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Prevalence and Associated Predictors of Preoperative Anxiety among Adult Elective Surgical Patients in a Tertiary Care Setting in Dera Ismail Khan, Pakistan: A Hospital-Based Analytical Cross-Sectional Study

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Abstract

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Background: Preoperative anxiety is a prevalent psychological condition affecting surgical patients, with adverse implications for perioperative outcomes, yet evidence from peripheral regions of Pakistan remains limited. This study aimed to determine the prevalence and associated predictors of preoperative anxiety among adult elective surgical patients in tertiary care hospitals of Dera Ismail Khan, Pakistan.

Methods: A hospital-based analytical cross-sectional study was conducted over six months (January 2026 to June 2026) in tertiary care hospitals of Dera Ismail Khan, Pakistan. A total of 390 adult patients undergoing elective surgical procedures. Participants were selected using convenience sampling. Data was collected using a structured questionnaire and the validated Amsterdam Preoperative Anxiety and Information Scale (APAIS). Multivariable logistic regression analysis was performed to identify independent predictors of preoperative anxiety, with statistical significance set at $p < 0.05$.

Results: The prevalence of clinically significant preoperative anxiety (APAIS ≥11) was 57.4% (95% CI: 52.3–62.4%), with a mean APAIS score of 11.42 ± 3.87. Independent predictors included female gender (AOR = 2.10; 95% CI: 1.28–3.45), younger age 18–30 years (AOR = 1.84; 95% CI: 1.12–3.03), absence of previous surgical history (AOR = 2.82; 95% CI: 1.71–4.65), major surgery (AOR = 1.96; 95% CI: 1.18–3.25), fear of postoperative pain (AOR = 3.41; 95% CI: 2.04–5.72), and fear of not waking up after anesthesia (AOR = 2.27; 95% CI: 1.39–3.72). Fear of postoperative pain was the most prevalent concern (68.5%), and 44.1% of patients expressed high information needs. The model explained 42.1% of variance (Nagelkerke R^2) and correctly classified 78.3% of cases.

Conclusion: Preoperative anxiety affects more than half of elective surgical patients in this peripheral Pakistani setting. Routine anxiety screening using APAIS, structured preoperative counseling addressing specific fears, particularly pain and anesthesia safety, and improved information delivery should be integrated into perioperative care to optimize surgical outcomes.

Introduction

Preoperative anxiety represents a significant and increasingly recognized challenge within contemporary surgical and anesthetic practice, posing substantial implications for patient safety, perioperative management, and healthcare resource utilization (1). The global burden of this condition is considerable; a systematic review and meta-analysis encompassing 28 studies and 14,652 participants estimated the worldwide pooled prevalence of preoperative anxiety at 48% (2). However, further epidemiological syntheses suggest that the prevalence may be substantially higher in specific contexts, affecting approximately 60–80% of adult surgical patients, with the

highest burdens observed across the African and Asian continents (3). Preoperative anxiety is not merely a transient emotional state but a clinically significant phenomenon that can profoundly influence anesthetic induction, intraoperative hemodynamic stability, postoperative recovery trajectories, and overall patient satisfaction with perioperative care (4). Despite its well-documented negative impact, preoperative anxiety frequently receives insufficient attention in routine clinical practice, necessitating a paradigm shift toward systematic screening and evidence-based intervention.

The epidemiological landscape of preoperative anxiety reveals considerable global and regional heterogeneity. Within South Asia, the prevalence remains alarmingly high, with Pakistani studies reporting rates between 38% and 62% across different settings (5,6). A multicenter cross-sectional study in Eastern Nepal reported a prevalence of 25.85% using the APAIS, though broader assessments indicate significantly higher rates across the region (7). In Pakistan, Parveen et al. (2024) reported a global prevalence of 62.0% among 400 elective surgical patients in Karachi, with APAIS scores indicating greater anxiety related to surgery (mean = 7.27 ± 2.31) compared to anesthesia (mean = 5.14 ± 2.35) (5). Similarly, a cross-sectional study among patients awaiting open-heart surgery at cardiac centers in Rawalpindi and Islamabad found that females, younger patients (20–46 years), and those undergoing valvular surgeries were significantly more susceptible to developing preoperative anxiety (8). The prevalence varies considerably across surgical specialties; in the Karachi study, ENT and urology patients exhibited notably higher anxiety rates of 75.0% and 68.0%, respectively (5).

Preoperative anxiety is a multifactorial phenomenon influenced by an interplay of sociodemographic, clinical, psychological, and procedure-related variables. Among sociodemographic factors, younger age has been consistently identified as an independent predictor of high preoperative anxiety (9). Female gender similarly emerges as a robust predictor across multiple studies; in a Saudi Arabian cohort, female gender was significantly associated with higher anxiety levels (89.7% vs. 10.3% in males, P = 0.036), and multivariate analysis from the Karachi study demonstrated that females exhibited increased vulnerability, with an adjusted odds ratio of 1.91 (95% CI: 1.13–3.21; p = 0.015) (5,9). Psychological and behavioral factors constitute particularly potent predictors; fear of postoperative pain (62.1% vs. 31.7%, P = 0.01) and fear of surgical complications (58.6% vs. 39.3%, P = 0.041) have been identified as significant risk factors (5,10). The most powerful predictor identified in recent research is a high need for information, with an odds ratio of 12.9 for high preoperative anxiety (11).

The clinical consequences of unmitigated preoperative anxiety are extensive, affecting virtually every phase of the perioperative journey. Hemodynamically, it manifests sympathetic overactivity leading to tachycardia, hypertension, and arrhythmia, complicating anesthetic induction and intraoperative management (12). Postoperatively, it is associated with increased pain intensity, heightened analgesic

consumption, delayed recovery, prolonged hospitalization, and decreased patient satisfaction (13,14). The pathophysiological underpinnings involve activation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to glucocorticoid release that can impair immune function, promote hyperalgesia, and increase susceptibility to postoperative complications (15,16). Despite these well-documented adverse effects, preoperative anxiety remains under-assessed and undertreated, particularly in peripheral healthcare settings where resources and awareness may be limited.

Although considerable research has examined preoperative anxiety in major urban centers, limited evidence is available from peripheral regions of Pakistan such as Dera Ismail Khan. The sociocultural characteristics, educational status, healthcare resources, and patient-provider communication patterns in these settings differ substantially from metropolitan areas, potentially influencing both the prevalence and predictors of anxiety. This evidence gap restricts the development of culturally appropriate, context-specific interventions. Therefore, this study aimed to determine the prevalence and associated predictors of preoperative anxiety among adult elective surgical patients in tertiary care hospitals of Dera Ismail Khan, Pakistan, to inform evidence-based perioperative psychological care strategies.

METHODOLOGY

This hospital-based analytical cross-sectional study was conducted from January 2026 to June 2026 at tertiary care hospitals in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. The study was conducted over a period of six months to determine the prevalence and associated predictors of preoperative anxiety among adult patients undergoing elective surgical procedures.

The sample size was calculated using the Cochrane formula with a 95% confidence level, 5% margin of error, and an estimated prevalence of preoperative anxiety of 50%. The required sample size was 384 participants; however, 390 eligible participants were recruited during the study period. A non-probability convenience sampling technique was employed for participant recruitment.

