

# Prevalence of preoperative anxiety and its contributing factors in adult patients undergoing elective orthopaedic surgery at an academic hospital in South Africa: a pilot study

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**Background:** Preoperative anxiety potentially results in perioperative anaesthetic complications. This study aimed to determine the prevalence of preoperative anxiety in adult patients scheduled to undergo elective orthopaedic surgery at an academic hospital in South Africa and identify contributory factors.

**Methods:** This cross-sectional study included all patients scheduled for elective orthopaedic surgery the following day from 25 July to 3 November 2021. An adapted version of the Amsterdam Preoperative Anxiety and Information Scale (APAIS) was used. Four questions determined the patients' anxiety and two questions their desire for more information about their forthcoming anaesthesia and surgery. A 5-point Likert scale was used to capture the patients' responses to the APAIS questions. Data on other possible contributory factors to preoperative anxiety were collected using a questionnaire.

**Results:** Of the 88 patients, 82 (93.2%) were included in the study. A total of 40 (48.8%) patients had an APAIS score of  $\geq 11$ , indicating anxiety. A high need-for-information score ( $\geq 8$ ) was found in 31 (37.8%) patients. A significant association between patients with a higher anxiety score and a higher need-for-information score ( $p = 0.0063$ ) was identified. Other non-significant factors associated with a higher anxiety score included a lower level of education and no postoperative home support.

**Conclusion:** Patients with a high need for information tended to be more anxious on the day before surgery. The APAIS could be introduced in preoperative ward admissions to identify these patients and provide an appropriate level of counselling about their planned procedure. Counselling might reduce their preoperative anxiety, but further research needs to confirm this assertion. Larger studies are recommended to determine the influence of other factors contributing to preoperative anxiety.

**Keywords:** preoperative anxiety, elective orthopaedic surgery, Amsterdam Preoperative Anxiety and Information Scale, APAIS, perioperative complications

## Introduction

The preoperative period is from when a patient is informed they require surgery until the time the operation commences. During this waiting period, which can be lengthy for elective surgery, anxiety tends to increase as the day of the operation approaches and is often at its highest in the 24 hours before the surgery. Anxiety activates the sympathetic nervous system, causing physical and psychological problems, complicating the induction of anaesthesia. These adverse effects can persist into the intraoperative and postoperative periods causing cardiovascular instability, awareness, increased pain, nausea and vomiting, and prolonged hospitalisation.<sup>1,2</sup> Reducing preoperative anxiety is therefore required for ethical and economic reasons, and may reduce perioperative morbidity, although the evidence in this regard is weak.<sup>3</sup>

Many studies investigated factors that can be modified to reduce preoperative anxiety, and an inverse relationship with the amount of information a patient receives preoperatively has been shown.<sup>4,5</sup> However, a limited number of studies regarding factors contributing to preoperative anxiety in Africa have been

published.<sup>6</sup> No studies have been conducted in South Africa to determine the prevalence of preoperative anxiety and limited studies regarding its relationship to information received were reported.<sup>7</sup> Therefore, this study aimed to investigate this issue further.

Tools used in previous studies to measure preoperative anxiety included the Spielberger State-Trait Anxiety Inventory (STAI), the Visual (or Numerical) Analogue Scale for Anxiety (VASA), and the Amsterdam Preoperative Anxiety and Information Scale (APAIS).<sup>1-5,8-15</sup> The STAI has been widely used to measure anxiety, but it is a 40-item questionnaire that requires 10–20 minutes to complete, consequently limiting its use. The anxiety analogue scales are easy to administer, but do not capture specific data about the anaesthesia or surgery, or information desired by the patient. The APAIS was designed specifically for the preoperative period and includes six questions, four about anxiety and two regarding the patient's desire for information on their impending procedure.<sup>16</sup> Furthermore, the APAIS is easy to interpret and has been validated in different countries and languages (although not in Africa).<sup>17,18</sup> More specifically, the APAIS has been used to

determine preoperative anxiety in patients undergoing elective orthopaedic surgery, the focus group of this study.<sup>17,19</sup> Therefore, the researchers considered the APAIS the most appropriate instrument for this study.

