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Preoperative anxiety and the need for information among patients undergoing anesthesia in KINHASA: Prevalence and Associated Factors

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ABSTRACT

Background: Preoperative anxiety and the need for information are two aspects of patient preparation for surgery. The study aimed to determine the prevalence and associated factors in Kinshasa.

Methods: A multicenter study with prospective data collection involved 443 adults in four hospitals. The Amsterdam Preoperative Anxiety and Information Scale (APAIS) was used to measure anxiety and the need for information. The cutoff scores were ≥ 11 and ≥ 8. Associations were analyzed using logistic regression, with an exploratory interaction between educational level and the explanations provided during the preanesthesia consultation

Results: The median age was 35 years, and women accounted for 76.3% of the participants. High overall anxiety was observed in 213 patients (48.1%; 95% CI: 43.5–52.7), and a high need for information was observed in 86 patients (19.4%; 95% CI: 16.0–23.4). The scores were positively correlated ($\rho = 0.605$; $p < 0.001$). Explanations were reported by 179 patients (40.4%). Their adjusted association with anxiety differed according to educational level: aOR = 0.66 among non-college graduates and 0.007 among college graduates. College education and explanations were associated with a high need for information, with aORs of 50.87 and 0.51, respectively.

Conclusion: Nearly one in two patients exhibited high levels of preoperative anxiety. Preoperative information must take patient expectations into account. These associations remain exploratory, and their magnitude should be interpreted with caution, given the small sample sizes and the observational nature of the study.

Keywords: preoperative anxiety; APAIS; need for information; preanesthetic consultation; Kinshasa.

1. INTRODUCTION

The prospect of surgery confronts patients with several uncertainties: pain, anesthesia, the postoperative period, and the possibility of complications. Preoperative anxiety refers to the emotional reaction associated with this situation. Its intensity varies and cannot be inferred solely from the severity of the condition or the patient's apparent calmness. Assessing it is part of careful preparation for the patient's experience, complementing the physical examination [1, 2].

It is helpful to distinguish between concerns related to anesthesia and those related to surgery. One person may primarily fear losing consciousness, while another may be more concerned about the outcome of the surgery. The need for information is an additional factor: wanting detailed explanations does not necessarily indicate high levels of anxiety. The APAIS provides a brief assessment of these dimensions; its anxiety component has been compared to the STAI and a visual analog scale by Boker and colleagues [3]. The prevalence rates reported in the literature vary depending on the study , the timing of the assessment, the instrument used, and the cutoff point applied. In Ethiopia, Bedaso and Ayalew observed preoperative anxiety in 47.0% of the 402 patients assessed, while Mulugeta and colleagues reported a rate of 61.0% among 353 patients. Both studies used the STAI. Differences between studies should therefore not be interpreted as geographical differences independent of measurement methods [4, 5].

In Kinshasa, Lukeba and colleagues studied 416 adults in four hospitals between October 2021 and January 2022. Significant levels of state anxiety were present in 51.9% of the participants. This study provides a local benchmark, but its assessment instrument and categories are not equivalent to those of the APAIS. Another study from Kinshasa, based on an interventional study on psychological preparation, found no significant difference between groups in terms of reduction in state anxiety [6, 7]. The preanesthetic consultation is an opportune time to address patients' concerns and explain the care plan. However, providing information is not a one-size-fits-all intervention: its understanding depends in particular on language, content, available time, and the patient's expectations. A multimedia information trial and a systematic review focusing on the format and timing of information delivery demonstrate the value of studying these modalities rather than treating every explanation as an identical presentation [8, 9].

In hospitals in Kinshasa, a combined assessment of anxiety and the need for information can guide the organization of preoperative preparation. The APAIS has the advantage of being brief to administer and of having a French version that has been psychometrically validated. However, its use in a population comprising patients with varying levels of education, as well as in both emergency and elective procedures, requires careful attention to the conditions under which it is administered and to the interpretation of the results [10, 11]. The purpose of this study is to determine the prevalence of overall preoperative anxiety and a high need for information, and then to examine their associations with patient characteristics and the explanations received at the preoperative assessment center (CPA). The analysis distinguishes between the overall score and the anesthetic and surgical subscores. It also allows us to examine whether the association between the explanations provided and anxiety is consistent across different educational levels.

This study has a descriptive and analytical purpose. It does not aim to demonstrate the effectiveness of an educational intervention, as patients were not randomly assigned to a standardized information group or a control group. The formulation of the objectives and the interpretation of the results are therefore based on the concept of association. The objective is thus to identify the factors associated with overall preoperative anxiety and the need for information among adult patients scheduled to undergo anesthesia for surgery at four hospitals in Kinshasa.

2. METHODS

2.1 Study Period, Type, and Setting

This was a multicenter, observational, analytical study with prospective data collection. The analysis presented here focuses on the preoperative assessment of anxiety and the need for information, as well as their associations with patient characteristics and the explanations received at the preoperative assessment center (CPA). The comparison between patients who received explanations and those who did not was based on patient self-reports and did not involve random assignment.

The study was conducted at four facilities in Kinshasa: the Kinshasa University Clinics, the Monkole Mother-and-Child Hospital, the Biamba Marie Mutombo Hospital, and HJ Hospitals. Recruitment included patients being treated for a surgical procedure requiring anesthesia. The anesthesia and intensive care units, as well as the post-operative monitoring units, served as the hospital settings for data collection. The study covered the period from May 2025 to August 2026.

