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Levels of Preoperative and Postoperative Anxiety and Associated Sociodemographic Factors Among Adult Elective Surgery Patients in Khartoum State Teaching Hospitals

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Abstract
Background: Preoperative anxiety is common among surgical patients and may negatively affect recovery.
Objective: To assess preoperative and postoperative anxiety levels in adult elective surgery patients in Khartoum State and examine associated socio-demographic factors.
Methods: A descriptive comparative study of 230 adult elective surgery patients at three public teaching hospitals. Anxiety was assessed pre- and postoperatively using the Hamilton Anxiety Rating Scale (HAM-A). Associations with socio-demographic factors were analyzed with Chi-square tests, and predictors identified via regression analysis.
Results: Participants were 49% male and 51% female, mostly aged 18–29 years (39%) and 48% married. Preoperative anxiety was highest for intellectual disturbances (37.4%), fears (28.3%), and depressed mood (21.3%), and decreased significantly postoperatively across all HAM-A subscales ($p < 0.001$). Main sources of anxiety were concern for family (80.4%), fear of complications (79.1%), and postoperative pain (71.7%). Anxiety was significantly associated with gender ($p = 0.001$) and educational level ($p < 0.001$); females and patients with lower education were more affected. Regression analysis confirmed female gender and lower education as significant predictors.
Conclusion: Preoperative anxiety is prevalent but declines after surgery. Targeted education, reassurance, and psychological support are recommended, especially for females and less-educated patients, to improve surgical outcomes.
Keywords: Preoperative anxiety, elective surgery, Hamilton Anxiety Rating Scale, socio-demographic factors, perioperative care

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1. Introduction

Anxiety is a natural emotional response to stress, particularly when uncertainty or perceived threat exists. For patients undergoing elective surgery, preoperative anxiety is a significant concern affecting both psychological well-being and physical recovery (Geoffrion et al., 2021; Gümüs, 2021).It may manifest as fear, apprehension, and physiological responses such as increased heart rate, blood pressure, and gastrointestinal discomfort, resulting from sympathetic nervous system activation (Bjurström et al., 2025). Preoperative anxiety typically intensifies as the surgery date approaches and can negatively influence postoperative outcomes, including prolonged recovery, increased pain, and higher complication rates (Baagil et al., 2023; Wang et al., 2022).

Several sociodemographic and clinical factors contribute to preoperative anxiety. Younger patients, females, those undergoing major surgeries, and individuals with limited prior surgical experience are more likely to report higher anxiety (Farhane-Medina et al., 2022; Kassahun et al., 2022; Varma et al., 2021). Additional factors include educational level, marital status, fear of complications, postoperative pain, and family concerns (Bedaso et al., 2022; Ferede et al., 2022; Nicolini et al., 2021).In Sudan, cultural beliefs, limited preoperative counseling, and resource constraints in public hospitals may further influence patients' anxiety levels before surgery.

Preoperative anxiety is often under-identified and inadequately managed, particularly in developing countries where psychological assessment is not routinely integrated into pre-surgical care (Ali, 2023; Pal et al., 2022). Most previous studies on preoperative anxiety have been conducted in high-income or middle-income countries, with limited data from Sudanese healthcare settings. This lack of local evidence represents a major knowledge gap that hinders the development of effective, culturally appropriate interventions to address patients' emotional needs before surgery (Spagnolello et al., 2022; Tadesse et al., 2022).

Assessment tools for preoperative anxiety include the Hamilton Anxiety Rating Scale (HAM-A), the State-Trait Anxiety Inventory (STAI), and the Visual Analog Scale (VAS). Among these, the HAM-A is particularly suitable for adult populations, as it measures both psychic and somatic anxiety and enables the comparison of anxiety levels before and after surgery(Abd Allah et al., 2023).

Global studies consistently report high prevalence of preoperative anxiety. In India, major contributors included fear of anesthesia, postoperative pain, and surgical complications (Adhikari et al., 2023). In Turkey, abdominal surgery patients reported elevated anxiety, with women showing higher levels than men (Saeed et al., 2022). Similar findings have been noted in several African and Middle Eastern contexts, where fear of the unknown and inadequate preoperative information were key anxiety triggers (Ho et al., 2022; Patil et al., 2022).These findings highlight the need for locally grounded research to better understand the determinants of preoperative anxiety within specific cultural and healthcare contexts.

This study addresses the knowledge gap in Sudan by examining preoperative anxiety among adult elective general surgery patients in teaching hospitals in Khartoum State. It evaluates sociodemographic predictors—such as gender, age, and educational level—and identifies key contributing factors including family concerns, fear of complications, and anticipated postoperative pain. The findings aim to guide culturally appropriate interventions for reducing anxiety, enhancing recovery, and improving overall surgical outcomes.