Other factors shown internationally to contribute to preoperative anxiety, such as demographic and social factors, were investigated as possible contributory factors.<sup>13,20</sup> In South Africa, with its multicultural attributes and considerable socio-economic inequalities, no information is available about the influence of a patient's social circumstances on preoperative anxiety, or whether cultural differences influence patients' expression of preoperative anxiety, e.g. male patients might not display or express anxiety as it could be considered a weakness.

This study aimed to determine the prevalence of preoperative anxiety in adult patients scheduled to undergo elective orthopaedic surgery at a tertiary-level academic hospital in South Africa and investigate factors contributing to preoperative anxiety in these patients. Patients scheduled for elective orthopaedic surgery were chosen as the study population because they cover a wide age range, are usually well enough preoperatively to participate in completing a questionnaire, and regular daily theatre lists are available.

**Methods**

**Study design**

A prospective, observational, cross-sectional questionnaire-based study was conducted.

The study population comprised all adult patients admitted for elective orthopaedic surgery the following day from 25 July to 3 November 2021.

The study was part of an undergraduate medical student research programme that was planned before the COVID-19 epidemic started in March 2020. The students' schedule permitted only three months for data collection. The following equation has been used to calculate the exact sample size in other studies:<sup>10,11</sup>

$$n = (Za/2)^2 \times p(1 - p) \div d^2$$

where:

*n* is the required sample size

*Z* is the cut-off value of the normal distribution being 1.96

*p* is the prevalence

*d* is the degree of accuracy

The average prevalence of preoperative anxiety among patients from previous African studies was 60.8%. Therefore, if the researchers were to use this equation to calculate the required sample size, it would have been as follows:<sup>10</sup>

$$n = (1.96)^2 \times 0.608 (1 - 0.608) \div (0.05)^2 = 366 \text{ patients}$$

At the planning stage, it was estimated that 20 patients would undergo elective orthopaedic surgery per week, and only 240 patients could therefore be included considering the time allocated for our study (12 weeks × 20 patients/week). Following a discussion with the Department of Biostatistics, it was confirmed that this sample size would be sufficient for our objectives. However, the COVID-19 pandemic and its accompanying lockdown regulations and restrictions resulted in a substantial reduction in the sample size obtained.

Patients included were at least 18 years of age, scheduled for elective orthopaedic surgery the following day, able to give informed consent and understand Afrikaans, English, or Sesotho. Patients physically or mentally unable to participate were excluded from the study, as were those who had already received their preoperative anaesthetic assessment during their current hospital admission. The study was explained to members of the hospital's Department of Anaesthesiology and it was arranged that the students performing the data collection would interview the patients before the anaesthetist performed their preoperative assessment of the patient.

**Measurement**

The questionnaire used to measure the prevalence of preoperative anxiety was an adapted version of the APAIS (Table I). The original APAIS requires the respondent to determine how much a specific statement reflects their viewpoint. The researchers (themselves from different South African language

**Table I:** The adapted\* Amsterdam Preoperative Anxiety and Information Scale (APAIS)

|                                      |   |
|--------------------------------------|---|
| <b>Anaesthesia-related questions</b> | <b>Anxiety</b>  |
|                                      | 1. How worried are you about the anaesthetic?                                       |
|                                      | 2. How much is the anaesthetic continually on your mind?                            |
|                                      | <b>Need for information</b>   |
|                                      | 3. To what extent would you like to know as much as possible about the anaesthetic? |
| <b>Procedure-related questions</b>   | <b>Anxiety</b>  |
|                                      | 4. How worried are you about the procedure?   |
|                                      | 5. How much is the procedure continually on your mind?                              |
|                                      | <b>Need for information</b>   |
|                                      | 6. To what extent would you like to know as much as possible about the procedure?   |

\*Statements in the original APAIS were converted to questions to which patients had to respond on a 5-point Likert scale ranging between 1 ("Not at all") and 5 ("Extremely")

groups) felt this might confuse their patient population, and the patients would better understand the concept of answering a question. Therefore, the researchers adapted the original APAIS by changing the statements into questions, e.g. the original APAIS statement "I am worried about the anaesthetic" was changed to the question "How worried are you about the anaesthetic?"