Data were collected using a structured and pre-tested questionnaire developed according to the study objectives and relevant literature. The questionnaire comprised seven sections covering sociodemographic information, clinical characteristics, the Amsterdam Preoperative Anxiety and Information Scale (APAIS), psychological factors, information and communication factors, social support and environmental factors, and a Visual Analog Scale (VAS) for anxiety. The APAIS consists of six items scored on a five-point Likert scale ranging from 1 (not at all) to 5 (extremely), with an anxiety score calculated by summing items 2, 3, 5, and 6 (total score ranging from 4 to 20). Clinically significant anxiety was defined as an APAIS anxiety score of 11 or greater. The information requirement score was calculated by summing items 4 and 6 (total score ranging from 2 to 10).

Participants were included if they were adult patients aged 18 years or above, scheduled for elective surgical procedures, conscious and able to communicate effectively, and willing to provide written informed consent.

Patients were excluded if they were undergoing emergency surgery, had a diagnosed psychiatric illness, were receiving psychotropic medications, were critically ill, unable to communicate effectively, or refused to participate in the study.

Following ethical approval and informed consent, data were collected through face-to-face interviews conducted by trained data collectors. Each interview required approximately 10–15 minutes to complete in a private setting to maintain confidentiality and minimize external influences on responses. Completed questionnaires were checked daily for completeness and consistency before data entry.

Data were entered and analyzed using SPSS version 25. Descriptive statistics were used to summarize study variables, with categorical data presented as frequencies and percentages and continuous data as means with standard deviations. The prevalence of preoperative anxiety was calculated as the proportion of patients with APAIS scores ≥ 11. Associations between variables and anxiety were assessed using the chi-square test, independent samples t-test, and one-way ANOVA. Variables with a p-value ≤ 0.25 in bivariate analysis were entered into a multivariable binary logistic regression model to identify independent predictors. Results were reported as adjusted odds ratios (AORs) with 95% confidence intervals (CIs), and statistical significance was set at $p < 0.05$.

Ethical approval was obtained from the Institutional Review Board of Tertiary Care Hospitals, Dera Ismail Khan, and the research committee of Gomal University, Dera Ismail Khan. Written informed consent was obtained from all participants before enrollment. Confidentiality was ensured through the use of unique identification codes, access to data was restricted to the research team, and participants were free to withdraw from the study at any time without affecting their medical care.

RESULTS

Baseline Demographic and Clinical Characteristics

The study cohort comprised 390 adult elective surgical patients who participated in the study, yielding a 100% response rate among eligible approached patients. The baseline demographic and clinical characteristics are presented in **Tables 4.1 and 4.2**, providing a comprehensive overview of the study population's composition across multiple clinically relevant domains.

Age Distribution: The mean age of the participants was 39.8 years with a standard deviation of ±13.6 years, ranging from 18 to 82 years. The age distribution revealed that the largest proportion of participants (32.3%, n=126) belonged to the younger age group of 18–30 years, followed by the 31–45 years age group (29.2%, n=114). Participants aged above 60 years constituted the smallest proportion (13.6%, n=53). This distribution demonstrates a gradual decline in representation with advancing age, with younger and middle-aged adults (18–45 years) comprising the majority of the study sample (61.5%).

Gender Composition: The gender distribution was relatively balanced, with a slight male predominance (53.1%, n=207) compared to females (46.9%, n=183). This near-equal representation is a methodological strength, allowing for robust gender-based comparisons in subsequent analyses.

Marital Status: The majority of participants were married (67.7%, n=264), which is consistent with the cultural and demographic norms of the Pakistani population. Single patients constituted 23.8% (n=93) of the sample, while divorced or widowed participants formed the smallest proportion (8.5%, n=33).

Educational Status: Secondary education was the most common educational level (36.4%, n=142), followed by higher education (25.1%, n=98). A considerable proportion of participants had no formal education (16.7%, n=65) or only primary education (21.8%, n=85).

Occupation: Laborers constituted the largest occupational group (23.8%, n=93), followed by private job holders (19.5%, n=76) and the unemployed (18.2%, n=71). The predominance of labor and private sector employment reflects the socioeconomic profile of the region.

Type of Surgery: The majority of participants were scheduled for major surgical procedures (58.7%, n=229), while 41.3% (n=161) were undergoing minor surgeries. This predominance of major procedures is expected in a tertiary care setting.

Surgical Specialty: General surgery was the most common specialty (39.2%, n=153), followed by orthopedic surgery (27.2%, n=106). Gynecology and other specialties each accounted for approximately 17% of the cases.

Previous Surgical History: More than half of the participants (55.9%, n=218) had no previous surgical history, while 44.1% (n=172) had undergone at least one surgical procedure in the past.

Type of Anesthesia Planned: General anesthesia was the most commonly planned type (61.5%, n=240), followed by regional anesthesia (28.7%, n=112). Local anesthesia was planned for a small proportion of patients (9.7%, n=38).

ASA Physical Status: The majority of patients were classified as ASA II (46.2%, n=180), followed by ASA I (43.3%, n=169). Only 10.5% (n=41) of patients had ASA III or above physical status.

Table 4.1: Sociodemographic Characteristics of Participants (N=390)

Variable	Category	n (%)
Age Group (Years)	18–30	126 (32.3)
	31–45	114 (29.2)
	46–60	97 (24.9)
	>60	53 (13.6)
Gender	Male	207 (53.1)
	Female	183 (46.9)
Marital Status	Single	93 (23.8)
	Married	264 (67.7)

	Divorced/Widowed	33 (8.5)
Educational Level	No Formal Education	65 (16.7)
	Primary	85 (21.8)
	Secondary	142 (36.4)
	Higher Education	98 (25.1)
Occupation	Unemployed	71 (18.2)
	Laborer	93 (23.8)
	Private Job	76 (19.5)
	Government Job	52 (13.3)
	Business	65 (16.7)
	Other	33 (8.5)

Table 4.2: Clinical Characteristics of Participants (N=390)

Variable	Category	n (%)
Type of Surgery	Minor Surgery	161 (41.3)
	Major Surgery	229 (58.7)
Surgical Specialty	General Surgery	153 (39.2)
	Orthopedic Surgery	106 (27.2)
	Gynecology	66 (16.9)
	Other	65 (16.7)
Previous Surgical History	Yes	172 (44.1)
	No	218 (55.9)
Type of Anesthesia	General Anesthesia	240 (61.5)
	Regional Anesthesia	112 (28.7)
	Local Anesthesia	38 (9.7)
ASA Physical Status	ASA I	169 (43.3)
	ASA II	180 (46.2)
	ASA III	41 (10.5)

Note: ASA = American Society of Anesthesiologists

Prevalence of Preoperative Anxiety

Out of 390 participants, 224 patients experienced clinically significant preoperative anxiety, yielding an overall prevalence of 57.4% (95% CI: 52.3–62.4%). This indicates that more than half of the elective surgical patients in this setting experienced significant anxiety prior to their surgical procedures. The high prevalence underscores the substantial psychological burden associated with awaiting surgery and highlights the need for routine anxiety screening and intervention in perioperative care.

The mean APAIS anxiety score was 11.42 (SD = ±3.87), indicating that, on average, participants scored above the threshold for clinically significant anxiety. The majority

of patients (57.5%) had APAIS scores in the high-to-severe range (≥11), while 23.1% had moderate anxiety and 19.5% had low anxiety. The distribution demonstrates a substantial burden of moderate-to-severe anxiety, with more than one-third of patients (34.4%) experiencing high anxiety levels.

The mean information requirement score was 7.08 (SD = ±2.14), indicating a moderate-to-high desire for information regarding surgical and anesthetic procedures. A substantial proportion of patients (44.1%) expressed a high need for information, while only 14.6% had low information needs.

