Original Article

Prevalence and Predictors of Anxiety among Surgical Patients in the Preoperative Holding Area of National Orthopaedic Hospital, Enugu, Nigeria: A Cross-Sectional Study

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Abstract

Background: High preoperative anxiety in surgical patients impacts anesthetic management, postoperative pain scores, patient satisfaction, and postoperative morbidity. The Amsterdam Preoperative Anxiety and Information Scale (APAIS) offers an attractive option for the assessment of preoperative anxiety on account of its brevity and validity. **Aim:** Our aim was to determine the prevalence and predictors of preoperative anxiety in our surgical patients. **Materials and Methods:** We conducted a cross-sectional study among surgical patients by means of interviewer-administered structured questionnaire. The questionnaire incorporated both the APAIS and numeric rating scale for anxiety instruments, with the patients' demographic and clinical details. The data collection was carried out from January 2021 to October 2022. Data entry and analysis were done using IBM Statistical Product and Service Solutions, statistical software version 25. Continuous variables were summarized using mean and standard deviation, while categorical variables were presented using frequencies and proportions. Chi square test, Student *t* test, correlation analysis, and multivariate analysis using binary logistic regression were used in the analysis. Statistical significance was determined by a *P* value of <0.05. **Results:** A total of 451 patients participated in the study, with a mean age of 39.4 ± 14.4 years. The prevalence of clinically significant anxiety was 24.4% (110/451). The predictors of high preoperative anxiety in our cohort were female gender, tertiary education attainment, lack of previous surgical experience, ASA grade 3, and patients scheduled for major surgery. **Conclusion:** A substantial proportion of the surgical patients experienced clinically significant preoperative anxiety.

Keywords: *Amsterdam Preoperative Anxiety and Information Scale, anesthesia, numeric rating scale, preoperative anxiety, surgery*

Introduction

Preoperative anxiety is a very distressing experience for surgical patients. It has also been associated with challenges in anesthetic management of the patient and adverse postoperative outcomes, including increased anesthetic requirement,[1] poor recovery,[2] greater postoperative pain and analgesic requirement,[2,3] low patient satisfaction,[2] and higher postoperative morbidity.[4,5] Identifying the level of preoperative anxiety and the risk factors may assist healthcare providers in ameliorating it and these attendant consequences. The reported prevalence of preoperative anxiety in surgical patients varies widely and could range between 25%[6] and 89%[7] depending on patient factors, environmental factors, and the tools used for the assessment, among others. A prevalence of 97% had been reported in a Pakistani study that utilized a clinician-rated scale (The Hamilton anxiety rating scale) and included all patients with any trace of anxiety in the consideration of prevalence.[8] Several tools commonly used for the evaluation of preoperative anxiety include the Visual Analogue Scale (VAS), the Hospital Anxiety and Depression Scale (HADS), and the State-Trait Anxiety Inventory-state form (STAI-S), but the Amsterdam Preoperative Anxiety and Information Scale (APAIS) was developed specifically for preoperative anxiety among surgical patients. It is known that preoperative anxiety is influenced by the extent and nature of surgeries. Orthopedic and trauma surgeries evoke considerable anxiety, and in our environment, the name of the hospital

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is somewhat dreadful, often unjustifiably. This phobia may be related to the high rate of limb amputations carried out in the facility mainly on account of diabetic foot gangrene and trauma.[9]

On account of its impact on the quality of care, the assessment of preoperative anxiety by anesthesiologists could provide guidance for requisite pharmacological and nonpharmacological interventions. Thus, we sought to determine the prevalence and predictors of preoperative anxiety among our surgical patients. We also sought to compare the performance of the APAIS instrument with the Numeric Rating Scale for Anxiety (NRS-A).

Materials and Methods

Research ethics

The research protocol was approved by the Institutional Review Board of National Orthopaedic Hospital, Enugu [IRB/HEC number S.313/iv/; Protocol number 140]. Written informed consent was obtained from the selected patients before recruitment to participate in the study.

Study type and setting

This is an interviewer-administered questionnaire-based study. The study was conducted on patients awaiting surgery in the preoperative holding area of the surgical suites in National Orthopaedic Hospital Enugu, Nigeria between January 2021 and October 2022.