A 5-point Likert scale was used, with 1 representing "Not at all" and 5 representing "Extremely". The anxiety score for each patient was calculated by adding the scores of APAIS questions 1, 2, 4, and 5 (minimum score = 4, maximum = 20), with a total  $\geq 11$  representing anxiety. The patient's need for information was calculated by adding the values of APAIS questions 3 and 6 (minimum = 2, maximum = 10); a score of 2–4 indicated "no/little", 5–7 an "average", and 8–10 a "high" need for information.

### Data collection

The six medical students, co-authors of this paper, obtained patients' informed consent for the study and collected the data. However, from the second week of the study period, patients scheduled to have orthopaedic surgery but pending COVID-19 test results (14 in total), were admitted to a ward inaccessible to the students. A protocol amendment was obtained and the anaesthetists assigned to perform the preoperative assessments of these patients, enrolled the patients in the study and collected the questionnaire-based information on behalf of the students, before proceeding with their anaesthetic assessments. These data collection forms were handled in a manner to prevent COVID-19 transmission to the researchers.

Afrikaans, English, or Sesotho language questionnaires were used according to patient preference and administered by a

**Table II:** Sociodemographic characteristics and anxiety experienced by adult patients undergoing elective orthopaedic surgery at the hospital ( $n = 82$ )

| Variables   | n (%)     | Anxiety experienced |             |
|---|-----------|---------------------|-------------|
|   |           | Yes<br>n (%)        | No<br>n (%) |
| <b>Gender</b>   |           |                     |             |
| Male  | 38 (46.3) | 21 (55.3)           | 17 (44.7)   |
| Female  | 44 (53.7) | 19 (43.2)           | 25 (56.8)   |
| <b>Home language</b>  |           |                     |             |
| Afrikaans   | 27 (32.9) | –                   | –           |
| English   | 4 (4.9)   | –                   | –           |
| Sesotho   | 34 (41.5) | –                   | –           |
| Afrikaans and English   | 3 (3.7)   | –                   | –           |
| Afrikaans and Sesotho   | 1 (1.2)   | –                   | –           |
| Other   | 13 (15.9) | –                   | –           |
| <b>Level of education</b>                                       |           |                     |             |
| None  | 5 (6.1)   | 3 (60.0)            | 2 (40.0)    |
| Primary school  | 14 (17.0) | 7 (50.0)            | 7 (50.0)    |
| Grade 10  | 24 (29.3) | 12 (50.0)           | 12 (50.0)   |
| Grade 12  | 28 (34.2) | 13 (46.4)           | 15 (53.6)   |
| Tertiary qualification  | 11 (13.4) | 5 (45.5)            | 6 (55.5)    |
| <b>Previous surgery</b>   |           |                     |             |
| Yes   | 53 (64.6) | 25 (47.2)           | 28 (52.8)   |
| No  | 29 (35.4) | 14 (48.3)           | 15 (51.7)   |
| <b>Experience of anaesthesia with previous surgery (n = 53)</b> |           |                     |             |
| Very bad  | 3 (5.7)   | –                   | –           |
| Bad   | 5 (9.4)   | –                   | –           |
| Neither good nor bad  | 14 (26.4) | –                   | –           |
| Good  | 23 (43.4) | –                   | –           |
| Very good   | 8 (15.1)  | –                   | –           |
| <b>Used anxiety medication in the preceding year</b>            |           |                     |             |
| Yes   | 10 (12.2) | 3 (30.0)            | 7 (70.0)    |
| No  | 72 (87.8) | 37 (51.4)           | 35 (48.6)   |
| <b>Help at home with recovery</b>                               |           |                     |             |
| Yes   | 75 (91.5) | 35 (46.7)           | 40 (53.3)   |
| No  | 7 (8.5)   | 5 (71.4)            | 2 (28.6)    |