The mean Visual Analog Scale anxiety score was 6.86 (SD = ±2.35), indicating moderate-to-severe anxiety levels. More than half of the participants (53.3%) reported severe anxiety (scores 7–10), while 27.2% reported moderate anxiety and 19.5% reported mild anxiety. The consistency between VAS and APAIS findings strengthens the validity of the anxiety assessment.

Table 4.3: Prevalence and Scores of Preoperative Anxiety (N=390)

Variable	Category	n (%)
Anxiety Status	Present (APAIS ≥ 11)	224 (57.4)
	Absent (APAIS < 11)	166 (42.6)
APAIS Score Range	4–6 (Low Anxiety)	76 (19.5)
	7–10 (Moderate Anxiety)	90 (23.1)
	11–14 (High Anxiety)	134 (34.4)
	15–20 (Severe Anxiety)	90 (23.1)
Information Need Level	Low Need (2–4)	57 (14.6)
	Moderate Need (5–7)	161 (41.3)
	High Need (8–10)	172 (44.1)
VAS Score Range	0–3 (Mild)	76 (19.5)
	4–6 (Moderate)	106 (27.2)
	7–10 (Severe)	208 (53.3)
Mean APAIS Anxiety Score	11.42 ± 3.87	
Mean Information Score	7.08 ± 2.14	
Mean VAS Score	6.86 ± 2.35	

Note: APAIS = Amsterdam Preoperative Anxiety and Information Scale; VAS = Visual Analog Scale

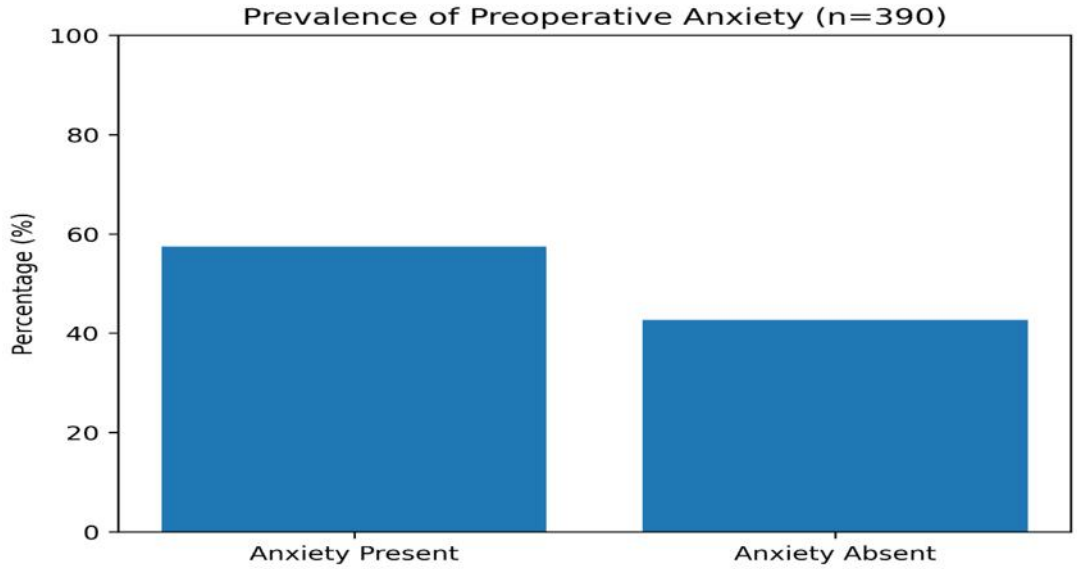

Figure 4.1: Prevalence of Preoperative Anxiety Among Adult Elective Surgical Patients

The bar chart illustrates the overall prevalence of clinically significant preoperative anxiety (APAIS ≥ 11) among the 390 study participants. The chart shows that 57.4% (n=224) of patients experienced clinically significant anxiety, while 42.6% (n=166) did not. This visual representation clearly demonstrates that more than half of the elective surgical patients in this tertiary care setting experienced substantial psychological distress before surgery.

Psychological Factors Associated with Anxiety

A large majority of participants (68.5%) expressed agreement or strong agreement with fear of postoperative pain, making it the most prevalent psychological concern among the study population. Only 13.3% disagreed or strongly disagreed with this fear. This finding is consistent with previous studies that identified postoperative pain as the most common factor contributing to anxiety. The high prevalence of pain-related fear has important clinical implications, as it suggests that postoperative pain management should be prominently addressed during preoperative counseling.

A substantial proportion of participants (62.3%) feared not waking up after anesthesia, making it the second most common psychological concern. Only 21.0% of participants disagreed or strongly disagreed with this fear. This finding highlights the significant anxiety associated with anesthesia and the need for anesthesiologists to provide clear reassurance regarding the safety of anesthetic procedures.

Fear of surgical complications was expressed by 64.1% of participants, fear of intraoperative awareness by 57.5%, and fear of death related to surgery by 47.4% of participants. Fear of death related to surgery was the least prevalent among the assessed psychological concerns, though it remained a significant concern for nearly

half of the participants.

Table 4.4: Comparison of Psychological Factors (Agree/Strongly Agree Combined)

Psychological Factor	Frequency (n)	Percentage (%)	Rank
Fear of Postoperative Pain	267	68.5	1
Fear of Surgical Complications	250	64.1	2
Fear of Not Waking Up After Anesthesia	243	62.3	3
Fear of Intraoperative Awareness	224	57.5	4
Fear of Death Related to Surgery	185	47.4	5

Note: *Percentages calculated based on N=390*

Information and Communication Factors

Less than half of the participants (42.5%) reported receiving adequate surgical information, while 32.3% felt they had not received sufficient information. A substantial proportion (25.1%) remained neutral, suggesting uncertainty about the adequacy of information received. These findings highlight a significant gap in preoperative patient education. Only 39.0% of participants reported receiving adequate information about anesthesia, while 37.2% felt they had not received sufficient anesthesia information. The high proportion of patients with inadequate anesthesia information is concerning, given the direct relationship between anesthesia knowledge and anxiety reduction.

A majority of participants (53.3%) expressed satisfaction with healthcare communication, while 27.2% were dissatisfied. However, the substantial proportion of dissatisfied patients indicates significant room for improvement in healthcare provider-patient communication.

Social Support and Environmental Factors

The majority of participants (76.2%) reported family support was available, while 23.8% did not have family support. A majority (60.8%) of participants perceived the hospital environment as comfortable, while 39.2% found it uncomfortable. A substantial majority of participants (68.5%) reported that waiting time increased their anxiety, while 31.5% did not perceive waiting time as anxiety-provoking. This finding suggests that minimizing preoperative waiting times could be an effective strategy for reducing anxiety.

Association Between Sociodemographic Variables and Preoperative Anxiety

Bivariate associations between sociodemographic characteristics and preoperative anxiety were assessed using Chi-square tests. Variables showing significant

associations were further analyzed using multivariable logistic regression.

Gender

Female patients demonstrated significantly higher levels of preoperative anxiety compared to male patients. Among females, 67.2% (n=123) experienced clinically significant anxiety compared to 48.8% (n=101) of males. This difference was highly statistically significant (χ^2 = 12.87, df = 1, p < 0.001), indicating a strong gender disparity in preoperative anxiety prevalence.

Age

Younger patients experienced significantly higher anxiety levels compared to older patients. The highest prevalence of anxiety was observed in the 18–30 years age group (70.6%, n=89), with a progressive decline in anxiety prevalence with increasing age. The lowest prevalence (30.2%, n=16) was observed in patients aged >60 years. This strong inverse relationship between age and anxiety was highly statistically significant (χ^2 = 25.86, df = 3, p < 0.001).