Inclusion criteria

All consenting patients aged 18 years and above, scheduled for elective surgical procedures.

Exclusion criteria

Patients posted for emergency procedures, ASA grade ≥4 patients, and those with altered mental state were excluded from selection. The refusal of a patient to grant consent also implies exclusion from being recruited for the study.

Sample size determination

According to a previous study which reported preoperative anxiety prevalence at 32%,[10]

$$\text{Sample size} = \frac{(z1-\alpha/2)^2\, P(1-p)}{d^2},$$

where $z1\text{-}\alpha/2$ is the standard normal deviate at 5% type 1 error, p is the prevalence from a previous study, and d is absolute error chosen as 5%.

$$\text{Sample size} = \frac{1.96^2 \times 0.32(0.68)}{0.05^2} = 334.$$

Add 10% for attrition, minimum total sample size for the survey is 367 patients.

Anxiety assessment instruments

The APAIS instrument was used to assess preoperative anxiety.[10] This self-reported tool, specifically developed for the assessment of preoperative anxiety in surgical patients, has been widely validated.[11] The instrument consists of six items; four anxiety items (1, 2, 4, 5) and two information requirement items (3, 6). The scores of each item are graded on a 5-point Likert pattern indicating the respondent's degree of agreement with the item; from 1 (not at all) to 5 (extremely agree). Consequently, each respondents' total anxiety score will range from 4 to 20, while the total requirement for information will range from 2 to 10. For the anxiety scale, the recommended threshold for high anxiety level of clinical significance is a total ≥11.[10] This enables optimal sensitivity, specificity, and predictive value. Higher values in the anxiety and information requirement scores imply greater anxiety and requirement for information, respectively.

In addition, each patient's global anxiety was self-rated using the 11-point NRS-A. The VAS has been validated as a reliable tool for the assessment of preoperative anxiety with 5 cm on the 11-point scale of 0–10 considered the threshold for a clinically significant level of preoperative anxiety.[12] Whereas the VAS and NRS are not same or interchangeable scales, several studies have demonstrated a substantial correlation between the two in the measurement of clinical indices.[13-15] Furthermore, the NRS-A has been used in previous studies on preoperative anxiety and demonstrated good correlation with other preoperative anxiety scales such as the APAIS, Corah's Dental Anxiety Scale, and the STAI-S.[7,16]

Study procedure

The consenting selected patients were recruited consecutively until the calculated minimum sample size was exceeded. Anonymous interviewer-administered structured questionnaire was used by two trained assistants to collect the data. Information sought in the questionnaire includes the demographic (gender, age, and educational attainment) and clinical data of the patient (American Society of Anesthesiologists [ASA] physical status grade, presence of comorbidity, anesthetic technique, history of previous surgery, or substance abuse, type of surgery and setting of the surgery service). The type of surgery was graded as "Major" or "Minor" based on the grading indicated on the published operation list by the respective surgeons. This term is still widely used to communicate the severity of the surgical procedure despite the inherent controversies with its variable application.[17] The two survey instruments (APAIS and NRS-A) were incorporated in the questionnaire. Each patient's Global anxiety was self-reported using the NRS-A. The 11-point numerical rating scale had a range; with 0 for no anxiety and 10 for extreme anxiety. Finally, the total anxiety of the APAIS instrument was used to determine the prevalence of preoperative anxiety using a threshold of ≥11.[10]

Data analysis

Data entry and analysis were done using IBM Statistical Product and Service Solutions, statistical software version 25 (IBM, Armonk, New York, USA). Continuous variables were summarized using mean and standard deviation, while categorical variables are presented using frequencies and proportions. Chi square test, Student *t* test, correlation analysis, and multivariate analysis using binary logistic regression were used in the analysis. The level of statistical significance was determined by a *P* value of <0.05.

In determining the predictors of the outcome variable, significant anxiety, the variable that was categorized as "Yes" or "No" was cross-tabulated with the socio-demographic and clinical characteristics of the respondents. Variables that had a p value of ≤0.2 on Chi-square analysis were then entered into the logistic regression model to determine the predictors of significant anxiety. The results of the binary logistic regression analysis were presented using adjusted odds ratio (AOR) and 95% confidence interval (CI). The level of statistical significance was determined by a *P* value of <0.05.