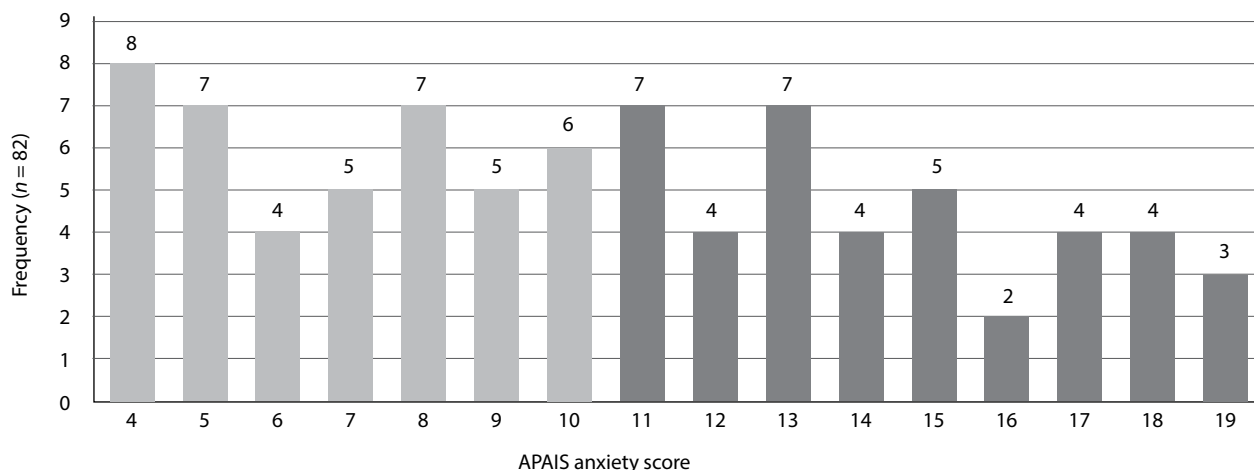


Figure 1: Distribution of participants according to the anxiety score calculated by adding the values for APAIS questions 1, 2, 4 and 5

student or doctor fluent in the appropriate language. The data collected included APAIS scores and information suspected to contribute to anxiety, including age, gender, level of education, previous surgery experience, chronic anxiolytic use, and expected support at home.

**Data analysis**

The Department of Biostatistics at the university assisted with the quantitative data analysis, using SAS version 9.4 (SAS Institute Inc.; Cary, NC, USA). The data obtained from the questionnaires was coded into an Excel (version 2016) spreadsheet. Quantitative data were presented in graphical format, or charts, or had statistical analysis methods applied to it, to allow for easier interpretation and analysis. This included demographic data that were collected during the interview and the adapted APAIS questionnaire results. Analysis of the data was aimed at finding similarities or patterns and drawing conclusions or identifying common trends compared to results from previously published studies.

**Ethical aspects**

Approval for the study was obtained from the Health Sciences Research Ethics Committee (HSREC) of the University of the Free State. Informed consent was obtained from patients prior to participation in the research.

**Results**

In total, 88 patients were invited to participate in the study. However, six declined due to pain (response rate 82/88 = 93.2%). The median age was 46 years (range 18–85 years) and 44 (53.7%) patients were female.