The study population consisted of adult patients scheduled to undergo anesthesia for surgery at the selected facilities. Eligible patients were those aged at least 18 years, classified as ASA I, II, or III, capable of responding to the questionnaire, and who had consented to participate. Patients with sensory, cognitive, or psychiatric disorders, those unable to respond to the questionnaire, and those who refused to participate were excluded.

Recruitment was conducted on a consecutive basis among patients who met the selection criteria during the data collection period. The minimum sample size was estimated using the formula $n = Z^2 \times p \times (1 - p) / d^2$, for a 95% confidence level ($Z = 1.96$), an absolute precision of 5%, and an expected proportion of 51.9%, based on the study by Lukeba et al. in Kinshasa [6]. The calculation yields 383.6, or 384 patients after rounding. A 10% safety margin results in a target of 423 patients after rounding.

The sample analyzed consisted of 443 participants. These were the available observations with all six APAIS items completed and valid for the selected analyses. Consecutive recruitment does not constitute a probabilistic sample of all patients who underwent surgery in Kinshasa.

2.1 Study Methodology and Procedure

Patients were identified prior to surgery and received information about the study before consent was obtained. The APAIS questionnaire was administered preoperatively: on the morning of surgery for inpatients and upon arrival at the facility for outpatients. The interview was conducted in French, with a verbal explanation in the patient's native language when necessary.

Clinical information was obtained from medical records and anesthesia charts. The initial data collection also included intraoperative and immediate postoperative information. The analysis presented here is limited to the APAIS dimensions and factors relevant to their preoperative assessment.

Sociodemographic characteristics included age, sex, educational level, marital status, and source of payment for care. Age was expressed in years. For the models, educational level was grouped into "college/university" and "non-college/university"; the latter group combined the categories "high school graduate" and "no formal education." Marital status was grouped into married and unmarried for the association analysis.

Clinical and surgical characteristics included history of anesthesia, information received at the preanesthesia consultation, whether the procedure was urgent or elective, ASA class, surgical specialty, comorbidities, BMI, allergies, and reported use of psychoactive substances. BMI was calculated as weight in kilograms divided by height in meters squared. The presence of comorbidities and a history of anesthesia was determined based on the original descriptions.

The variable "explanations received at the preoperative consultation" distinguished between "yes" and "no" responses. It described the patient's report and did not measure on a separate scale the content, duration, understanding, or quality of the information. The "no" category did not necessarily imply the absence of any anesthesiology consultation.

The surgical specialty was described using its original categories. For modeling purposes, adult orthopedics, neurosurgery, urology, and maxillofacial surgery were grouped together under "other specialties" due to their small sample sizes. The three other groups were general and visceral surgery, gynecology, and obstetrics.

The six APAIS responses were scored on a scale of 1 to 5. Order A through F corresponded to that of the questionnaire reproduced in the data collection protocol. Items A and B measured anxiety related to anesthesia, D and E measured anxiety related to surgery, and C and F measured the need for information [15, 10].

Table 1: The Amsterdam Preoperative Anxiety an Information Scale (APAIS)

Items		Not at all	A little	Moderately	A lot	Extremely
A	I am concerned about anesthesia	1	2	3	4	5
B	I'm constantly thinking about anesthesia	1	2	3	4	5
C	I'd like to learn as much as possible about anesthesia	1	2	3	4	5
D	I am concerned about the procedure	1	2	3	4	5
E	I keep thinking about the procedure	1	2	3	4	5
F	I'd like to learn as much as possible about the procedure	1	2	3	4	5

The primary criterion was high overall anxiety, defined as a score of A + B + D + E ≥ 11 on a theoretical scale ranging from 4 to 20. The anesthetic subscores A + B and surgical subscores D + E, ranging from 2 to 10, were recorded numerically. The overall threshold of ≥ 13 was presented solely as a secondary description. None of these thresholds constituted a psychiatric diagnosis.

The need for information was calculated as C + F and classified as low or none for a score of 2 to 4, moderate for a score of 5 to 7, and high for a score of 8 to 10. For the multivariate analysis, the high level was compared to the low or none and moderate levels combined.

2.3 Data Processing and Analysis

The data were verified prior to analysis. Each APAIS response had to be an integer between 1 and 5. The four sums were recalculated based on the items and compared to the initial sums. The 443 observations had valid items and consistent scores. No imputation of APAIS items was performed. Recodings were distinguished from the source data. The variables used in the models were completed for the sample analyzed. The technical identifier allowed each analytical observation to be linked to its source row; it did not constitute an institution identifier.

Statistical analyses were performed using Python 3.12. Qualitative variables were described in terms of counts and percentages. The distribution of quantitative variables was examined using the Shapiro–Wilk test; skewed variables were presented as medians and first and third quartiles. Key proportions were accompanied by a 95% CI calculated using the Wilson method. Crude associations were examined using univariate logistic regressions, with calculation of odds ratios (ORs) and their 95% confidence intervals (CIs). The p-values for the coefficients were derived from the Wald test. For Mult categorical factors, the overall association was examined using the likelihood ratio test. Explanatory variables were selected based on their clinical relevance and expected precedence in the analysis, without automatic selection based solely on p-values.

The anxiety model included age, sex, educational level, history of anesthesia, preoperative counseling, urgency, ASA class, and surgical specialty. Age was treated as a continuous variable, with an OR expressed for a 10-year increase. ASA class and comorbidities were not included simultaneously in the main model. After observing a lack of fit in the additive model, an education level × explanations interaction was examined. This analysis was exploring. The associations of the explanations were then estimated separately according to education level, using contrasts derived from the same adjusted model.