Results

A total of 460 eligible consenting patients were recruited for the study. Nine recruited patients (2%) could not participate in the study owing to poor comprehension of the measurement instruments. Four hundred and fifty-one (451) patients finally participated in the study, with a mean age of 39.4 ± 14.4 years. Among the study respondents, patients aged 40 years and above constituted the largest group, 41.7%. The gender distribution had a slight preponderance of males, 53.2%. Majority, 63.6% have had a previous history of surgery. A higher proportion of the surgeries, 80.5% were categorized as major surgeries [Table 1].

The mean of respondents total anxiety score (APAIS) was 8.3 ± 3.4, while the mean of the global anxiety (NRS-A) was 3.1 ± 2.5. The surgery-related anxiety was greater than the anesthesia-related anxiety. However, the need for anesthesia-related information was similar to the need for surgery-related information [Table 2]. The prevalence of clinically significant anxiety in the study population was 24.4% (110/451).

Most of the patients, 80.5% (363/451) had a low need for information. The patients with higher information requirement had significantly higher anxiety [Table 3]. The mean total anxiety score was highest among respondents who had a high requirement for information, 9.3 ± 4.4 and least for those who had low requirement for information, 8.0 ± 3.3 and the difference in mean was found to be statistically significant ($F = 4.701$, $P = 0.010$).

A higher proportion of females, 29.9% had high anxiety when compared with the males, 19.6% ($\chi^2 = 6.428$, $P = 0.011$). The highest proportion of respondents who were designated as having ASA grade 3 had significant anxiety, 52.9% while those who had ASA grade 2 had the least, 18.5% and the difference in proportions was found to be statistically significant ($\chi^2 = 0.533$, $P = 0.005$). Tertiary education attainment was also associated with high anxiety scores [Table 4].

The respondents who were scheduled for major surgeries were 2.235 times more likely to have significant anxiety when compared with those who had minor surgeries ([AOR] = 2.235, 95% CI: 1.189–4.203). The respondents who were males were twice less likely to have significant anxiety when compared to those who were females (AOR = 0.583, 95%CI: 0.370–0.918). The respondents who had primary education and less were twice less likely to have significant anxiety when compared with those who attained tertiary education (AOR = 0.407, 95%CI: 0.198–0.835). Similarly,

Table 1: Sociodemographic and clinical characteristics of the respondents

Variable	Frequency (*n* = 451)	%
Age of respondents		
Mean ± (SD)	39.4 ± 14.4	
Age of respondents in groups		
<30 years	127	28.2
30–39 years	136	30.2
≥40 years	188	41.7
Gender		
Male	240	53.2
Female	211	46.8
Educational attainment of respondent		
No formal education	11	2.4
Primary education	64	14.2
Secondary education	163	36.1
Tertiary education	213	47.2
Previous surgery		
Yes	287	63.6
No	164	36.4
Care setting		
Ambulatory care	80	17.7
In-patient	371	82.3
ASA grade		
Grade 1	288	63.9
Grade 2	146	32.4
Grade 3	17	3.8
Type of surgery		
Major	363	80.5
Minor	88	19.5
Co-morbidity status of patient		
Yes	146	32.4
No	305	67.6
Anesthetic technique		
General anesthesia	180	39.9
Local anesthesia	271	60.1
History of substance abuse		
Yes	44	9.8
No	407	90.2

Table 2: APAIS scale components and scores, with the NRS-A

APAIS component	Sample size (*n*)	Minimum possible score	Maximum possible score	Mean ± (SD)	Median
Anesthesia-related anxiety	451	2	10	3.6 ± 2.0	3.0
Surgery-related anxiety	451	2	10	4.6 ± 2.2	4.0
Total anxiety score	451	4	20	8.3 ± 3.4	8.0
Need for anesthesia-related information	451	1	5	1.7 ± 1.0	1.0
Need for surgery-related information	451	1	5	1.7 ± 1.1	1.0
Total need for information score	451	2	10	3.3 ± 1.8	3.0
Global anxiety score	451	0	10	3.1 ± 1.8	3.0