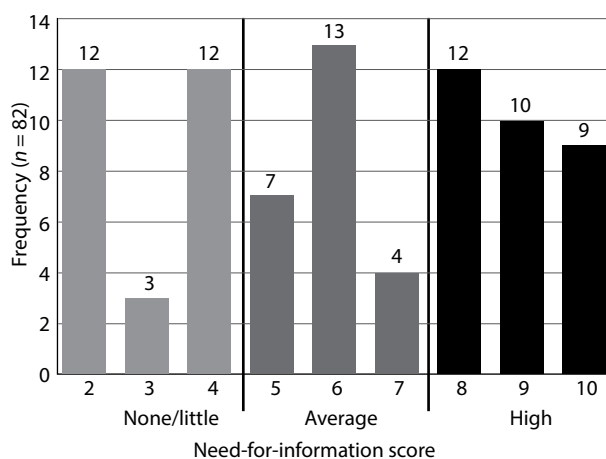


Figure 2: Distribution of participants according to the anxiety score calculated by adding the values for APAIS questions 3 and 6

The sociodemographic characteristics of the patients are presented in Table II. Most patients spoke either Sesotho or Afrikaans at home. The majority had been educated at secondary school level (Grade 10 or 12). Several non-statistically significant trends were noted. A higher prevalence of anxiety occurred in patients who were male, less educated, had a previous bad experience with anaesthesia, and had less home support. A lower prevalence of anxiety in patients on chronic anxiolytic medication was also observed. Having previously undergone surgery was not found to influence anxiety.

There were 42 (51.2%) patients with an anxiety score of < 11, indicating no anxiety; the remaining 40 (48.8%) patients had an anxiety score of ≥ 11, reflecting anxiety (Figure 1). There were similar proportions of patients in the three need-for-information

Table III: Association between anxiety and need for information (n = 82)

| Need-for-information score | Mean anxiety score* | Patients with anxiety score ≥ 11 |
|----------------------------|---------------------|----------------------------------|
| 2–4 (no/little) (n = 27)   | 210/27 = 7.8        | 7/27 (25.9%)                     |
| 5–7 (average) (n = 24)     | 259/24 = 10.8       | 12/24 (50.0%)                    |
| 8–10 (high) (n = 31)       | 394/31 = 12.7       | 21/31 (67.7%)                    |

\*Per category of need-for-information score

score categories: “none/little” (27 patients; 32.9%), “average” (24 patients; 29.3%) and “high” (31 patients; 37.8%) (Figure 2).

Calculating the mean anxiety score for each of the need-for-information score categories showed a significant association between patients with a higher need-for-information score and a higher anxiety score ( $p = 0.0063$ ) (Table III). There was a tendency for patients to be more worried about their surgery than their anaesthetic, but patients expressed a similar need for information regarding both the surgery and anaesthesia.

## Discussion

The prevalence of preoperative anxiety among adult patients scheduled for elective orthopaedic surgery at a South African tertiary hospital was 48.8%. A significant association was observed between preoperative anxiety and the need for more information about anaesthesia and surgical procedure. None of the other factors investigated showed a statistically significant relationship with preoperative anxiety.

The prevalence of preoperative anxiety in this study was lower than reported in most other African studies. Abate et al. reviewed the literature on the global prevalence of preoperative anxiety and found that worldwide, the highest levels were reported from the African continent.<sup>6</sup> Studies included were from Ethiopia, Nigeria, and Tunisia, with a range of 47–70.3% and an overall prevalence of 56%. They postulated that these high levels could be attributed to patients not having adequate information or lacking understanding of their intended procedure, with patients in these countries often living in rural areas with limited access to healthcare education. Patients who previously had received anaesthesia and undergone surgery were less anxious before future procedures. Abate et al. surmised this previous experience had allowed patients to know more about the operative process and thus reduced their fears.<sup>6</sup>

The higher level of literacy in South Africa, compared to the African countries included in the review by Abate et al., might point to educational differences causing the lower prevalence of anxiety found in our study, as we noted a trend towards lower levels of anxiety as the level of education increased, similar to the findings by Mulugeta et al. in an Ethiopian study.<sup>6,10</sup> However, this association is unclear, with other studies either finding no relationship between educational level and preoperative anxiety, or an increased risk with a higher level of education.<sup>8,15,20</sup>