For high information needs, the main model included age, sex, educational level, anesthetic history, explanatory variables, and urgency. This model was limited to these factors given the 86 events and sparse data cells. An extended model adding ASA class and surgical specialty was examined in a sensitivity analysis. The linearity of the relationship between age and the logit was examined using an age × logarithm of age term. Collinearity was assessed using VIFs. Model fit was evaluated using the Hosmer Lemeshow test, with probabilities grouped into ten categories. The relationship between anxiety and information scores was examined using Spearman's

correlation; comparisons of binary indicators were supplemented by Fisher's exact test. Tests were two-sided, with a significance level of 0.05. ORs were interpreted as odds ratios and not as risk ratios. Particular attention was paid to very high or imprecise estimates in categories with few events [23, 24].

2.4 Ethical Considerations

The protocol was approved by the Ethics Committee of the School of Public Health at the University of Kinshasa under number ESP/CE/92/2025. Participation was based on voluntary informed consent. The confidentiality of the collected information was maintained during data processing and analysis. These measures are consistent with the principles of protecting participants in medical research [25].

3. RESULTS

The 443 observations in the analytical dataset were included. The six APAIS items were complete and valid; the recalculated scores matched the four initial sums.

3.1 Sociodemographic Characteristics

Table 1 presents the distribution of sociodemographic characteristics of the study population.

Table 1: Sociodemographic Characteristics of Patients

Characteristic	Result
Age, median [Q1–Q3], years	35.0 [30.0–49.0]
Age, minimum–maximum, years	18–80
Male	105 (23.7%)
Female	338 (76.3%)
College education	246 (55.5%)
"Graduate" category	180 (40.6%)
No education	17 (3.8%)
Married	352 (79.5%)
Single	70 (15.8%)
Divorced	10 (2.3%)
Widowed	11 (2.5%)
Self-funded	216 (48.8%)
Funding through a mutual insurance company	227 (51.2%)

N = 443. The percentages are calculated based on all observations. The educational level categories use the labels from the database; the specific content of the "graduate" category is not detailed here.

The population was predominantly female, with 338 women (76.3%). The median age was 35 years; half of the patients were between 30 and 49 years old, with ages ranging from 18 to 80 years. A total of 246 patients (55.5%) had a college education, while 197 (44.5%) belonged to the non-college-educated group used for the analyses. Married patients accounted for 79.5% of the total. The two funding categories were similar in size, with a slight predominance of funding through private health insurance.

3.2 Clinical Characteristics and Surgical Context

The medical history and context of the procedure are described in Table 2. These characteristics were examined prior to analyzing their associations with the APAIS dimensions.

Table 2: Clinical Characteristics and Surgical Context

Characteristic	Result
No prior anesthesia history	216 (48.8%)
History of anesthesia present	227 (51.2%)
Explanations at the preoperative assessment: none	264 (59.6%)

Characteristic	Result
Explanations provided to the CPA: yes	179 (40.4%)
Scheduled procedure	306 (69.1%)
Emergency procedure	137 (30.9%)
ASA Class I	167 (37.7%)
ASA Class II	190 (42.9%)
ASA Class III	86 (19.4%)
No comorbidities	360 (81.3%)
Comorbidities present	83 (18.7%)
BMI, median [Q1–Q3], kg/m²	24.2 [21.6–27.6]
General and Visceral Surgery	191 (43.1%)
Obstetrics	130 (29.3%)
Gynecology	97 (21.9%)
Adult Orthopedics	13 (2.9%)
Neurosurgery	9 (2.0%)
Urology	2 (0.5%)
Oral and Maxillofacial Surgery	1 (0.2%)

N = 443. The presence of a history of anesthesia and comorbidities was reconstructed based on the original descriptions. For the regression analyses, “other specialties” included adult orthopedics, neurosurgery, urology, and maxillofacial surgery (n = 25).

A history of anesthesia was reported for 227 patients (51.2%). Reasons for the preoperative assessment were mentioned for 179 patients (40.4%), compared with 264 (59.6%) for whom the answer was negative. Elective procedures accounted for the majority (69.1%). ASA Class II was the most common, followed by Classes I and III. Comorbidities were reported in 83 patients (18.7%). General and visceral surgery, obstetrics, and gynecology constituted the main surgical groups; the other specialties together accounted for 5.6% of the sample.

3.3 APAIS Scores and Frequency of Anxiety

Table 3 describes the scores for the two anxiety subscales, the overall score, and the need for information. Figure 1 then shows the distribution of the overall score around the selected screening threshold.

Table 3: Distribution of APAIS Scores

Dimension	Median [Q1–Q3]	Minimum–maximum
Anesthetic Anxiety	5.0 [4.0–7.0]	2–10
Surgical anxiety	5.0 [4.0–6.0]	2–10
Overall anxiety	10.0 [9.0–13.0]	4–18
Need for information	5.0 [4.0–7.0]	2–10

N = 443. The theoretical ranges are 2 to 10 for each anxiety subscore and the need for information, and 4 to 20 for overall anxiety.