Table 3: Association between requirement-for-information and anxiety scale of the APAIS for the total sample

Information requirement category	Sample size (*n* = 451)	Total anxiety (Mean ± SD)	*F*	*P* value
Low (2–4)	(*N* = 363)	8.0 ± 3.3	4.701	0.010
Intermediate (5–7)	(*N* = 65)	9.2 ± 3.1		
High (8–10)	(*N* = 23)	9.3 ± 4.4		

Table 4: Factors associated with clinically significant preoperative anxiety among the respondents

Variable	Significant anxiety (*n* = 451)		χ^2	*P* value
	Yes, *N* (%)	No, *N* (%)		
Age of respondents in groups				
<30 years	34 (26.8)	93 (73.2)	0.792	0.673
30–39 years	30 (22.1)	106 (77.9)		
≥40 years	46 (24.5)	142 (75.5)		
Gender				
Male	47 (19.6)	193 (80.4)	6.428	0.011
Female	63 (29.9)	148 (70.1)		
Educational attainment of respondent				
Primary education and less	12 (16.0)	63 (84.0)	7.661	0.022
Secondary education	34 (20.9)	129 (79.1)		
Tertiary education	64 (30.0)	149 (70.0)		
Previous surgery				
Yes	62 (21.6)	225 (78.4)	3.325	0.068
No	48 (29.3)	116 (70.7)		
Care setting				
Ambulatory care	18 (22.5)	62 (77.5)	0.188	0.664
In-patient	92 (24.8)	279 (75.2)		
ASA grade				
Grade 1	74 (25.7)	214 (74.3)	10.533	0.005
Grade 2	27 (18.5)	119 (81.5)		
Grade 3	9 (52.9)	8 (47.1)		
Type of surgery				
Major	95 (26.2)	268 (73.8)	3.198	0.074
Minor	15 (17.0)	73 (83.0)		
Comorbidity status of patient				
Yes	32 (21.9)	114 (78.1)	0.716	0.398
No	78 (25.6)	227 (74.4)		
Anesthetic technique				
General anesthesia	48 (26.7)	132 (73.3)	0.842	0.359
Local anesthesia	62 (22.9))	209 (77.1)		
History of substance abuse				
Yes	11 (25.0)	33 (75.0)	0.010	0.921
No	99 (24.3)	308 (75.7)		

the respondents who had a previous history of surgery were about twice less likely to have significant anxiety when compared with those who had no previous history (AOR = 0.626, 95%CI: 0.395–0.991). The respondents who were categorized as ASA grade 1 were three times less likely to have significant anxiety when compared with those who were ASA grade 3 (AOR = 0.321, 95%CI: 0.113–0.910) [Table 5].

Both the APAIS instrument and the NRS-A demonstrated similar properties in the evaluation of respondents with different sociodemographic and clinical characteristics, except with the technique of anesthesia where significantly higher anxiety was noted with general anesthesia by the NRS-A but not the APAIS instrument [Table 6].

There was a strong positive correlation between total anxiety of the APAIS scale and the NRS-A, and this was found to be statistically significant (n = 451, r = 0.675, $P < 0.001$). There was a weak positive correlation between anesthesia anxiety score and surgery anxiety score as increases in anesthesia anxiety score correlated positively with surgery anxiety score, (n = 451, r = 0.320, $P < 0.001$). We also found a significant but much weaker correlation between the anxiety and information scales of the APAIS instrument (n = 451, r = 0.130, $P < 0.001$) [Table 7].

Discussion

The prevalence of significant anxiety among our patients using the APAIS scale was 24.4%. Two previous studies that investigated preoperative anxiety in Nigeria used the STAI-S and VAS instruments and reported prevalence of 51% and 34%, respectively. The small sample size in those studies and nondefinition of the predictors of preoperative anxiety made our study a necessity. An Ethiopian multicenter study that used the STAI-S instrument however reported a prevalence of high anxiety in 61% of their patients.[18] Not surprisingly, most of the patients in their cohort had minimal education which turned out to be a strong risk factor for preoperative anxiety in their study. In another study conducted with the APAIS instrument in the waiting area of a tertiary hospital in France, the prevalence of high level of anxiety was 24.7% among the cohort of 933 patients.[6] In this latter study which was conducted in the preoperative holding area of a tertiary hospital the same instrument and cutoff threshold for anxiety were all similar to our study, and the reported prevalence compares well.