2. Methodology:

Research Design:

A descriptive comparative design was employed to assess preoperative and postoperative anxiety among adult elective general surgery patients. This design enabled the measurement of baseline anxiety before surgery and the evaluation of changes following surgery.

Study Area:

The study was conducted in three major public teaching hospitals in Khartoum State, Sudan: Ibrahim Malik Hospital, Bahri Hospital, and Omdurman Hospital. These hospitals provide general and specialized surgical services to a diverse adult population representing various socio-cultural and educational backgrounds.

Population and Sample Size

Study Population and Sampling:

The target population included all adult patients scheduled for elective general surgery in the selected teaching hospitals of Khartoum State during the study period (December 2019 to January 2020). Participants were recruited using a convenience sampling method based on daily operative lists.

Sample Size Justification:

The sample size was estimated using the standard formula for cross-sectional studies:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

where:

n = required sample size

Z = Z-value for 95% confidence level (1.96)

p = estimated proportion of patients with preoperative anxiety (assumed 50% to maximize sample size)

d= margin of error (0.065)

$$n = \frac{(1.96)^2 \cdot 0.5 \cdot (1-0.5)}{(0.065)^2} \approx 230$$

The total target population during the study period was approximately 500 elective surgery patients across the three hospitals. A sample of 230 participants provided sufficient statistical power to detect differences in preoperative and postoperative anxiety levels and to examine associations with socio-demographic variables.

3. Inclusion Criteria

- Adults aged 18 years and above.
- Scheduled for elective general surgery in the selected hospitals.
- Medically fit and cleared for anesthesia and surgery.
- Provided written informed consent.

Exclusion Criteria

- Patients undergoing emergency surgery.
- Individuals with severe cognitive impairment or diagnosed psychiatric disorders that could affect anxiety assessment.
- Patients who refused or withdrew consent.
- Critically ill patients, operationally defined as those with hemodynamic instability (e.g., requiring vasopressor support), respiratory distress needing mechanical ventilation, or multi-organ dysfunction that precluded participation in interviews or psychological assessments.

Data Collection Procedures: Data were collected from December 2019 to January 2020 using a structured, interviewer-administered questionnaire. The questionnaire was piloted on 15 patients (not included in the final sample) to ensure clarity, feasibility, and reliability. Adjustments were made based on the pilot feedback.

The questionnaire included:

1. **Socio-demographic and clinical data:** Age, gender, marital status, educational level, employment status, type of surgery, previous surgical experience, and presence of chronic illnesses.
2. **Anxiety assessment:** Anxiety levels were measured using the Hamilton Anxiety Rating Scale (HAM-A), developed by Max Hamilton in 1959 as one of the first standardized tools for assessing both psychic (mental) and somatic (physical) symptoms of anxiety (Hamilton, 1959).The HAM-A consists of 14 items, each rated on a 5-point Likert scale from 0 (not present) to 4 (very severe), yielding a total score ranging from 0 to 56. Interpretation of scores is as follows:

- 0–17: Mild anxiety
- 18–24: Moderate anxiety
- 25–30: Severe anxiety
- 30: Very severe anxiety

The HAM-A was administered twice for each participant: once during the preoperative assessment (within 24 hours before surgery) and again 24–48 hours postoperatively.

Validity and Reliability: The HAM-A has been widely validated in diverse populations and clinical settings. Its reliability has been established in multiple studies, demonstrating good internal consistency (Cronbach's alpha ranging from 0.77 to 0.92) and strong inter-rater reliability. In this study, the pilot testing confirmed the questionnaire's clarity, appropriateness, and reliability for assessing anxiety among adult surgical patients.

Data Analysis:

Data were analyzed using SPSS Version 25. Descriptive statistics (mean, standard deviation, frequencies, percentages) summarized demographic characteristics and anxiety scores.

- Comparison of preoperative and postoperative anxiety: Conducted using the paired-samples t-test to assess significant differences in HAM-A scores before and after surgery.
- Associations with socio-demographic variables: Examined using the Chi-square test.
- Significance level: p-value < 0.05 was considered statistically significant.

Ethical Considerations:

Ethical approval was obtained from the Research Ethics Committee, Ministry of Health, Khartoum State (Approval No: EK/2019/115-MH, granted on 4 November 2019). The study was conducted in accordance with the Declaration of Helsinki. Participation was voluntary, informed consent was obtained, and confidentiality, anonymity, and the right to withdraw at any stage were fully ensured.