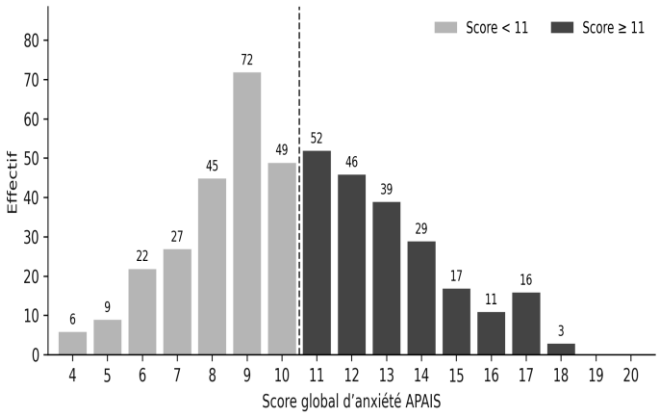


Figure 1: Distribution of the APAIS overall anxiety score among the 443 patients

The median overall score was 10.0 [9.0–13.0], with a range of 4 to 18. The medians for the anesthetic and surgical subscores were identical, but the third quartile was higher for anesthetic anxiety. At a cutoff of ≥ 11, 213 patients had high preoperative anxiety, representing 48.1% (Wilson 95% CI: 43.5–52.7%). The remaining 230 patients (51.9%) had a score below 11. At the secondary cutoff of ≥ 13, 115 patients were classified, representing 26.0%. These classifications describe the level of anxiety as measured by the APAIS; they do not constitute a psychiatric diagnosis.

3.4 Level of Information Need

Figure 2 presents the three levels of information need defined based on QC + QF. The "high" category constitutes the event studied in the second logistic regression.

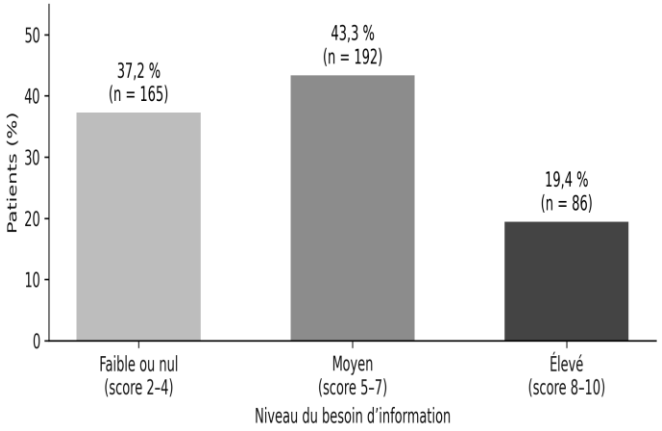


Figure 2: Distribution of patients according to APAIS level of need for information

The need for information was moderate in 192 patients (43.3%), low or nonexistent in 165 (37.2%), and high in 86 (19.4%; Wilson's 95% CI: 16.0–23.4%). The median score was 5.0 [4.0–7.0], with values ranging from 2 to 10. The moderate category was therefore the most common. Patients with a high need were compared to the 357 patients with a low, none, or moderate need; this dichotomization is in line with the objective of the logistic analysis and does not replace the three-category description.

3.5 Relationship Between Anxiety and Need for Information

The relationship between the two dimensions was examined based on their numerical scores and then described using the selected categories. The overall anxiety score and the information score were positively correlated (Spearman's $\rho = 0.605$; $p < 0.001$). Patients with the highest information scores also tended to have higher anxiety scores.

Anxiety scores ≥ 11 were present in 74 of the 86 patients with a high need for information (86.0%), compared with 139 of the remaining 357 patients (38.9%; Fisher's exact test, $p < 0.001$). Twelve patients had a high need for information without anxiety ≥ 11, while 139 had anxiety ≥ 11 without a high need for information. The two dimensions are therefore associated but are not interchangeable. This data does not allow us to determine the direction of this relationship.

3.6 Factors Associated with Anxiety in Univariate Analysis

Table 4 presents the crude associations between the studied characteristics and a total anxiety score of ≥ 11. Each factor was examined separately.

Table 4: Crude associations with an APAIS overall anxiety score ≥ 11

Factor and category	Anxiety n/N (%)	Crude OR	95% CI	p
Age, per 10-year increase	—	0.95	0.83–1.09	0.455
Gender: Male (ref.)	47/105 (44.8%)	1.00	—	—
Female	166/338 (49.1%)	1.19	0.77–1.85	0.436
Education Level: Non-college (ref.)	26/197 (13.2%)	1.00	—	—
College	187/246 (76.0%)	20.85	12.57–34.57	< 0.001
Anesthesia history: None (ref.)	116/216 (53.7%)	1.00	—	—
Present	97/227 (42.7%)	0.64	0.44–0.94	0.021
Explanations received at the CPA: No (ref.)	183/264 (69.3%)	1.00	—	—
Yes	30/179 (16.8%)	0.089	0.056–0.14	< 0.001

Factor and category	Anxiety n/N (%)	Crude OR	95% CI	p
Type of procedure: Elective (ref.)	130/306 (42.5%)	1.00	—	—
Emergency	83/137 (60.6%)	2.08	1.38–3.14	< 0.001
ASA Class: I (ref.)	72/167 (43.1%)	1.00	—	—
II	93/190 (48.9%)	1.27	0.83–1.92	0.270
III	48/86 (55.8%)	1.67	0.99–2.82	0.056
Surgical specialty: General and visceral (ref.)	87/191 (45.5%)	1.00	—	—
Gynecology	60/97 (61.9%)	1.94	1.18–3.19	0.009
Obstetrics	52/130 (40.0%)	0.80	0.51–1.25	0.325
Other specialties	14/25 (56.0%)	1.52	0.66–3.52	0.327
Comorbidity: None (ref.)	176/360 (48.9%)	1.00	—	—
Present	37/83 (44.6%)	0.84	0.52–1.36	0.479
Marital status: Unmarried (ref.)	44/91 (48.4%)	1.00	—	—
Married	169/352 (48.0%)	0.99	0.62–1.56	0.954
Healthcare financing: Health insurance (ref.)	113/227 (49.8%)	1.00	—	—
Private	100/216 (46.3%)	0.87	0.60–1.26	0.463
BMI, per 1 kg/m² increase	—	0.99	0.95–1.03	0.481

N = 443. Ref: reference category (OR = 1). n/N: number of anxiety cases in the category. p: Wald test; for age and BMI, the OR corresponds to the indicated increase. Overall association: ASA, p = 0.151; surgical specialty, p = 0.008 (likelihood ratio).