Educational Level

There was a significant inverse relationship between educational level and preoperative anxiety. Patients with no formal education had the highest anxiety prevalence (69.2%, n=45), while those with higher education had the lowest prevalence (45.9%, n=45). This association was statistically significant (χ^2 = 11.57, df = 3, p = 0.009), suggesting that educational attainment may influence anxiety levels through improved health literacy and understanding.

Marital Status and Occupation

Although single patients had the highest anxiety prevalence (64.5%, n=60), followed by married patients (55.7%, n=147) and divorced/widowed patients (51.5%, n=17), this association did not reach statistical significance (χ^2 = 2.49, df = 2, p = 0.288). Similarly, variation in anxiety prevalence was observed across occupational groups, but the association was not statistically significant (χ^2 = 7.26, df = 5, p = 0.202).

Table 4.5: Bivariate Associations Between Sociodemographic Variables and Preoperative Anxiety

Variable	Category	Anxiety Present n (%)	χ^2	df	*p*
Gender	Male	101 (48.8)	12.87	1	<0.001
	Female	123 (67.2)			
Age Group (Years)	18–30	89 (70.6)	25.86	3	<0.001
	31–45	68 (59.6)			
	46–60	51 (52.6)			
	>60	16 (30.2)			
Marital Status	Single	60 (64.5)	2.49	2	0.288
	Married	147 (55.7)			
	Divorced/Widowed	17 (51.5)			
Educational Level	No Formal	45 (69.2)	11.57	3	0.009

	Primary	53 (62.4)			
	Secondary	81 (57.0)			
	Higher	45 (45.9)			
Occupation	Unemployed	44 (62.0)	7.26	5	0.202
	Laborer	57 (61.3)			
	Private Job	46 (60.5)			
	Government Job	22 (42.3)			
	Business	33 (50.8)			
	Other	22 (66.7)			

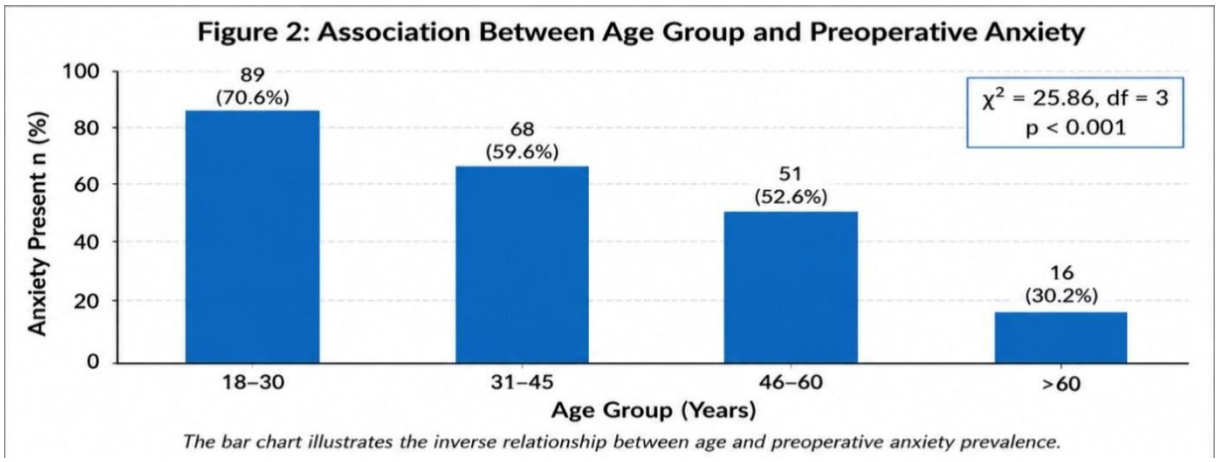

Figure 4.2: Association Between Age Group and Preoperative Anxiety

The bar chart illustrates the inverse relationship between age and preoperative anxiety prevalence. The highest prevalence was observed in the 18–30 years age group (70.6%), with a progressive decline to 30.2% in patients aged >60 years. This dose-response relationship was statistically significant (χ^2 = 25.86, df = 3, p < 0.001).

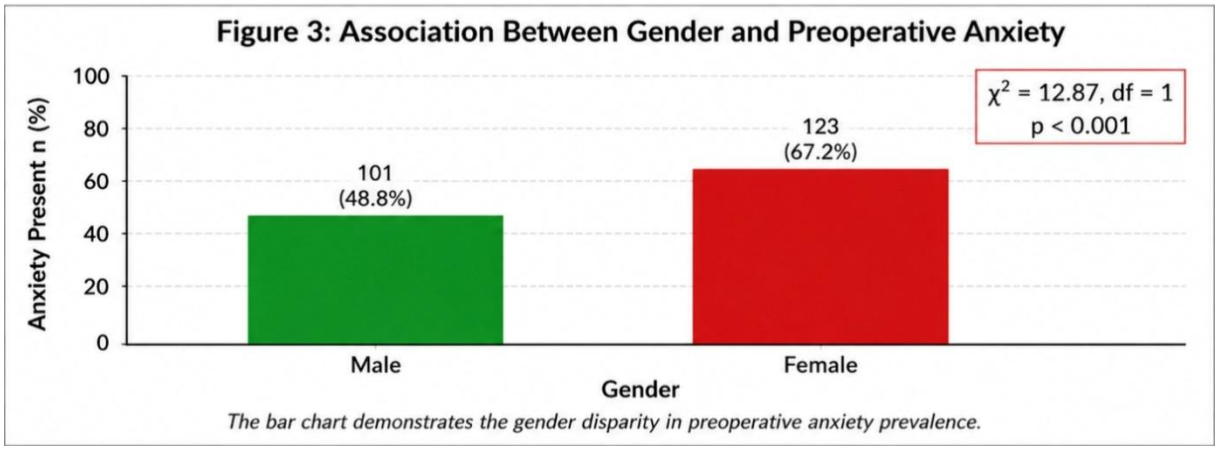

Figure 4.3: Association Between Gender and Preoperative Anxiety

The bar chart demonstrates the gender disparity in preoperative anxiety prevalence. Female patients had significantly higher anxiety prevalence (67.2%) compared to

male patients (48.8%), with a statistically significant difference (χ^2 = 12.87, df = 1, p < 0.001).

Association Between Clinical Variables and Preoperative Anxiety

Previous Surgical History

Patients without previous surgical experience had significantly higher anxiety prevalence (66.1%, n=144) compared to those with prior surgical history (46.5%, n=80). This association was highly statistically significant (χ^2 = 14.87, df = 1, p < 0.001), indicating that prior surgical experience may serve as a protective factor against preoperative anxiety through increased familiarity with the surgical process.

Type of Surgery

Patients scheduled for major surgery experienced significantly higher anxiety levels (66.8%, n=153) compared to those undergoing minor procedures (44.1%, n=71). This association was highly statistically significant (χ^2 = 19.68, df = 1, p < 0.001), reflecting the increased perceived threat and potential complications associated with major surgical interventions.

Type of Anesthesia

Patients scheduled for general anesthesia had the highest anxiety prevalence (64.6%, n=155), followed by regional anesthesia (48.2%, n=54) and local anesthesia (39.5%, n=15). This association was highly statistically significant (χ^2 = 13.84, df = 2, p = 0.001), suggesting that the type of anesthesia planned significantly influences preoperative anxiety levels.