Furthermore, the lower prevalence of anxiety in South Africa may be related to the laws and regulations of medical consent and their administration. In most African countries, consent is required before surgery, but may be inadequately administered or documented prior to surgery, which could result in higher anxiety levels if patients do not feel in control of the decision for their surgery.<sup>21,22</sup> Nevertheless, even in South Africa, which has strict regulations governing informed consent, patients who have signed informed consent are often not given adequate information preoperatively about their anaesthetic and concerns have been raised regarding this matter.<sup>23</sup>

Patients rarely decline to receive information about their planned operation and most patients have a positive attitude towards receiving information. Moerman et al. found that over 80% of patients had an average to high need-for-information score.<sup>16</sup> While this figure was lower in our study (67.1% expressed a similar level of desire to receive information), our findings showed a similar relationship between anxiety and need for information, with patients having a high need-for-information score being more likely to experience preoperative anxiety (Table III). This relationship indicates the importance of asking patients awaiting surgery what they would like to know more about and whether they have any specific concerns.<sup>4</sup> Although the patient may have received all the legally required information for informed consent, they may have misinterpreted this information or have a concern the doctor did not consider discussing. Open-ended questions, e.g. “What else would you like to know?”, allow the patient to raise unaddressed concerns, as individuals may have different issues causing anxiety, not necessarily covered when generic information is given.<sup>13</sup>

Many methods are available nowadays to communicate information to patients and multimedia techniques are becoming increasingly popular. In the South African context, the use of an information video for patients experiencing a language barrier has a beneficial effect in reducing preoperative anxiety. However, this effect was only seen in patients with a high preoperative anxiety score, with little effect in those with low anxiety scores.<sup>7</sup>

One must also appreciate that not all patients with high preoperative anxiety scores will benefit from additional information, as patients' coping strategies for this form of stress may differ. In our study, a quarter of anxious patients had a low need-for-information score and, as Moerman et al. pointed out, these patients could become more anxious when given excessive information.<sup>16</sup> Aust et al. found that a third of highly anxious preoperative patients preferred not to be given additional information and would rather use personal self-distraction techniques.<sup>24</sup> Of note, highly anxious patients who did want further information favoured personal interaction and talking with the physician as the preferred method of obtaining this information, as opposed to non-personal techniques, e.g. via the internet or multimedia.

Whether information should be withheld from a preoperative patient who suffers from severe anxiety has been debated, in case this causes increased anxiety with cardiovascular complications.<sup>25</sup> The Health Professions Council of South Africa (HPCSA) guidelines on informed consent states that patients “have a right to information about the healthcare services available to them”, as well as the “treatment options” and the “benefits, risks, costs and consequences generally associated with each option”.<sup>26</sup> If a doctor considers that information could potentially harm the patient and decides to withhold relevant information, i.e. uses “therapeutic privilege”, this should only be in exceptional circumstances and should be clearly documented why it had been in the best interest of the patient.

The low need-for-information scores recorded for a third of our study patients may reflect their coping strategies, their confidence in the decisions made by their doctors (they were at the highest level academic hospital in the province), or the information already given to them before ward admission. If the study had been conducted at a private hospital, where patients take a more active role in their healthcare, higher need-for-information scores would be likely.<sup>23</sup> The study by Moerman et al. was also conducted at an academic hospital in the Netherlands, but fewer patients (17%) had such a low need-for-information score.<sup>16</sup> This difference could be due to educational style differences, with South Africa only moving in the post-apartheid era towards the modern approach seen in European countries, where critical thinking and active participation in problem-solving are encouraged in schools.<sup>27</sup>

Contrary to most studies, which usually reported an increased prevalence of preoperative anxiety in women, we found no significant difference between the genders, although slightly more men exhibited anxiety. Further studies are therefore needed to confirm the relationship between gender and preoperative anxiety in South Africa.