In the unadjusted analysis, having a college education was associated with higher anxiety scores than not having a college education (OR = 20.85; 95% CI: 12.57–34.57; p < 0.001). Explanations received at the pre-anesthesia consultation were associated with lower scores (OR = 0.089; 95% CI: 0.056–0.143; p < 0.001). The history of anesthesia was also associated with lower scores (OR = 0.64; p = 0.021). Emergency procedures were associated with higher odds (OR = 2.08; p < 0.001).

Compared with general and visceral surgery, gynecology showed a crude association with anxiety (OR = 1.94; p = 0.009). Other specialty comparisons were not statistically significant. No significant associations were found for age, sex, ASA class, comorbidities, marital status, funding, or BMI. These crude associations do not account for other patient characteristics.

3.7 Factors Associated with High Information Needs in Univariate Analysis

Table 5 presents the crude associations with a high need for information, defined as a QC + QF score ≥ 8.

Table 5: Crude associations with an APAIS information need score ≥ 8.

Factor and category	High need n/N (%)	Crude OR	95% CI	p
Age, per 10-year increase	—	1.13	0.96–1.33	0.155
Gender: Male (ref.)	26/105 (24.8%)	1.00	—	—
Female	60/338 (17.8%)	0.66	0.39–1.11	0.114
Education Level: Non-college (ref.)	2/197 (1.0%)	1.00	—	—
College	84/246 (34.1%)	50.56	12.25–208.67	< 0.001
Anesthesia history: None (ref.)	39/216 (18.1%)	1.00	—	—
Present	47/227 (20.7%)	1.19	0.74–1.90	0.481
Explanations received at the CPA: No (ref.)	67/264 (25.4%)	1.00	—	—
Yes	19/179 (10.6%)	0.35	0.20–0.61	< 0.001
Type of procedure: Elective (ref.)	58/306 (19.0%)	1.00	—	—
Emergency	28/137 (20.4%)	1.10	0.66–1.82	0.715
ASA Class: I (ref.)	29/167 (17.4%)	1.00	—	—
II	37/190 (19.5%)	1.15	0.67–1.97	0.609
III	20/86 (23.3%)	1.44	0.76–2.74	0.263
Surgical specialty: General and visceral (ref.)	40/191 (20.9%)	1.00	—	—
Gynecology	21/97 (21.6%)	1.04	0.57–1.89	0.890
Obstetrics	19/130 (14.6%)	0.65	0.36–1.18	0.153
Other specialties	6/25 (24.0%)	1.19	0.45–3.18	0.726
Comorbidity: None (ref.)	71/360 (19.7%)	1.00	—	—
Present	15/83 (18.1%)	0.90	0.48–1.66	0.732
Marital status: Unmarried (ref.)	19/91 (20.9%)	1.00	—	—
Married	67/352 (19.0%)	0.89	0.50–1.58	0.692
Health Care Financing: Health Insurance (ref.)	52/227 (22.9%)	1.00	—	—
Private	34/216 (15.7%)	0.63	0.39–1.02	0.058
BMI, per 1 kg/m² increase	—	0.96	0.91–1.01	0.142

N = 443. Ref: reference category (OR = 1). p: Wald test. Overall association: ASA, p = 0.539; surgical specialty, p = 0.399 (likelihood ratio). The non-university group includes 197 patients, only two of whom had a high need.

University affiliation was strongly associated with a high need for information (OR = 50.56; 95% CI: 12.25–208.67; p < 0.001). A high need was observed in 84 of the 246 university patients (34.1%), compared with two of the 197 non-university patients (1.0%). The rarity of events in the latter group partly explains the magnitude and imprecision of the OR.

Explanations received at the CPA were associated with lower odds of high need (OR = 0.35; 95% CI: 0.20–0.61; p < 0.001). No statistically significant association was found for the other factors examined. Private funding had a lower estimate than mutual insurance, but its confidence interval included 1 (p = 0.058). This result was not presented as a significant association.

3.8 Multivariate Analysis of Anxiety

The initial additive model showed a lack of fit (Hosmer–Lemeshow, p < 0.001). Adding the interaction term between educational level and explanations improved the fit (likelihood ratio for the interaction, p < 0.001). Table 6 presents the estimates of the model including this interaction.

Table 6: Multivariate logistic regression of anxiety (APAIS ≥ 11)

Variable and category	Adjusted OR	95% CI	p
Age, per 10 years	1.18	0.86–1.60	0.309
Male (ref.)	1.00	—	—
Female	1.19	0.47–3.01	0.720
Non-academic, without explanations (ref.)	1.00	—	—
Academic, in the absence of explanations	252.65	78.40–814.13	< 0.001
No history of anesthesia (ref.)	1.00	—	—
History of anesthesia present	0.53	0.28–1.01	0.053
No explanations received, non-academic (ref.)	1.00	—	—
Explanations received from non-academics	0.66	0.28–1.54	0.334
Scheduled intervention (ref.)	1.00	—	—
Emergency intervention	1.07	0.48–2.36	0.876
ASA I (ref.)	1.00	—	—
ASA II	0.90	0.43–1.86	0.770
ASA III	0.59	0.21–1.63	0.305
General and Visceral Surgery (ref.)	1.00	—	—
Gynecology	1.73	0.59–5.11	0.321
Obstetrics	1.49	0.57–3.94	0.417
Other specialties	1.47	0.33–6.62	0.615
University interaction × explanations	0.010	0.002–0.043	< 0.001

N = 443; 213 events. All variables in the table are included simultaneously. Ref: OR = 1. When an interaction is present, the "university" OR is estimated for patients without explanations, and the "explanations" OR for non-university patients. The interaction OR is a ratio of ORs, not an independent overall association.

