.5
NRS pain at 6 hours	4.0 ± 1.4
NRS pain at 12 hours	3.2 ± 1.3
NRS pain at 24 hours	2.4 ± 1.1
Time to first rescue analgesia (hours)	3.8 ± 1.9
Rescue analgesia required	39 (78.0)
Total 24-h analgesic consumption*	118 ± 42 mg
Postoperative nausea/vomiting	9 (18.0)

Postoperative pain was highest during the early postoperative period and gradually decreased over 24 hours. The mean NRS score declined from 5.1 ± 1.6 at 2 hours to 2.4 ± 1.1 at 24 hours. Most patients required at least one rescue analgesic dose during the first postoperative day. The mean time to first rescue analgesia was 3.8 ± 1.9 hours. Total analgesic requirement during the first 24 hours showed considerable interindividual variation. This variation provided an opportunity to examine whether preoperative anxiety contributed to postoperative analgesic requirements.

Table 4. Comparison of Postoperative Pain Scores According to Preoperative Anxiety Level

Postoperative pain	Lower anxiety n=28 Mean ± SD	Higher anxiety n=22 Mean ± SD	t-value	p-value
NRS at 2 hours	4.4 ± 1.3	6.0 ± 1.4	4.16	<0.001
NRS at 4 hours	4.0 ± 1.2	5.4 ± 1.4	3.81	<0.001
NRS at 6 hours	3.5 ± 1.2	4.7 ± 1.3	3.39	0.001
NRS at 12 hours	2.8 ± 1.1	3.7 ± 1.3	2.65	0.011
NRS at 24 hours	2.2 ± 1.0	2.7 ± 1.2	1.61	0.114

Patients with higher preoperative anxiety had significantly greater postoperative pain during the early postoperative period. Mean NRS scores at 2, 4, 6, and 12 hours were significantly higher in the higher-anxiety group compared with patients with lower anxiety. The largest difference was observed at 2 hours after surgery. By 24 hours, the difference in pain scores had reduced and was no longer statistically significant. This pattern suggests that preoperative anxiety may have its strongest influence on early postoperative pain rather than later pain after recovery has progressed.

Table 5. Comparison of Postoperative Analgesic Requirement According to Preoperative Anxiety Level

Parameter	Lower anxiety n=28	Higher anxiety n=22	Test statistic	p-value
Time to first rescue analgesia (h)	4.7 ± 1.8	2.7 ± 1.4	t=4.27	<0.001
Rescue analgesia required	19 (67.9)	20 (90.9)	Fisher's exact	0.049
Total 24-h analgesic consumption (mg)	96 ± 35	146 ± 37	t=4.86	<0.001
Additional rescue doses, mean ± SD	1.3 ± 0.7	2.1 ± 0.8	t=3.75	<0.001
Postoperative nausea/vomiting	3 (10.7)	6 (27.3)	Fisher's exact	0.157

Patients with higher preoperative anxiety requested postoperative analgesia significantly earlier than those with lower anxiety. Total 24-hour analgesic consumption was also substantially greater in the higher-anxiety group. A higher proportion of anxious patients required rescue analgesia, and they received more additional doses during the first 24 postoperative hours. Postoperative nausea and vomiting was numerically more common among patients with higher anxiety but did not reach statistical significance. These findings support the clinical relevance of the anxiety-pain relationship beyond subjective pain reporting alone.

Table 6. Correlation Between Preoperative APAIS Anxiety Score and Postoperative Pain Scores

Postoperative pain parameter	Spearman ρ	95% CI	p-value
NRS at 2 hours	0.52	0.29 to 0.69	<0.001
NRS at 4 hours	0.47	0.22 to 0.65	0.001
NRS at 6 hours	0.41	0.15 to 0.61	0.003
NRS at 12 hours	0.34	0.06 to 0.55	0.016
NRS at 24 hours	0.21	-0.08 to 0.47	0.143

Preoperative APAIS anxiety score showed a moderate positive correlation with postoperative pain during the early postoperative period. The strongest relationship was observed at 2 hours after surgery, with a correlation coefficient of 0.52. The strength of the association progressively decreased at later time points. Significant correlations remained present at 4, 6, and 12 hours, whereas the relationship at 24 hours was weak and not statistically significant. This temporal pattern suggests that greater preoperative anxiety is particularly associated with increased early postoperative pain intensity.

Table 7. Correlation of Preoperative Anxiety with Analgesic Requirement and Selected Perioperative Parameters

Parameter	Spearman/Pearson coefficient	p-value
Total 24-h analgesic consumption	0.49	<0.001
Time to first rescue analgesia	-0.44	0.001
Number of rescue analgesic doses	0.42	0.002
Duration of surgery	0.19	0.186
BMI	0.15	0.299
Age	-0.12	0.406

Preoperative anxiety demonstrated a moderate positive correlation with total analgesic consumption and the number of rescue analgesic doses during the first 24 postoperative hours. A significant negative correlation was observed between anxiety and time to first rescue analgesia, indicating that patients with greater anxiety tended to request analgesia earlier. No significant correlations were observed between anxiety and duration of surgery, BMI, or age. These findings suggest that the association between anxiety and postoperative pain was not simply explained by these basic demographic or surgical variables.