Surgical Specialty and ASA Status

Patients in the gynecology specialty had the highest anxiety prevalence (69.7%, n=46), followed by orthopedic surgery (56.6%, n=60) and general surgery (55.6%, n=85). However, this association did not reach statistical significance (χ^2 = 6.49, df = 3, p = 0.090). Similarly, although patients with ASA III or above had slightly higher anxiety prevalence (61.0%, n=25), followed by ASA I (58.0%, n=98) and ASA II (56.1%, n=101), the association was not statistically significant (χ^2 = 0.54, df = 2, p = 0.764).

Table 4.6: Bivariate Associations Between Clinical Variables and Preoperative Anxiety

Variable	Category	Anxiety Present n (%)	χ^2	df	*p*
Previous Surgery	Yes	80 (46.5)	14.87	1	<0.001
	No	144 (66.1)			
Type of Surgery	Minor	71 (44.1)	19.68	1	<0.001
	Major	153 (66.8)			
Surgical Specialty	General Surgery	85 (55.6)	6.49	3	0.090

	Orthopedic	60 (56.6)			
	Gynecology	46 (69.7)			
	Other	33 (50.8)			
Type of Anesthesia	General	155 (64.6)	13.84	2	0.001
	Regional	54 (48.2)			
	Local	15 (39.5)			
ASA Status	ASA I	98 (58.0)	0.54	2	0.764
	ASA II	101 (56.1)			
	ASA III or above	25 (61.0)			

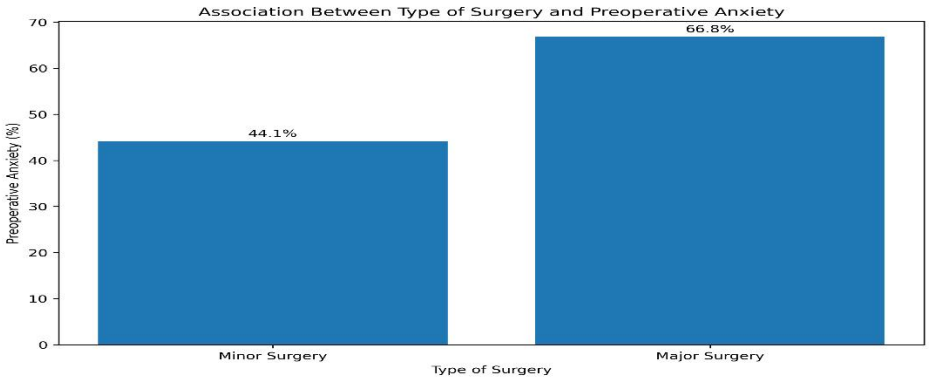

Figure 4.4: Association Between Type of Surgery and Preoperative Anxiety

The bar chart demonstrates the significantly higher anxiety prevalence among patients scheduled for major surgery (66.8%) compared to those undergoing minor procedures (44.1%). This difference was highly statistically significant (χ^2 = 19.68, df = 1, $p < 0.001$).

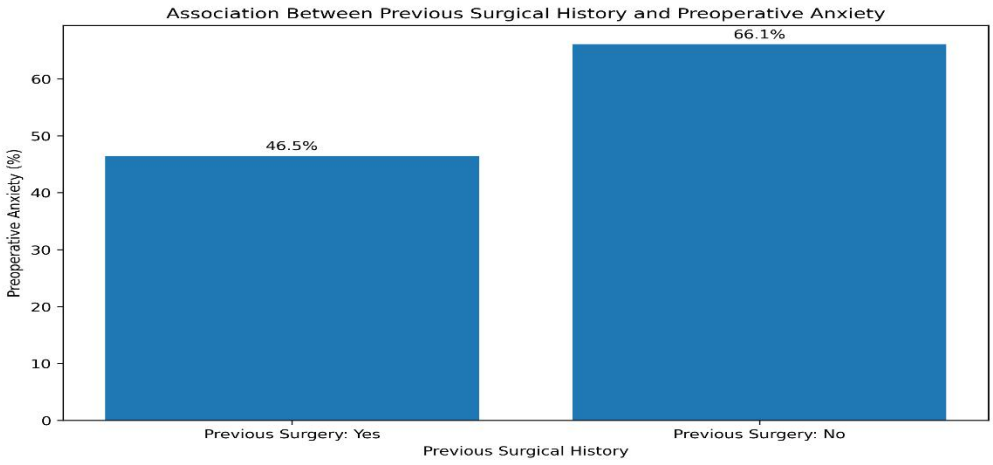

Figure 4.5: Association Between Previous Surgical History and Preoperative Anxiety

The bar chart illustrates the protective effect of previous surgical experience. Patients without prior surgical history had significantly higher anxiety prevalence (66.1%) compared to those with previous surgical experience (46.5%), with a statistically

significant difference (χ^2 = 14.87, df = 1, p < 0.001).

Association Between Psychological Factors and Preoperative Anxiety

All psychological factors showed highly significant associations with preoperative anxiety (p < 0.001 for all). Patients who feared postoperative pain had significantly higher anxiety prevalence (72.9%, n=140) compared to those without this fear (42.4%, n=84) (χ^2 = 36.58, df = 1, p < 0.001). Patients who feared not waking up after anesthesia had significantly higher anxiety prevalence (74.5%, n=140) compared to those without this fear (41.6%, n=84) (χ^2 = 42.73, df = 1, p < 0.001). Patients who feared intraoperative awareness had significantly higher anxiety prevalence (66.0%, n=134) compared to those without this fear (48.1%, n=90) (χ^2 = 12.32, df = 1, p < 0.001). Patients who feared surgical complications had significantly higher anxiety prevalence (73.5%, n=150) compared to those without this fear (39.8%, n=74) (χ^2 = 43.84, df = 1, p < 0.001). Patients who feared death related to surgery had significantly higher anxiety prevalence (80.9%, n=119) compared to those without this fear (43.2%, n=105) (χ^2 = 53.41, df = 1, p < 0.001).

Table 4.7: Association Between Psychological Factors and Preoperative Anxiety

Psychological Factor	Category	Anxiety Present n (%)	χ^2	df	*p*
Fear of Postoperative Pain	No	84 (42.4)	36.58	1	<0.001
	Yes	140 (72.9)			
Fear of Not Waking Up	No	84 (41.6)	42.73	1	<0.001
	Yes	140 (74.5)			
Fear of Intraoperative Awareness	No	90 (48.1)	12.32	1	<0.001
	Yes	134 (66.0)			
Fear of Surgical Complications	No	74 (39.8)	43.84	1	<0.001
	Yes	150 (73.5)			
Fear of Death	No	105 (43.2)	53.41	1	<0.001
	Yes	119 (80.9)			

Association Between Information Requirements and Preoperative Anxiety

Patients with clinically significant anxiety had significantly higher mean information requirement scores (7.68 ± 1.96) compared to those without anxiety (6.28 ± 2.08). This difference was highly statistically significant (t = 6.82, df = 388, p < 0.001), indicating that anxious patients expressed a greater desire for information regarding their surgery and anesthesia.

Table 4.8: Comparison of Information Requirement Scores by Anxiety Status

Anxiety Status	n	Mean Information	SD	t	df	*p*

		Score				
Anxiety Present	224	7.68	1.96	6.82	388	<0.001
Anxiety Absent	166	6.28	2.08			

Comparison of APAIS Anxiety Scores by Study Variables

Gender Differences

Female patients had significantly higher mean APAIS anxiety scores (12.17 ± 3.74) compared to male patients (10.73 ± 3.92). This difference was highly statistically significant ($t = -3.58$, $df = 388$, $p < 0.001$), confirming the gender disparity in anxiety levels observed in the bivariate analysis.