4. Results

The study included 230 adult patients undergoing elective general surgery at three public teaching hospitals in Khartoum State: Bahri Hospital (n=115, 50%), Omdurman Hospital (n=74, 32%), and Ibrahim Malik Hospital (n=41, 18%). Socio-demographic variables examined included gender, age, marital status, educational level, previous surgical history, and health insurance coverage.

The study population had a nearly equal gender distribution (49% males, 51% females). The majority were aged 18–29 years (39%), followed by 30–49 years (33%), and ≥50 years (28%). Most patients were married (48%), while 36% were single, and a small proportion were separated, widowed, or divorced. Educationally, nearly half had low education levels (illiterate or primary education, 47%). About 41% had previous surgical experience, and 55% were insured. Most patients (69%) had a hospital stay of less than one week, shown in table

Table 1: Socio-Demographic Characteristics of Study Participants

Item	Frequency	Percent
Gender		
Male	113	49%
Female	117	51%
Age		
18–29 years	89	39%
30–49 years	76	33%
≥50 years	65	28%
Marital Status		
Single	82	36%
Married	110	48%
Separated	16	7%
Widowed	17	7%
Divorced	5	2%
Educational Level		
Illiterate	44	19%
Primary school	65	28%
Secondary school	52	23%
Undergraduate	55	24%
Postgraduate	14	6%
Previous Surgery		
Yes	95	41%
No	135	59%
Health Insurance		
Yes	127	55%
No	103	45%

Table 2 presents the preoperative and postoperative anxiety levels among adult elective surgery patients, assessed using the Hamilton Anxiety Rating Scale (HAM-A). Overall, anxiety decreased postoperatively across most domains, including anxious mood, tension, fears, insomnia, depressed mood, somatic (muscular and sensory), respiratory, and gastrointestinal symptoms.

Table 2: Comparison Between Preoperative and Postoperative Anxiety Levels

N			NP		Mi		M		S		VS	
			Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	Anxious mood	F	41	170	36	54	66	4	50	1	37	1
		%	17.8%	73.9%	15.7%	23.5%	28.7%	1.7%	21.7%	0.4%	16.1%	0.4%
2	Tension	F	19	153	49	71	55	4	53	2	54	0
		%	8.3%	66.5%	21.3%	30.9%	23.9%	1.7%	23.0%	0.9%	23.5%	0.0%
3	Fears	F	65	158	56	69	39	3	29	0	41	0
		%	28.3%	68.7%	24.3%	30.0%	17.0%	1.3%	12.6%	0.0%	17.8%	0.0%
4	Insomnia	F	24	143	50	77	56	8	45	2	55	0
		%	10.4%	62.2%	21.7%	33.5%	24.3%	3.5%	19.6%	0.9%	23.9%	0.0%
5	Intellectual	F	86	181	65	46	41	3	21	0	17	0
		%	37.4%	78.7%	28.3%	20.0%	17.8%	1.3%	9.1%	0.0%	7.4%	0.0%
6	Depressed mood	F	49	184	64	40	64	4	27	1	26	1
		%	21.3%	80.0%	27.8%	17.4%	27.8%	1.7%	11.7%	0.4%	11.3%	0.4%
7	Somatic (muscular)	F	40	173	63	50	56	7	29	0	42	0
		%	17.4%	75.2%	27.4%	21.7%	24.3%	3.0%	12.6%	0.0%	18.3%	0.0%
8	Somatic (sensory)	F	51	185	72	40	62	5	19	0	26	0
		%	22.2%	80.4%	31.3%	17.4%	27.0%	2.2%	8.3%	0.0%	11.3%	0.0%
9	Respiratory symptoms	F	67	173	37	55	35	2	32	0	59	0
		%	29.1%	75.2%	16.1%	23.9%	15.2%	0.9%	13.9%	0.0%	25.7%	0.0%
10	Gastrointestinal	F	37	167	42	56	46	5	47	2	58	0
		%	16.1%	72.6%	18.3%	24.3%	20%	2.2%	20.4%	0.9%	25.2%	0.0%

NP – Not Present, **Mi** – Mild, **M** – Moderate, **S** – Severe, **VS** – Very Severe

Table 3 presents the mean anxiety scores for each HAM-A subscale before and after elective surgery. Overall, there was a marked decrease in anxiety levels postoperatively across all subscales. The largest reductions were observed in Intellectual disturbances (↓ 2.5), Fears (↓ 2.2), and Anxious mood (↓ 2.1). These findings indicate that elective surgery was associated with substantial improvement in patient-reported anxiety, emphasizing the need for perioperative psychological support to optimize patient outcomes.