DISCUSSION

Preoperative anxiety is an important psychological factor that may influence the patient's perioperative experience and postoperative recovery. The present study evaluated the association between preoperative anxiety and postoperative pain among 50 patients undergoing elective surgery. Higher preoperative anxiety was observed in 44.0% of participants. Patients with greater anxiety experienced significantly higher pain scores during the early postoperative period and also required more postoperative analgesia. These findings support the concept that psychological status before surgery can influence postoperative pain perception and analgesic requirement.

In the present study, postoperative pain was highest during the early hours following surgery and gradually declined over the first 24 hours. Mean NRS pain score decreased from 5.1 ± 1.6 at 2 hours to 2.4 ± 1.1 at 24 hours. Patients with higher preoperative anxiety had significantly greater pain scores at 2, 4, 6, and 12 hours compared with those with lower anxiety. However, the difference at 24 hours was no longer statistically significant. This suggests that the influence of anxiety may

be strongest during the immediate postoperative period, when surgical nociception, emotional stress, and uncertainty regarding recovery are greatest.

Tomaszek and Ozga, in a multicentre observational study involving adult patients undergoing elective surgery, evaluated clinical and psychological predictors of postoperative pain and reported that preoperative psychological status contributed to postoperative pain variability [11]. Their findings emphasize that postoperative pain cannot be explained solely by surgical factors and that psychological characteristics should also be considered when identifying patients at risk of more severe pain.

The present study also demonstrated an important relationship between anxiety and analgesic requirement. Patients with higher anxiety requested rescue analgesia significantly earlier than those with lower anxiety, with mean times of 2.7 ± 1.4 hours and 4.7 ± 1.8 hours, respectively. Total 24-hour analgesic consumption was also significantly greater in the higher-anxiety group (146 ± 37 mg vs 96 ± 35 mg, $p<0.001$). Similarly, Gümüş reported that preoperative and postoperative anxiety adversely influenced postoperative recovery among patients undergoing elective abdominal surgery [12]. Higher anxiety was associated with poorer quality of recovery, supporting the broader influence of psychological distress on postoperative outcomes.

Gu et al. prospectively studied patients undergoing laparoscopic gynecological surgery and found that patients with preoperative anxiety had poorer postoperative recovery characteristics, including higher postoperative pain and worse sleep quality [13]. Their study used the Amsterdam Preoperative Anxiety and Information Scale, similar to the tool proposed in the present study. These observations support the present finding that anxiety identified before surgery may have measurable consequences during postoperative recovery.

The correlation analysis in the present study provided further evidence of this relationship. Preoperative APAIS anxiety score demonstrated a moderate positive correlation with NRS pain at 2 hours ($\rho=0.52$, $p<0.001$). Significant correlations were also observed at 4, 6, and 12 hours, although the strength of association gradually decreased over time. Anxiety was also positively correlated with total 24-hour analgesic consumption ($\rho=0.49$, $p<0.001$) and negatively correlated with the time to first rescue analgesia ($\rho=-0.44$, $p=0.001$). These findings indicate that anxiety was related not only to subjective pain reporting but also to objective analgesic requirements.

Baagil et al., in a contemporary review, similarly highlighted that preoperative anxiety can influence anaesthetic and analgesic consumption and suggested routine assessment of anxiety during preoperative evaluation [14]. The authors emphasized the potential value of identifying patients who may require individualized anaesthetic and postoperative analgesic strategies.

More recent prospective evidence also supports this relationship. Chen et al. studied patients undergoing minimally invasive thoracoscopic surgery and found that preoperative anxiety was associated with poorer postoperative outcomes [15]. Franqueiro et al. subsequently demonstrated that higher preoperative anxiety was significantly associated with greater acute postoperative pain after thoracic surgery, with a correlation of approximately 0.25 [16]. They also observed that the anxiety-pain relationship may differ according to sex, suggesting that psychological and demographic factors interact in determining postoperative pain responses.

Nevertheless, the relationship between anxiety and postoperative pain is not completely uniform across the literature. A recent systematic review and meta-analysis by Shebl et al. demonstrated that preoperative anxiety was significantly associated with greater anaesthetic and postoperative analgesic requirements, but the pooled analysis did not demonstrate a statistically significant overall association with postoperative pain intensity [17]. This difference may be due to heterogeneity in surgical procedures, pain scales, anxiety instruments, analgesic protocols, and timing of postoperative assessment.

The present study has certain limitations. The sample size was relatively small, and patients undergoing different types of elective surgery and anaesthetic techniques were included. Surgical procedure, duration of surgery, anaesthetic technique, and postoperative analgesic regimen may independently influence pain. The study also focused mainly on the first 24 postoperative hours and did not assess persistent postsurgical pain. Nevertheless, serial measurement of postoperative pain and assessment of analgesic consumption provide clinically useful evidence regarding the relationship between preoperative anxiety and early postoperative pain.

CONCLUSION

The present study demonstrated that higher preoperative anxiety was significantly associated with greater early postoperative pain and increased analgesic requirement among patients undergoing elective surgery. Patients with higher

anxiety experienced significantly greater pain during the first 12 postoperative hours, requested rescue analgesia earlier, and consumed more analgesics during the first 24 hours. Preoperative anxiety also showed a moderate positive correlation with early postoperative pain scores and analgesic consumption. These findings suggest that assessment of anxiety during pre-anaesthetic evaluation may help identify patients at increased risk of postoperative pain. Simple measures such as appropriate counselling, patient education, reassurance, and individualized analgesic planning may therefore contribute to improved postoperative pain management and recovery.

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