Age Differences

There was a statistically significant difference in mean APAIS anxiety scores across age groups ($F = 10.24$, $df = 3$, $p < 0.001$). Post-hoc analysis revealed that the 18–30 years age group had significantly higher scores compared to the 46–60 years and >60 years groups, confirming the inverse relationship between age and anxiety levels.

Previous Surgical History

Patients without previous surgical history had significantly higher mean APAIS anxiety scores (12.35 ± 3.61) compared to those with prior surgical experience (10.24 ± 3.92). This difference was highly statistically significant ($t = -5.84$, $df = 388$, $p < 0.001$).

Type of Surgery

Patients scheduled for major surgery had significantly higher mean APAIS anxiety scores (12.17 ± 3.65) compared to those undergoing minor procedures (10.36 ± 3.98). This difference was highly statistically significant ($t = -4.60$, $df = 388$, $p < 0.001$).

Table 4.9: Comparison of APAIS Anxiety Scores by Study Variables

Variable	Category	n	Mean APAIS Score	SD	Test Statistic	df	*p*
Gender	Male	207	10.73	3.92	t = -3.58	388	<0.001
	Female	183	12.17	3.74			
Age Group	18–30 Years	126	12.58	3.51	F = 10.24	3	<0.001
	31–45 Years	114	11.63	3.78			
	46–60 Years	97	10.48	3.89			
	>60 Years	53	9.72	3.94			
Previous	Yes	172	10.24	3.92	t = -5.84	388	

Surgery							
	No	218	12.35	3.61			
Type of Surgery	Minor	161	10.36	3.98	t = -4.60	388	<0.001
	Major	229	12.17	3.65			
Type of Anesthesia	General	240	12.08	3.68	F = 8.95	2	<0.001
	Regional	112	10.76	3.98			
	Local	38	9.61	3.76			
Educational Level	No Formal	65	12.85	3.54	F = 8.31	3	<0.001
	Primary	85	12.13	3.82			
	Secondary	142	11.36	3.84			
	Higher	98	10.08	3.91			

Correlation Analysis

Correlation Between APAIS Anxiety Score and VAS Score

There was a strong, positive, and statistically significant correlation between APAIS anxiety scores and VAS anxiety scores ($r = 0.742$, $p < 0.001$), demonstrating good convergent validity between the two anxiety measures. This finding is consistent with previous studies that reported good correlation between the APAIS and VAS.

Correlation Between APAIS Anxiety Score and Information Requirement Score

There was a moderate, positive, and statistically significant correlation between APAIS anxiety scores and information requirement scores ($r = 0.384$, $p < 0.001$), indicating that higher anxiety levels were associated with greater desire for information.

Table 4.10: Pearson Correlation Matrix

Variable	APAIS Anxiety Score	VAS Score	Information Score
APAIS Anxiety Score	1.000	0.742**	0.384**
VAS Score	0.742**	1.000	
Information Score	0.384**		1.000

**p < 0.001 (two-tailed)

Multivariable Logistic Regression Analysis

Variables with p-values less than 0.25 during bivariate analysis were entered into a binary logistic regression model to identify independent predictors of preoperative anxiety. The final model included gender, age group, educational level, previous

surgical history, type of surgery, type of anesthesia, and all psychological factors. The model demonstrated good fit (Hosmer-Lemeshow χ^2 = 8.36, df = 8, p = 0.398) and explained approximately 42.1% of the variance in preoperative anxiety (Nagelkerke R^2 = 0.421). The model correctly classified 78.3% of cases, indicating satisfactory predictive accuracy.

Multivariable Logistic Regression Analysis of Independent Predictors of Preoperative Anxiety (N=390)

Table 4.11 presents the results of the multivariable logistic regression analysis. After adjusting for potential confounders, six variables emerged as significant independent predictors of preoperative anxiety. The strongest predictor was fear of postoperative pain (AOR = 3.41, 95% CI: 2.04 – 5.72, p < .001), followed by no previous surgical history (AOR = 2.82, 95% CI: 1.71 – 4.65, P <.001), Female gender (AOR = 2.10, p = .003), age 18-30 years (AOR = 1.84, p = .017), major surgery (AOR = 1.96, p = .009), fear of not waking up (AOR = 2.27, p = .001), and fear of death (AOR = 1.73, p = .035) were also significant. The model demonstrated good fit (Hosmer-Lemeshow **χ^2 = 8.36, p = .398**) and explained 42.1% of the variance in preoperative anxiety (Nagelkerke R^2 = .421).

Table 4.11: Multivariable Logistic Regression Analysis of Independent Predictors of Preoperative Anxiety (N=390)

Variable (Reference Group)	AOR	95% CI	*p*
Female (Male)	**2.10**	**1.28 – 3.45**	**0.003**
Age 18-30 Years (>60)	1.84	1.12-3.03	**0.017**
Age 31-45 Years (>60)	1.51	0.91-2.52	0.114
Age 46-60 Years (>60)	1.33	0.79-2.26	0.282
No previous Surgical History (Yes)	**2.82**	**1.71-4.65**	**<0.001**
Major Surgery (Minor)	**1.96**	**1.18-3.25**	**0.009**
Fear of Postoperative Pain (No)	**3.14**	**2.04-5.72**	**<0.001**
Fear of Not Waking Up (No)	**2.27**	**1.39-3.72**	**0.001**
Fear of Intraoperative Awareness (No)	1.41	0.88-2.27	0.153
Fear of Surgical Complications (No)	1.62	0.98 - 2.67	0.060
Fear of Death (No)	1.73	1.04 - 2.89	0.035
Regional Anesthesia (Local)	1.39	0.75 - 2.57	0.297
General Anesthesia (Local)	1.68	0.94 - 3.00	0.078
No Formal Education (Higher)	1.54	0.90 - 2.64	0.115
Secondary Education (Higher)	1.33	0.82 - 2.16	0.251

Note: AOR = Adjusted Odds Ration; CI = Confidence Interval; p < 0.05 considered statistically significant.

Model Fit Statistics:

- Hosmer-Lemeshow Test: χ^2 = 8.36, df = 8, p = 0.398

- Nagelkerke R^2 = .421
- Model Classification Accuracy: 78.3%

Summary of Independent Predictors

The multivariable logistic regression analysis identified six independent predictors of preoperative anxiety that remained statistically significant after adjusting for potential confounders:

1. Female Gender (AOR = 2.10; 95% CI: 1.28–3.45; p = 0.003): Female patients had more than twice the odds of experiencing clinically significant preoperative anxiety compared to male patients, even after adjusting for other factors.

2. Younger Age (18–30 Years) (AOR = 1.84; 95% CI: 1.12–3.03; p = 0.017): Patients in the 18–30 years age group had 1.84 times higher odds of anxiety compared to patients aged >60 years.

3. No Previous Surgical History (AOR = 2.82; 95% CI: 1.71–4.65; p < 0.001): Patients without previous surgical experience had nearly three times higher odds of anxiety compared to those with prior surgical history, making this the strongest sociodemographic predictor.

4. Major Surgery (AOR = 1.96; 95% CI: 1.18–3.25; p = 0.009): Patients scheduled for major surgery had approximately twice the odds of anxiety compared to those undergoing minor procedures

5. Fear of Postoperative Pain (AOR = 3.41; 95% CI: 2.04–5.72; p < 0.001): Fear of postoperative pain emerged as the strongest independent predictor, with patients having this fear exhibiting more than three times higher odds of anxiety.