After adjustment, the association between educational level and anxiety depended on the explanations provided. In the absence of explanations, the adjusted OR for educational level was 252.65 (95% CI: 78.40–814.13; $p < 0.001$). This estimate is very high and imprecise; in the academic group without explanations, only four patients had a score below 11. It should therefore be interpreted with caution and does not correspond to a 253-fold increase in risk.

Age, sex, urgency, ASA class, and surgical specialty showed no statistically significant adjusted association. A history of anesthesia was associated with an ORa of 0.53, but the 95% CI included 1 (0.28–1.01; $p = 0.053$). The crude association observed for urgency and gynecology was therefore not maintained in this model.

The interaction model showed no signs of misfit on the Hosmer Lemeshow test ($p = 0.648$). Maximum VIF = 2.50. The test for linearity of age did not reveal any deviation ($p = 0.982$). These checks do not constitute an external validation of the model.

3.9 Association of Explanatory Variables with Anxiety by Educational Level

To make the interaction interpretable, Table 7 presents the observed proportions and adjusted ORs for the explanatory variables, separately for the two educational level groups. These ORs are contrasts derived from the same model as in Table 6.

Table 7: Explanatory Variables and Anxiety by Educational Level

Educational Level	Explanatory Variables	Anxiety n/N (%)	Adjusted OR	95% CI	p
Non-college graduate	No	14/91 (15.4%)	1.00	—	—
Non-college graduate	Yes	12/106 (11.3%)	0.66	0.28 – 1.54	0.334
College graduate	No	169/173 (97.7%)	1.00	—	—
College graduate	Yes	18/73 (24.7%)	0.007	0.002– 0.022	< 0.001

For each educational level, "no explanation" serves as the reference (OR = 1). Adjustment is identical to that in Table 6. Overall interaction test using the likelihood ratio: $p < 0.001$.

Among non-university graduates, anxiety was present in 15.4% of patients without explanations and 11.3% of those with explanations. The adjusted association was not statistically significant (ORa = 0.66; 95% CI: 0.28–1.54; $p = 0.334$).

Among university students, anxiety was present in 97.7% of patients without explanations and 24.7% of those with explanations. The adjusted OR associated with receiving an explanation was 0.007 (95% CI: 0.002–0.022; $p < 0.001$). The association was therefore much stronger in this group. Since nearly all college-educated patients who did not receive an explanation had anxiety scores ≥ 11, this estimate is sensitive to the few observations classified as having no anxiety.

Furthermore, among patients who received explanations, having a college education remained associated with higher anxiety scores compared to those without a college education (aOR = 2.62; 95% CI: 1.13–6.06; $p = 0.025$). These results indicate heterogeneity in the association and do not demonstrate a causal effect of the explanations. The content and precise timing of the explanations did not allow for an estimation of a causal effect.

3.10 Multivariate Analysis of High Information Need

Table 8 presents the main model for high information need. The six factors were included simultaneously, without automatic selection based solely on p-values.

Table 8: Multivariate logistic regression of APAIS information need ≥ 8

Variable and category	Adjusted OR	95% CI	p
Age, in 10-year intervals	1.11	0.90–1.37	0.311
Male (ref.)	1.00	—	—
Female	0.59	0.31–1.15	0.124
Non-college education (ref.)	1.00	—	—
College level	50.87	12.18–212.49	< 0.001
No history of anesthesia (ref.)	1.00	—	—
History of anesthesia present	1.54	0.89–2.66	0.119
No explanation provided (ref.)	1.00	—	—
Explanations received by the CPA	0.51	0.27–0.94	0.030
Scheduled intervention (ref.)	1.00	—	—
Emergency service	0.92	0.50–1.72	0.801

N = 443; 86 events. Ref.: reference category (OR = 1). The non-college group includes only two events; therefore, estimates for educational level are imprecise.

A university education remained associated with a high need for information after adjustment (ORa = 50.87; 95% CI: 12.18–212.49; p < 0.001). The very wide confidence interval highlights the low precision of the estimate. Explanations received at the CPA remained associated with lower odds of a high need for information (ORa = 0.51; 95% CI: 0.27–0.94; p = 0.030).

Age, sex, anesthetic history, and urgency did not show any statistically significant adjusted associations. The Hosmer–Lemeshow test did not indicate any lack of fit (p = 0.384), and the maximum VIF was 1.26. The test for linearity of age was not significant (p = 0.271).

In the extended model, which included ASA status and specialty, the main estimates remained similar: adjusted OR for university-level education = 52.26 (95% CI: 12.46–219.20) and adjusted OR for explanations = 0.49 (95% CI: 0.26–0.92; p = 0.027). The addition of these factors therefore did not significantly alter the main associations. This stability does not eliminate the uncertainty associated with rare events in the non-university group.

4. DISCUSSION

The study included 443 adult patients recruited from four facilities in Kinshasa. A total APAIS anxiety score of ≥ 11 was observed in 48.1% of participants, and a high need for information was observed in 19.4%. The two scores were positively correlated. Explanations received at the CPA were reported by 40.4% of participants. The adjusted analysis of anxiety revealed an exploratory interaction with educational level, while college education and the explanations received remained associated with a high need for information. These results provide two distinct insights. On the one hand, anxiety measured before surgery affected a significant portion of the sample. On the other hand, the associations with information were not limited to a general contrast between informed and uninformed patients. Educational level modified the observed association with anxiety. The discussion must therefore take into account this heterogeneity and the low precision of certain estimates.