An unexpected (although non-significant) finding of this study was the lower prevalence of anxiety (30%) in the 10 patients who reported anxiolytic use in the previous year. Inherently, one would expect the opposite, that patients with an anxiety disorder requiring treatment would be more likely to be anxious preoperatively. However, participants with chronic anxiety might have learnt previously to develop coping strategies or their current anxiolytic medication was effective.

Patients with strong social support are recognised to experience less preoperative anxiety.<sup>11</sup> Our results supported this observation, with preoperative anxiety experienced by most patients with no support at home. This is an understandable concern and a management plan needs to be formulated in advance so that a patient does not fear for their well-being after discharge from the hospital.

### **Study limitations**

Due to COVID-19 regulations, multiple data collectors with different levels of training (medical students versus qualified clinicians) were involved. This situation could have caused inconsistencies in data collection and capturing. Having the anaesthetists collect the information before conducting their preoperative assessment might have introduced bias.

Patients were only included in the study if they understood Afrikaans, English, or Sesotho. The person administering the questionnaire was also required to be competent in the patient's preferred language, which might not have been either's first language. Consequently, information might have been lost in translation leading to errors in data collection.

The APAIS was slightly modified from the original (1996) scale, and this modification has not been validated against the original APAIS. The authors felt this small change made it easier for the

patients in this study to understand the APAIS questionnaire. However, the modified instrument needs to be validated.

Some patients might already have received preoperative counselling on their surgery from their surgeon. An exclusion criterion stating that patients who had already received preoperative counselling from their surgeon was not applied for logistical reasons.

The number of patients included in the study was fewer than anticipated. The study was conducted during the second year of the COVID-19 pandemic when the number of elective cases being performed were still lower than pre-pandemic, and hospital COVID-19 protocols restricted the student researchers' access to patients. Owing to the time-restricted nature of the undergraduate student research module, the study period could not be extended to accommodate a larger sample size. The study was therefore changed to represent a pilot study, as less than a quarter of the number of patients required according to the sample size calculation could be recruited (82/366; 22.4%).

The pandemic could have affected the results of this study, although performed in the later stage when most social restrictions had been lifted. Buonanno et al. compared preoperative anxiety in patients having elective surgery over a similar time epoch as in our study, with patients studied five to six years previously.<sup>28</sup> APAIS scores were historically similar, but trait anxiety was increased and was attributed to the impact of this epidemic on the long-term anxiety of the population.<sup>28</sup> This indicates the results of our study may not differ substantially if repeated after the pandemic is fully over.

Our study did not explore the relationship between anxiety and types of surgery other than orthopaedic. A higher prevalence of anxiety might have been found if patients undergoing higher-risk surgery with a greater fear of complications had been studied.<sup>6</sup>

Moerman et al. noted that their questionnaire did not distinguish clearly between preoperative anxiety caused by fear of anaesthesia and fear related to the surgical procedure.<sup>16</sup> This could be investigated further as our results did show a tendency for patients to be more worried about their surgery than the anaesthesia, similar to other studies using the APAIS.<sup>29</sup>

### **Conclusion**

The prevalence of preoperative anxiety in elective orthopaedic surgery patients at a South African tertiary hospital was 48.8%. A positive association was found between preoperative anxiety and the desire for more information, but this was not uniform for all patients. The APAIS can be used to identify which patients desire more information so that additional preoperative counselling may be provided where appropriate. Larger studies are required to determine which other factors contribute to preoperative anxiety.

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## Conflict of interest

The authors declare no conflict of interest.

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## Ethical approval

Ethical approval for the study was obtained from the HSREC (ethics clearance number UFS-HSD2021/0362/2707) and the Free State Province Department of Health. Informed consent was obtained from patients prior to participation in the research.

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