6. Fear of Not Waking Up After Anesthesia (AOR = 2.27; 95% CI: 1.39–3.72; p = 0.001): Patients fearing not waking up after anesthesia had more than twice the odds of experiencing significant preoperative anxiety.

7. Fear of Death (AOR = 1.73; 95% CI: 1.04–2.89; p = 0.035): Fear of death related to surgery was also independently associated with increased anxiety, though with a smaller effect size compared to other predictors.

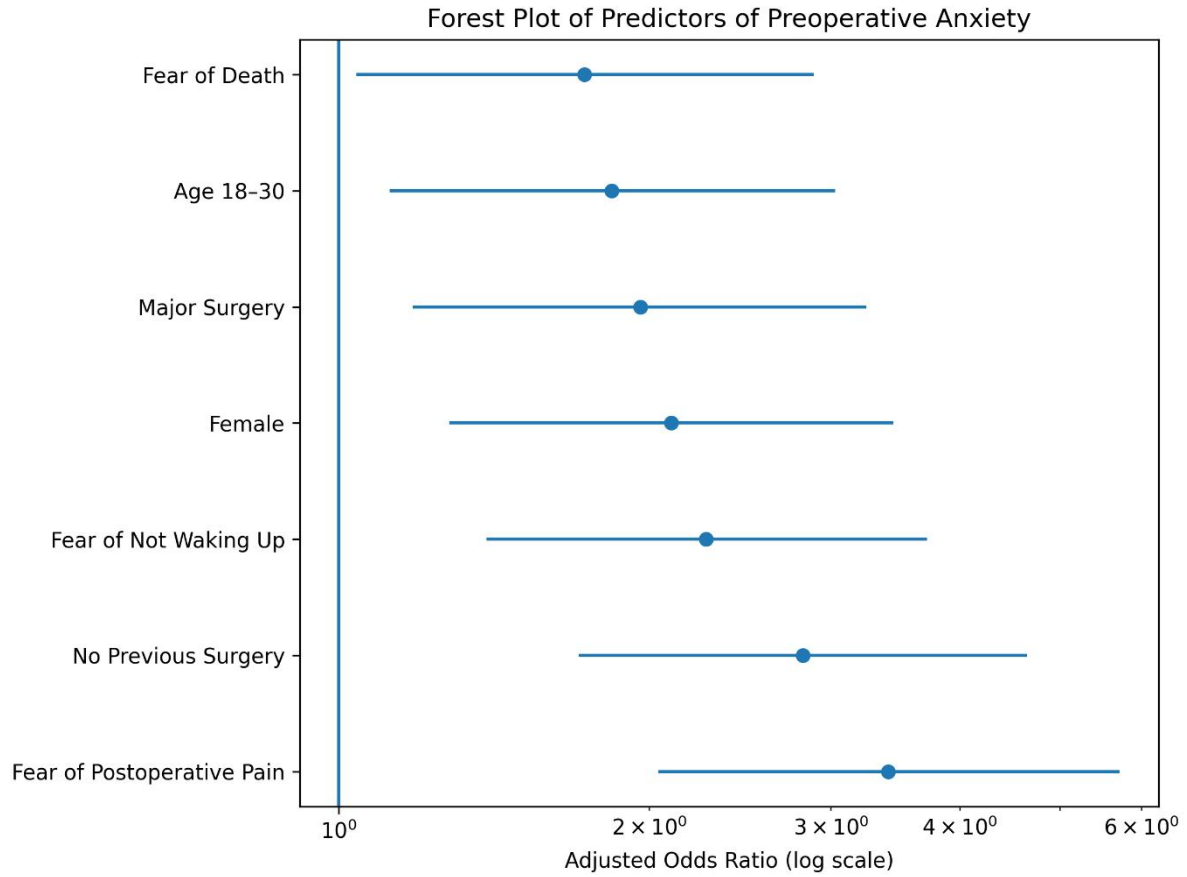

Figure 4.6: Forest Plot Showing Adjusted Odds Ratios (AOR) and 95% Confidence Intervals for Independent Predictors of Preoperative Anxiety

The forest plot displays the adjusted odds ratios and 95% confidence intervals for the seven independent predictors of preoperative anxiety identified through multivariable logistic regression analysis. The vertical reference line at OR = 1 indicates no effect. Predictors with confidence intervals entirely to the right of the reference line represent statistically significant risk factors. Fear of postoperative pain was the strongest predictor (AOR = 3.41), followed by absence of previous surgical history (AOR = 2.82), fear of not waking up after anesthesia (AOR = 2.27), female gender (AOR = 2.10), major surgery (AOR = 1.96), younger age 18–30 years (AOR = 1.84), and fear of death (AOR = 1.73).

Summary of Key Findings

1. Prevalence: The overall prevalence of clinically significant preoperative anxiety was 57.4% (95% CI: 52.3–62.4%), with a mean APAIS anxiety score of 11.42 ± 3.87.

2. Information Needs: The mean information requirement score was 7.08 ± 2.14, with 44.1% of patients expressing a high need for information.

3. Psychological Factors: The most prevalent psychological concerns were fear of postoperative pain (68.5%), fear of surgical complications (64.1%), and fear of not waking up after anesthesia (62.3%).

4. Significant Bivariate Associations: Gender ($\chi^2 = 12.87$, $p < 0.001$), age ($\chi^2 = 25.86$, $p < 0.001$), educational level ($\chi^2 = 11.57$, $p = 0.009$), previous surgical history ($\chi^2 = 14.87$, $p < 0.001$), type of surgery ($\chi^2 = 19.68$, $p < 0.001$), type of anesthesia ($\chi^2 = 13.84$, $p = 0.001$), and all psychological factors ($p < 0.001$) showed significant associations with preoperative anxiety.

5. Independent Predictors: Multivariable logistic regression identified seven independent predictors of preoperative anxiety:

- Female gender (AOR = 2.10; 95% CI: 1.28–3.45)
- Younger age (18–30 years) (AOR = 1.84; 95% CI: 1.12–3.03)
- No previous surgical history (AOR = 2.82; 95% CI: 1.71–4.65)
- Major surgery (AOR = 1.96; 95% CI: 1.18–3.25)
- Fear of postoperative pain (AOR = 3.41; 95% CI: 2.04–5.72)
- Fear of not waking up after anesthesia (AOR = 2.27; 95% CI: 1.39–3.72)
- Fear of death (AOR = 1.73; 95% CI: 1.04–2.89)

6. Model Performance: The logistic regression model demonstrated good fit (Hosmer-Lemeshow $p = 0.398$) and correctly classified 78.3% of cases, explaining 42.1% of the variance in preoperative anxiety.

DISCUSSION

This analytical cross-sectional study quantified the burden and determinants of preoperative anxiety among adult elective surgical patients in Dera Ismail Khan, Pakistan, using the validated APAIS instrument. The prevalence of clinically significant anxiety was 57.4% (mean score 11.42 ± 3.87), indicating a substantial perioperative psychological burden. This estimate is concordant with the pooled prevalence of 55.7% reported across low- and middle-income countries (29), suggesting that the magnitude of anxiety observed in this cohort reflects broader epidemiological patterns in comparable resource-constrained settings.

Notable heterogeneity exists within national and international estimates. Studies conducted in Karachi have reported prevalence rates of 62.0% and 52.4%, whereas a comparatively lower prevalence of 38% has been documented in Lahore (11,30,31). Such variation likely reflects differences in patient demographics, procedural spectrum, perioperative communication practices, and methodological factors, including timing of assessment. Similarly, lower prevalence reported in Nepal (22.85–25.85%) (6,32) may be attributable to assessment in preoperative holding areas and greater exposure to perioperative information, whereas higher estimates from India (77.62%) (33) likely correspond to assessment immediately prior to surgery, when

anxiety typically peaks.