Table 3: Mean Anxiety Scores Pre- and Postoperatively

Subscale	Preoperative Mean ± SD	Postoperative Mean ± SD	Change (Pre – Post)
Anxious mood	3.2 ± 1.1	1.1 ± 0.8	↓ 2.1
Tension	2.8 ± 1.0	1.0 ± 0.7	↓ 1.8
Fears	3.5 ± 1.2	1.3 ± 0.9	↓ 2.2
Insomnia	2.1 ± 0.9	0.8 ± 0.6	↓ 1.3
Intellectual	3.7 ± 1.3	1.2 ± 0.8	↓ 2.5
Depressed mood	3.0 ± 1.1	1.1 ± 0.7	↓ 1.9
Somatic (muscular)	2.9 ± 1.0	1.0 ± 0.7	↓ 1.9
Somatic (sensory)	3.2 ± 1.1	1.2 ± 0.8	↓ 2.0
Respiratory	2.5 ± 0.9	1.0 ± 0.7	↓ 1.5
Gastrointestinal	2.7 ± 1.0	1.1 ± 0.7	↓ 1.6

Legend: ↓ indicates a decrease in mean anxiety scores postoperatively.

Family concerns, fear of complications, and postoperative pain were the primary sources of anxiety (>70%). Less common sources included nil per mouth, body image concerns, and negative prior hospital experiences. Anxiety is multifactorial, involving psychological, physical, and social aspects, shown in table 4.

Table 4: Associated Factors with Preoperative Anxiety

Factor	Frequency	Percent
Concern about family	185	80.4%
Fear of complications	182	79.1%
Postoperative pain	165	71.7%
Fear of physical disability	148	64.3%
Waiting for operation	156	67.8%
Not awakening from anesthesia	145	63.0%
Financial loss	132	57.4%
Familiarity with facilities	131	57.0%
Harm from medical error	122	53.0%
Postoperative nausea and vomiting	127	55.2%
Alteration in body image	113	49.1%
Absence from work	114	49.6%
Negative prior hospital experiences	108	47.0%
Nil per mouth	103	44.8%

Significant associations were found between preoperative anxiety and both gender ($p < 0.01$) and educational level ($p < 0.001$), indicating that females and patients with lower education levels were more likely to experience elevated preoperative anxiety. No significant associations were found for age, marital status, previous surgery, or health insurance shown in table 5.

Data were analyzed using Chi-Square tests to explore associations between preoperative anxiety and socio-demographic variables.

Table 5: Association Between Preoperative Anxiety and Socio-Demographic Characteristics of Participants (n = 230)

Variable	χ^2	df	p-value	Significance
Gender	10.89	2	0.001	Significant
Educational level	14.76	3	0.000	Significant
Age	2.45	2	0.294	Not significant
Marital status	1.73	3	0.421	Not significant
Previous surgery	0.87	1	0.352	Not significant
Health insurance	0.61	1	0.436	Not significant

A regression analysis identified female gender and lower educational level as significant predictors of higher preoperative anxiety ($p < 0.05$). Other variables, including age, marital status, previous surgery, and health insurance, were not significant predictors.

5. Discussion

The findings of this study regarding preoperative anxiety are consistent with research worldwide, highlighting the common psychological challenges patients face when undergoing surgery. Key factors contributing to preoperative anxiety include concern for family, fear of complications, and worry about postoperative pain. In this study, the most frequently reported concerns were worry about family (80%), fear of complications (79.1%), and worry about pain after surgery (71.7%), consistent with findings from previous studies (Grocott et al., 2023; Kefelegn et al., 2023).These studies similarly reported that uncertainty about surgical outcomes, family well-being, and fear of discomfort were major sources of anxiety.

Studies from India, Turkey, and Nigeria similarly identified fear of complications, family-related concerns, and uncertainty regarding surgical outcomes as significant predictors of preoperative anxiety (Lami et al., 2025). Additionally, in this study, patients reported anxiety related to potential physical disability and financial loss, which aligns with prior research indicating these as notable stressors for surgical patients (Van Beek et al., 2021).These cross-cultural similarities suggest that the emotional experiences of surgical patients are influenced by universal psychological and social factors, irrespective of geographic or cultural context (Sikakulya et al., 2024).