4.1 Prevalence of Anxiety and Comparison with Literature

The prevalence of 48.1% indicates that approximately one in two patients met the overall threshold used. Numerically, this figure is close to 47.0% reported by Bedaso and Ayalew and 51.9% reported in Kinshasa by Lukeba and colleagues. These comparisons should remain descriptive: those two studies used the STAI, whereas our analysis is based on an APAIS score ≥ 11 [4, 6]. Mulugeta and colleagues reported 61.0%,

while Ahmed and colleagues observed 24.6% in northern Sudan. The discrepancy between these results cannot be attributed solely to the country. The composition of the samples, the presence of emergency cases, the medical specialties, and the measurement methods differ. No statistical comparison between these independent studies was performed in the present work [5, 16].

The study population was predominantly female and included a significant proportion of gynecological and obstetric procedures. Emergency cases accounted for 30.9% of the total. These characteristics describe the study population and limit the generalizability of the findings to all patients who underwent surgery in Kinshasa. The absence of a facility-specific variable also prevents us from determining whether the overall frequency was consistent across the four sites.

The secondary threshold of ≥ 13 classified 26.0% of participants, compared with 48.1% at the threshold of ≥ 11. This difference illustrates the importance of the threshold in the reported frequency. It does not call into question the distribution of scores but serves as a reminder that the percentages of "anxious" patients cannot be compared without verifying their definition. The primary threshold of ≥ 11 corresponds to the definition of a score greater than 10 studied by Wattier and colleagues [10].

4.2 Need for Information and Relationship to Anxiety

The need for information was most often moderate, among 43.3% of participants, and high among 19.4%. The majority therefore did not fall into the category with the highest demand. This observation does not mean that minimal information would be sufficient: the score reflects a stated desire and does not measure either knowledge or understanding of informed consent. The Spearman correlation coefficient of 0.605 between the scores indicates a positive relationship. Anxiety levels of ≥ 11 were present in 86.0% of patients with a high need for information, compared with 38.9% of the others. This association is consistent with the initial observation by Moerman and colleagues that a high demand for information may be accompanied by higher anxiety [15].

However, the two dimensions remained distinct. Twelve patients exhibited a high need for information without reaching the anxiety threshold, while 139 reached this threshold without a high need for information. It would therefore be insufficient to screen for anxiety solely among those who request a great deal of explanation. Conversely, a detailed request for information should not automatically be equated with a pathological symptom. The nature of the relationship cannot be established. Anxiety may increase the search for information; information deemed insufficient may allow uncertainty to persist; and individual characteristics may be associated with both. Repeated measurements before and after a defined intervention would allow these hypotheses to be examined with greater precision.

4.3 Educational Level and Interpretation of Associations

The crude association with educational level was particularly pronounced: anxiety affected 76.0% of college graduates compared with 13.2% of those without a college degree. A high need for information was observed in 34.1% of college graduates and in 1.0% of the others. Differences based on educational attainment have been previously re, notably by Celik and Edipoglu and by Caumo and colleagues; however, these studies do not confirm the magnitude of the differences observed here [14, 18]. Several interpretations are possible. The most highly educated participants may be more likely to express their expectations or seek more detailed information. Differences in understanding the questions, assistance with completing the survey, or recruitment may also play a role. These explanations remain hypotheses: the dataset does not directly measure medical knowledge, health literacy, or the quality of oral translation.

In the high information need model, the ORa for the university-educated group was 50.87, with a 95% CI of 12.18 to 212.49. Only two events occurred among the 197 non-university students. The magnitude and width of the interval are therefore due to limited statistical information in this group. A total sample size of 443 observations does not protect against biases associated with small cell counts [24]. These results do not allow us to conclude that university students have a fifty-fold higher risk in the general population. The OR is an odds ratio, and the selected hospital-based sample limits generalizability. The observed proportions remain essential for understanding the implications of the adjusted estimate [23].

4.4 Explanations Received at the CPA and Interaction with Educational Level

In total, 179 patients reported receiving explanations at the pre-anesthesia consultation (PAC), while 264 reported not receiving any. This proportion reflects self-reported experience; it does not allow us to conclude that 59.6% of patients did not undergo any anesthetic evaluation. The variable does not specify who provided the explanations, their duration, or their exact content. Among non-university students, anxiety was present in 15.4% of patients who did not receive explanations and in 11.3% of those who did. The

adjusted odds ratio (ORa) of 0.66, with a 95% confidence interval (CI) of 0.28 to 1.54, was not statistically significant. Among college graduates, the proportions were 97.7% and 24.7%, with an adjusted OR of 0.007. The interaction test was significant, but the interaction was examined after the additive model was found to be ill-fitting; it should therefore be considered exploratory.

The very low estimate of the OR for explanations among university students depends on a distribution that is almost entirely concentrated: only four university students without explanations had a score below 11. The adjusted OR of 252.65 for the university level in the absence of explanations reflects the same pattern. This structure may amplify maximum likelihood estimates and justify not interpreting their magnitude as a stable measure of a clinical effect [24].

Information that is understood and tailored could help reduce uncertainty. However, the study design does not allow the observed difference to be attributed solely to explanations. The recruitment site, interview procedures, prior anxiety, or perceptions of communication could contribute to the association. Adjusting the available variables does not rule out these possibilities. The trial by Jlala et al. examined a specific multimedia intervention, whereas the review by Hounsome et al. distinguished between information formats and timing. This comparison highlights what should be specified in a future study: a reproducible intervention, a baseline measure of anxiety, a defined assessment time, and comparable testing conditions [8, 9].