It would suffice to state that the wide variability in the reported prevalence of preoperative anxiety is not determined by the actual patient state alone. Several methodological factors could be responsible. The setting where the assessment of preoperative anxiety is conducted could impact on the degree of anxiety recorded. Studies that compared the anxiety levels of surgical patients at different stages of perioperative care indicate higher anxiety scores in the preoperative holding area and in the operating room compared to that obtained in the ward prior to surgery.[19,20] Furthermore, beyond the inherent differences in the validity of the instruments used in various studies, different cutoffs have been applied for the same instrument in various researches. These would impact on the prevalence rates entertained. For instance, the STAI-S and HADS-A produced anxiety prevalence rates of 39% and 23%, respectively, in the same group of cardiac patients, being largely influenced by the cutoff values applied for both instruments in the study (STAI-S ≥40; HADS-A ≥8).[21] In spite of the 89% prevalence of preoperative anxiety reported among neurosurgical patients by Perks *et al.*, the actual proportion of patients with clinically significant level

Table 5: Predictors of preoperative anxiety

Variable	Adjusted odds ratio	*P* value	95% Confidence interval (CI)	
			Lower	Upper
Gender				
Male	0.583	0.020	0.370	0.918
Female	1			
Educational attainment of respondent				
Primary education and less	0.407	0.014	0.198	0.835
Secondary education	0.623	0.063	0.379	1.025
Tertiary education	1			
Previous surgery				
Yes	0.626	0.046	0.395	0.991
No	1			
ASA grade				
Grade 1	0.321	0.033	0.113	0.910
Grade 2	0.217	0.006	0.074	0.638
Grade 3	1			
Type of surgery				
Major	2.235	0.013	1.189	4.203
Minor	1			

Table 6: Comparison of total anxiety of APAIS scale and global anxiety (NRS-A)

Variable	Overall anxiety (n = 451) Mean ± SD	F test (p value)	Global anxiety (n = 451) Mean ± SD	Kruskal Wallis test (P value)
Age of respondents in groups				
<30 years	8.7 ± 3.5	2.532	3.3 ± 2.4	1.302
30–39 years	7.8 ± 3.3	(0.081)	2.8 ± 2.5	(0.273)
≥40 years	8.3 ± 3.4		3.0 ± 2.5	
Educational attainment of respondent				
Primary education and less	7.8 ± 3.2	3.236	3.0 ± 2.3	5.735
Secondary education	7.9 ± 3.5	(0.040)	2.6 ± 2.6	(0.003)
Tertiary education	8.7 ± 3.3		3.4 ± 2.4	
ASA Grade				
Grade 1	8.5 ± 3.4	7.112	3.2 ± 2.5	3.705
Grade 2	7.6 ± 3.1	(0.001)	2.7 ± 2.4	(0.025)
Grade 3	10.3 ± 4.1		4.1 ± 2.8	
Gender		**Student t (P value)**		**Mann–Whitney U test (P value)**
Male	7.8 ± 3.0	3.352	2.7 ± 2.4	2.953
Female	8.8 ± 3.7	(0.001)	3.4 ± 2.5	(0.003)
Previous surgery				
Yes	7.9 ± 3.1	2.789	2.8 ± 2.4	2.550
No	8.9 ± 3.7	(0.006)	3.4 ± 2.5	(0.011)
Care setting				
Ambulatory care	8.3 ± 3.1	0.010	3.0 ± 2.3	0.255
In-patient	8.3 ± 3.4	(0.992)	3.1 ± 2.5	(0.799)
Type of surgery				
Major	8.4 ± 3.5	1.456	3.1 ± 2.5	1.573
Minor	7.8 ± 3.1	(0.146)	2.7 ± 2.3	(0.116)
Co-morbidity status of the patient				
Yes	8.0 ± 3.3	1.245	2.9 ± 2.4	0.796
No	8.4 ± 3.4	(0.214)	3.1 ± 2.5	(0.426)
Anesthetic technique				
General anesthesia	8.6 ± 3.4	1.568	3.4 ± 2.5	2.114
Local anesthesia	8.1 ± 3.4	(0.118)	2.9 ± 2.4	(0.035)
History of substance abuse				
Yes	8.2 ± 2.6	0.216	3.2 ± 2.3	0.436
No	8.3 ± 3.5	(0.829)	3.0 ± 2.5	(0.663)