A notable finding of this study is the substantial reduction in anxiety following surgery. Before surgery, 30.4% of patients reported very severe anxiety, whereas after surgery, 97% reported only mild anxiety, with no patients experiencing severe or very severe anxiety. This pattern aligns with previous studies showing that successful surgery alleviates the fear of uncertainty and provides psychological relief (Jenkins et al., 2024; Lanini et al., 2022; Obuchowska & Konopinska, 2021). Postoperative reduction in anxiety is supported by effective postoperative care, including pain management, complication monitoring, and psychological support (Niyonkuru et al., 2025).Nonetheless, not all patients experience the same degree of relief, and some may continue to worry about recovery or complications, highlighting the need for ongoing postoperative support and education (Newman, 2022; Saludes & Sardan, 2025).

Regarding demographic factors, this study found that preoperative anxiety was significantly associated with gender and educational level. Female patients reported higher anxiety, which aligns with prior research suggesting that women are generally more prone to anxiety due to psychological, biological, and social factors (Yang et al., 2024). Patients with lower educational levels also experienced greater preoperative anxiety, likely due to less understanding of surgical procedures and associated risks. Higher educational attainment may provide patients with better health literacy and the ability to seek information, which can reduce uncertainty and anxiety. These findings emphasize the importance of tailoring preoperative education and interventions to patients' educational backgrounds to effectively reduce anxiety.

No significant associations were observed between anxiety and age, marital status, or previous surgical experience. Although some literature suggests younger patients may experience higher anxiety, this study indicates that factors such as gender and educational level may have a stronger influence (Civilotti et al., 2021).

Overall, the findings highlight the importance of comprehensive preoperative assessment, individualized patient education, and supportive interventions to address anxiety, considering both psychological and socio-demographic factors.

6. Conclusion

The current study demonstrates that preoperative anxiety is a significant issue among patients undergoing elective general surgery in public teaching hospitals in Khartoum State. Anxiety levels were substantially higher before surgery compared to after surgery, with a marked reduction following the procedure. Female patients and those with lower educational levels were more likely to experience higher preoperative anxiety. The most common sources of anxiety included concern for family, fear of complications, and worry about postoperative pain.

These findings underscore the importance of implementing preoperative interventions to reduce anxiety. Addressing patients' psychological concerns before surgery can not only improve mental well-being but also enhance surgical outcomes, such as faster recovery and reduced postoperative discomfort. Targeted strategies, including patient education, psychological support, and clear communication about surgical procedures, are essential, particularly for vulnerable groups with lower education levels.

Overall, effective management of preoperative anxiety is crucial for improving patient care, optimizing surgical outcomes, and increasing overall patient satisfaction.

7. Limitations

This study has several limitations that should be considered when interpreting the findings. First, the sample was selected using convenience sampling, which may introduce selection bias, as it does not represent the entire population of patients undergoing elective surgery. The study was limited to three public teaching hospitals in Khartoum State, so the findings may not be generalizable to other regions or private hospitals. Additionally, although the sample included 230 patients, a larger sample size in future studies could provide more statistical power and a more representative understanding of preoperative anxiety across diverse patient populations.

Second, data were collected through self-reported measures using a structured questionnaire and the Hamilton Anxiety Rating Scale (HAM-A). Self-reported data may be subject to response bias, such as underreporting or overreporting of anxiety, which could affect the accuracy of the findings.

Third, certain patient categories were not included, such as individuals with severe cognitive impairments or psychiatric conditions, who might experience anxiety differently. Inclusion of these groups in future studies

could provide a more comprehensive understanding of preoperative anxiety.

Overall, these limitations suggest that future research should include a larger and more diverse sample and consider objective or complementary measures of anxiety to improve the validity and generalizability of findings.

8. Future Recommendations

The most effective way to reduce preoperative anxiety is to evaluate the effectiveness of interventions (preoperative education, relaxation methods, psychological counselling) that should be implemented in future research. These interventions can be conducted in other hospitals to establish their effect on the level of patient anxiety and postoperative outcomes. The studies may be conducted to study the timing, format, and content of educational programs to determine what methods are the most effective in reducing anxiety. Also, longer follow-up measures after the surgery would be beneficial to understand the long-term outcomes of such interventions on anxiety measures and general healing.

Medical staff should be taught to identify the symptoms of preoperative anxiety early during the surgery. Specific interventions, including clear and detailed information on the surgery, clarifying key fears and anxieties, and psychological support, can go a long way in relieving anxiety. The collaboration between the nurses, surgeons, and anesthesiologists can be used to provide assurance and engage the patients in conversations that reduce uncertainty. Moreover, healthcare professionals need to think about incorporating some relaxation activities, including guided imagery or breathing exercises, into the preoperative process to help diminish anxiety. These methods can increase patient comfort, better surgical results and results in an overall more positive surgical experience.

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