Female gender emerged as an independent predictor of preoperative anxiety (AOR = 2.10), consistent with prior evidence across diverse populations (11,34). This association is plausibly mediated through both biological mechanisms, including sex-related differences in neuroendocrine stress responses, and sociocultural determinants, such as gendered roles, healthcare autonomy, and patterns of emotional expression. These findings underscore the necessity for gender-responsive perioperative assessment and counseling frameworks.

Younger age (18–30 years) was also independently associated with increased anxiety (AOR = 1.84), demonstrating an inverse relationship between age and anxiety levels, as consistently reported in the literature (29,30,32). This pattern may be explained by limited prior exposure to surgical care, heightened uncertainty, and concerns regarding disruption of life trajectories among younger individuals. In contrast, older patients may possess greater experiential familiarity and more adaptive coping strategies, mitigating anxiety responses.

Absence of previous surgical history was identified as a robust predictor (AOR = 2.82), corroborating earlier findings (6,32,34). Lack of prior exposure likely amplifies uncertainty and anticipatory fear, whereas previous surgical experiences—particularly if favorable—may attenuate anxiety through increased procedural familiarity and trust in healthcare systems. These findings highlight the critical role of structured preoperative education, particularly for first-time surgical candidates.

Fear-related cognitions constituted the most influential determinants of anxiety. Fear of postoperative pain emerged as the strongest predictor (AOR = 3.41), consistent with evidence identifying pain anticipation as a central driver of preoperative distress (11,30). Additionally, fear of not regaining consciousness following anesthesia (AOR = 2.27) reflects persistent misconceptions regarding anesthetic safety (30,35). These findings emphasize the importance of comprehensive perioperative counseling, including clear communication regarding multimodal analgesia and the safety profile of modern anesthesia.

Patients with elevated anxiety demonstrated significantly greater information requirements ($p < 0.001$), consistent with the conceptual framework of APAIS (8). The regression model demonstrated acceptable explanatory capacity (Nagelkerke R^2 = 0.421), although residual variance suggests the influence of unmeasured psychosocial constructs, including personality traits, coping mechanisms, and sociocultural context (34). Collectively, these findings support the integration of systematic psychological screening and individualized, evidence-based counseling into routine perioperative care to mitigate anxiety and optimize surgical outcomes.

CONCLUSION

The overall prevalence of clinically significant preoperative anxiety among adult elective surgical patients in Dera Ismail Khan was 57.4%, indicating that more than half of patients experience substantial psychological distress before surgery.

Multivariable logistic regression identified six independent predictors: female gender (AOR = 2.10), younger age 18-30 years (AOR = 1.84), absence of previous surgical history (AOR = 2.82), major surgical procedures (AOR = 1.96), fear of postoperative pain (AOR = 3.41), and fear of not waking up after anesthesia (AOR = 2.27). Fear of postoperative pain was the most prevalent psychological concern (68.5%), followed by fear of surgical complications (64.1%) and fear of not waking up after anesthesia (62.3%). Patients with anxiety had significantly higher information needs (7.68 ± 1.96 vs. 6.28 ± 2.08; $p < 0.001$), and 68.5% reported that waiting time increased their anxiety, while 32.3% and 37.2% felt inadequately informed about surgery and anesthesia respectively. The logistic regression model explained 42.1% of variance and correctly classified 78.3% of cases. This study provides the first comprehensive evidence from a peripheral Pakistani region, addressing a significant gap in understanding preoperative anxiety in underserved healthcare settings. The findings support routine anxiety screening using validated tools like APAIS, targeted preoperative counseling addressing specific fears particularly pain and anesthesia safety, and improvements in information delivery and hospital processes to reduce waiting times. Anesthesiologists, surgeons, and perioperative nurses must collaborate to provide holistic, patient-centered care that integrates psychological assessment and intervention as essential components of perioperative management. Addressing preoperative anxiety is not merely a matter of patient comfort but a clinically important intervention with potential to enhance anesthetic safety, improve postoperative recovery, increase patient satisfaction, and reduce healthcare resource utilization. Healthcare systems in Pakistan and other low- and middle-income countries must invest in human and structural resources to provide comprehensive perioperative psychological care, recognizing that mental well-being is integral to optimal surgical outcomes.

Strengths of the Study

1. **Adequate sample size** (N=390) provided sufficient statistical power for multivariable logistic regression analysis with a favorable participant-to-variable ratio.
2. **Standardized validated tool** (APAIS) was used, which is a globally validated and reliable instrument for assessing preoperative anxiety and information needs.
3. **Comprehensive variable assessment** included sociodemographic, clinical, psychological, communication, and social support factors, allowing for a multidimensional understanding of anxiety predictors.
4. **Strong convergent validity** was demonstrated through significant positive correlation between APAIS and Visual Analog Scale (VAS) scores ($r = 0.742$, $p < 0.001$), confirming the validity of anxiety assessment.
5. **Good model performance** with the logistic regression model explaining 42.1% of variance (Nagelkerke $R^2 = 0.421$) and correctly classifying 78.3% of cases.

6. **Context-specific evidence** as this is the first comprehensive study from peripheral Dera Ismail Khan region, addressing the evidence gap in underserved Pakistani healthcare settings.
7. **Clinically actionable findings** identified specific, modifiable predictors (pain-related fear, anesthesia-related fear, information needs) that directly inform targeted interventions.

Limitations

1. **Cross-sectional design** precludes establishing causal relationships between predictors and anxiety; only associations can be inferred.
2. **Single-center study** conducted only in Dera Ismail Khan, limiting generalizability to other regions and healthcare settings in Pakistan.
3. **Convenience sampling** may introduce selection bias, as participants may not be representative of the entire surgical population.
4. **Single time-point assessment** measured anxiety at one time point only, not capturing fluctuations in anxiety levels across the preoperative period.
5. **Exclusion of high-risk groups** including patients with psychiatric illness, those on psychotropic medications, and critically ill patients may have underestimated true anxiety prevalence.
6. **Self-report bias** may be subject to social desirability bias, cultural norms about emotional expression, and lack of insight.
7. **Unmeasured confounders** such as personality traits (neuroticism), trait anxiety, coping styles, socioeconomic status, and religious beliefs were not assessed and may influence anxiety.

RECOMMENDATIONS

1. **Implement routine anxiety screening** using APAIS during preoperative assessments, with targeted counseling for high-risk groups including females, younger patients, and those without prior surgical experience.
2. **Address specific fears** through comprehensive preoperative education focusing on postoperative pain management and anesthesia safety, with clear reassurance about monitoring and recovery.
3. **Optimize hospital processes** by reducing waiting times, creating comfortable environments, and providing accurate information about expected delays to minimize anxiety.
4. **Enhance communication** through standardized preoperative education programs delivered in accessible language, using visual aids and written materials for patients with limited health literacy.
5. **Invest in healthcare provider training** on communication skills, psychological support, and evidence-based anxiety management strategies across the perioperative team.
6. **Integrate mental health services** into surgical care pathways through national guidelines, referral systems, and allocation of resources for psychological screening and intervention.

7. **Conduct multicenter longitudinal research** with randomized controlled trials to evaluate anxiety reduction interventions, develop predictive models, and assess cost-effectiveness across diverse Pakistani populations.

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