Table 7: Correlation between anxiety scales and score components

Variable	Sample size (n)	Pearson correlation (r)	P value
Correlation of total anxiety of APAIS scale with			
NRS-A	451	0.675	<0.001
Information score of APAIS scale	451	0.130	<0.001
Correlation of anesthesia anxiety score of APAIS scale with			
Surgery anxiety score of APAIS scale	451	0.320	<0.001

of anxiety was 55%.[7] Even this could have been lower if the cutoff of ≥11 was used, as against the lower cutoff of ≥10 applied by the researchers.

In clinical studies evaluating preoperative anxiety, it is important to also determine its predictors to enable the application of appropriate interventions; yet, this has been ignored in most of the previous studies. The predictors of high preoperative anxiety in our cohort were female gender, tertiary education attainment, lack of previous surgical experience, ASA grade 3, and patients scheduled for major surgery. Similarly, in the study conducted in Brazil by Caumo *et al.*, the identified risk factors for significant preoperative anxiety were female gender, ASA grade 3, high level of education, lack of previous surgical experience, and high trait anxiety.[22] However, in the study conducted among patients undergoing orthopedic procedures by Berth *et al*. using the APAIS instrument, no predictors of preoperative anxiety could be deciphered from the sample population.[23] Their small sample size of 68 patients, a predominantly female population and the fact that almost

all have had previous surgical experience could have been contributory. Mulugeta *et al.* also identified female gender, lack of previous surgical experience, and small family size as risk factors, but in contrast, lower education and no formal education were high risk factors for preoperative anxiety in their Ethiopian sample population.[18]

Our study recorded lower level of total anxiety and requirement for information compared to that reported among Canadian neurosurgical patients by Perks *et al.*[7] (8.3 ± 3.4; 3.3 ± 1.8 vs. 10.5 ± 4.0; 6.4 ± 2.4). This mirrors the prevalence of 24.4% and 55%, respectively, reported in both studies.

We observed a strong positive correlation between the NRS-A and the total anxiety of the APAIS scale (Pearson coefficient, $r = 0.675$; $P < 0.001$). The NRS-A similarly exhibited similar strong correlation with the total anxiety of the APAIS scale (Pearson coefficient, $r = 0.70$) in the study by Perks *et al.*,[7]and with the STAI-S (Spearman's coefficient, $r = 0.656$) in the study by Walawender *et al.*[16]

There was, however, a weaker correlation between the anxiety scale and the requirement for information scale of the APAIS instrument in our cohort. Earlier studies[7,8,23] reported stronger positive correlation between the anxiety scale and the requirement for information scale of the APAIS instrument.

Limitations

Direct comparison between the anxiety prevalence of our study with other works may be challenging owing to methodological differences already highlighted. Furthermore, some patients who had obvious physical signs of anxiety such as restlessness, tension, and difficulty concentrating conveniently denied having anxiety or worry over the impending surgery during the questionnaire administration. Such response artifacts arising of social desirability is a common source of research bias in self-report research data and could lead to underreporting of what may be deemed socially undesirable by the respondents.[24]

Conclusion

A substantial proportion of the surgical patients experienced clinically significant levels of preoperative anxiety. The predictors of high preoperative anxiety in our cohort were female gender, tertiary education attainment, lack of previous surgical experience, ASA grade 3, and patients scheduled for major surgery. The NRS-A showed good correlation with the APAIS anxiety scale.

Author contributions

"Conceptualization and design, ENO, ADGN, OO, KU, JA, LA; data acquisition, ADGN, LA, KU, JA; analysis and interpretation of the data, ADGN and ENO; statistical analysis, ENO; drafting of the manuscript, ADGN; manuscript revision and editing, ENO, ADGN, OO, KU, JA, LA. All the authors read and approved the final version of the manuscript to be published.

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Conflict of interest

The authors declare that no conflicting interest exists.

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