For high information needs, explanations were associated with an ORa of 0.51. This result may correspond to a lower demand for information following an exchange, but the precise timing is not detailed enough to conclude that the reduction was caused by the explanations. Nor should a reduction in demand be equated with a demonstrated improvement in understanding.

4.5 Other Characteristics Studied

Previous anesthesia history and urgency were associated with anxiety in the crude analysis, but these associations no longer reached the threshold of significance after adjustment. For prior anesthesia history, the adjusted OR was 0.53 with a p-value of 0.053. It is more accurate to report the estimate and its uncertainty than to characterize this variable as a proven protective factor. Age, sex, ASA class, and medical specialties showed no statistically significant adjusted associations. This does not establish that they play no role in all surgical situations. Certain categories of medical specialties were underrepresented and had been grouped together; as a result, the comparisons lost precision and clinical specificity.

The high proportion of female participants was not accompanied by an adjusted association with sex. This result differs from that of Mulugeta and colleagues, who observed an association with female sex. The difference may be due to the composition of the study population, the measures used, or the adjustment methods, although no specific mechanism can be confirmed here [5]. Healthcare financing was not significantly associated with anxiety in the unadjusted analysis, whereas the Kinshasa study by Lukeba and colleagues reported a association with the mode of financial coverage. The available categories and other patient characteristics are not identical; this discrepancy should not be presented as a refutation of the previous data [6].

4.6 Model Scope

Adding the interaction term improved the fit of the anxiety model. The Hosmer Lemeshow test no longer indicated a lack of fit, and the VIFs did not suggest significant multicollinearity. While these checks assess certain aspects of the model, they do not demonstrate its external validity or the causality of the associations. They do not correct for selection or measurement bias. For the sake of completeness, the extended model yielded estimates similar to those of the main model. This stability following the addition of the ASA class and specialty is reassuring regarding this specific comparison. It does not resolve the imprecision associated with the two events in the non-university group and does not replace validation in another sample. The high prevalence of anxiety makes the distinction between OR and risk ratio particularly important. An OR less than 1 cannot be directly translated into a percentage reduction in risk. Presenting proportions and ORs together allows for a more cautious interpretation [23].

4.7 Implications for Practice

The results support the value of systematically identifying concerns prior to the procedure. Brief use of the APAIS could help distinguish between anesthetic anxiety, surgical anxiety, and requests for information. The score should serve as a starting point for clinical discussion, not replace active listening or, on its own, determine a treatment decision. Information can be organized around the main stages of care and then tailored to the questions raised. Verifying understanding by paraphrasing would be appropriate, particularly when explanations in another language are necessary. These suggestions are avenues for improvement to be evaluated; their effectiveness was not directly tested in this study.

Non-pharmacological approaches, such as relaxation techniques or music chosen by the patient, can complement the information provided. The reviews by Wang, Powell, and Bradt provide evidence supporting certain strategies, while highlighting the limitations of the evidence and the heterogeneity of the interventions. They do not justify assuming an identical effect across all contexts [19, 20, 21].

Sedative premedication is an individualized clinical decision. The PremedX results do not support the routine administration of lorazepam to improve the reported experience following general anesthesia. They underscore that the desired relief must be balanced against recovery and the patient's characteristics [22].

4.8 Strengths and Limitations

The study is based on 443 observations from four institutions, complete APAIS items, and a verified recalculation of scores. It distinguishes between overall anxiety and the need for information, retains the description of subscores, and presents both crude and adjusted associations. The examination of interactions reveals heterogeneity that would have been masked by an overall estimate. Consecutive recruitment at selected facilities limits representativeness. The previous thesis reported 536 identified surgical patients, of whom 443 had completed the questionnaire; the individual data for the 93 non-respondents are not included in the analytical dataset. It is therefore not possible to assess whether their anxiety levels differed from those of the participants.

The facility is not specified in the analytical dataset provided, although the initial data collection form included this field. It was therefore not possible to describe the sample sizes by site, compare frequencies across hospitals, or account for the grouping of observations by facility. A hospital-specific effect may persist in the observed associations.

The measurement of explanations was based on a yes/no response. Their quality, comprehensibility, and precise timing relative to the assessment are not documented in sufficient detail for a causal analysis. The absence of measures of trait anxiety, preoperative pain, and social support also leaves open the possibility of unaccounted-for confounding factors.

Administering the questionnaire with an oral explanation in the participants' usual language may have facilitated participation, but the measurement properties under these conditions have not been established. No local linguistic validation is demonstrated by this analysis. Differences based on educational level should be interpreted in light of this limitation.

Finally, sparse cells, very wide confidence intervals, and the exploratory nature of the interaction limit the stability of the estimates. The models presented have not undergone external validation. Penalized methods could be examined in a subsequent analysis, but their results are not available here. Transparency regarding recruitment, measures, and limitations is consistent with the principles for reporting observational studies [26].

CONCLUSION

Among the 443 adults studied in Kinshasa, 48.1% of participants had a total APAIS anxiety score ≥ 11, and 19.4% reported a high need for information. The two dimensions were associated without confounding. The association between the explanations received at the preoperative consultation and anxiety varied by educational level in an exploratory analysis.

These findings support the need for preoperative preparation that is attentive to each patient's concerns and level of understanding. They do not demonstrate a causal effect of the explanations provided. The magnitude of the ORs should be interpreted with caution, given the small cell sizes, unmeasured factors, and the absence of hospital identifiers in the analytical dataset.

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