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Prevalence of pre-operative anxiety among adult patients undergoing elective surgery: A prospective observational single-centre study

Abstract

Objective: This study aimed to investigate the prevalence of pre-operative anxiety in elective surgical patients at a major metropolitan hospital in Australia.

Background: Globally, 310 million people are admitted for surgery every year. It is estimated that up to 80 per cent of these patients experience clinically relevant anxiety in the pre-operative period. Pre-operative anxiety can result in post-operative complications such as pain, delayed wound healing, surgical site infection, prolonged recovery and extended hospital stays. While pre-operative anxiety has many negative consequences, this anxiety has often been overlooked in clinical practice.

Methods: A prospective study was conducted between November 2021 and June 2022, involving 308 adult patients scheduled for elective surgery. Pre-operative anxiety levels were measured using the Amsterdam pre-operative anxiety and information scale (APAIS), and age, sex and surgery type were collected.

Results: In total, 308 patients were enrolled, more than half (58%, n=279) were women. The mean (± SD) APAIS score out of 20 was 8.69 (± 4.08). Almost one-third (32.4%, n=100) of patients had significant pre-operative anxiety (APAIS score > 11/20). Women were three times more likely to experience anxiety than men (OR=3.39, 95% CI 1.97–5.82). Conversely, older patients were less likely to experience anxiety, with a reduction in anxiety of two per cent for each year above 18 years (OR=0.98, 95%CI 0.97–0.99). Patients reported higher anxiety levels related to the surgery itself compared to the anaesthesia, with mean scores of 5.04 (± 2.48) and 3.65 (± 2.07) out of 10, respectively. More than half the patients (54.9%, n=169) reported needing more information about anaesthesia and surgery.

Conclusions: Findings suggest that clinically relevant anxiety is common yet underdiagnosed. A higher prevalence is observed among females and those under the age of 30. The surgical procedure more than the anaesthesia was reported to cause higher anxiety.

Relevance to clinical practice: Identifying the prevalence of high pre-operative anxiety highlights the importance of routine screening and the use of a standardised assessment tool for accurate evaluation in clinical practice. Prioritising interventions for at-risk groups, such as women and younger patients, is imperative to mitigate the risks of post-operative pain, delayed wound healing, surgical site infection, prolonged recovery and extended hospital stays.

Keywords: pre-operative anxiety, surgery, APAIS

Introduction

Surgery is widely recognised as a distressing event that commonly triggers anxiety in patients. Pre-operative anxiety is a normal and predictable response characterised by feelings of unease, fear and apprehension accompanied by physiological manifestations such as increased blood pressure, heart rate and respiratory rate[1,2]. Intense and prolonged pre-operative anxiety can negatively impact post-operative outcomes including, but not limited to, increased pain, surgical site infection, delayed wound healing, prolonged recovery and extended hospitalisation[3–5].

Pre-operative anxiety occurs among patients scheduled for surgery, regardless of the nature of the surgery. Several studies have assessed the prevalence of pre-operative anxiety. In a systematic review and meta-analysis of 28 studies conducted across developed and developing countries, the estimated prevalence of pre-operative anxiety ranged from 21 to 80 per cent. The overall pooled prevalence of pre-operative anxiety was found to be 48 per cent[6]. Another systematic review and meta-analysis of 27 studies focusing on low and middle-income countries reported a pooled prevalence of pre-operative anxiety at 55.7 per cent[7]. The causes of pre-operative anxiety include anticipation of pain, loss of independence, fear of anaesthesia and surgical complications, changes in appearance and unfavourable diagnosis[6,8].

Multiple factors, including demographic, psychological and surgery-related aspects, have been identified as contributors to pre-operative anxiety. Factors such as previous surgical experiences and access to information regarding anaesthesia and the surgical procedure have been found to influence pre-operative anxiety levels[9]. Gender has also been shown to play a role, with a recent systematic review of 27 studies involving 5575 surgical patients indicating that females tend to experience higher levels of pre-operative anxiety than males[7]. Furthermore, patients with a history of mental illnesses, including chronic anxiety and depression, may be more prone to experience high pre-operative anxiety levels[10].

The management of pre-operative anxiety often involves using sedatives and anxiolytic medications, including fentanyl, midazolam, morphine and ketamine[11]; however, these pharmacological interventions can have adverse effects such as respiratory difficulties, drowsiness and potential interference with anaesthesia medications[12]. Consequently, non-pharmacological approaches are gaining popularity as alternative interventions. These include interventions like aromatherapy, music therapy, audio-visual interventions and educational interventions[13–16]. The management of pre-operative anxiety lacks a widely accepted guideline or protocol. As a result, the choice between pharmacological and non-pharmacological interventions is primarily based on the preferences of the treating team. For instance, a report conducted in the United Kingdom demonstrated that a significant majority of anaesthetists (95%) favoured non-pharmacological interventions, such as patient communication and reassurance, as their preferred approach to managing pre-operative anxiety in adult patients[17].

Various instruments have been validated to measure patients' level of pre-operative anxiety. These include the Hospital anxiety and depression scale (HADS), the Amsterdam pre-operative anxiety and information scale (APAIS), the state–trait anxiety inventory (STAI), and the visual analogue scale (VAS)[18–21]. The APAIS is one of the most widely used tools to screen for pre-operative anxiety because it is a short and quick self-completion tool that has been translated into many languages[18]. Additionally, objective methods such as heart rate, blood pressure, cortisol levels and urinary catecholamine levels can be used to estimate pre-operative anxiety[22].

While systematic reviews and meta-analysis have provided insights into the global prevalence of pre-operative anxiety, yet a clear gap in knowledge exists about the Australian context. With its diverse cultural and socioeconomic factors and unique health care system, Australia provides a unique environment that can influence pre-operative anxiety levels in distinct ways. Hence, this study contributes to the global understanding of pre-operative anxiety, enriching the literature and informing future studies. The aim of this study was to determine the prevalence of anxiety among Australian elective surgical patients and to examine whether independent variables such as age, gender and type of surgery had an influence on pre-operative anxiety.

Methods

Study design, setting and population

A prospective observational study was conducted at the Royal Brisbane and Women's Hospital (RBWH) between November 2021 and June 2022. Located in Brisbane, the RBWH is the largest hospital in Queensland and performs over 27 500 surgical procedures annually, eight per cent more than other metropolitan hospitals in the area.

The study included patients who underwent elective surgery at the RBWH, were 18 years of age or older and able to communicate in English. Patients scheduled for day surgery only were excluded from the study. The researchers determined that a sample size of 300 participants was necessary to avoid sampling error (point precision of +/-5%). The calculation to determine the prevalence of anxiety was done using the sample size calculator from the Australian Bureau of Statistics. The calculated proportion was 32.47 per cent with a sample size of 300 (95% CI, 37.78–27.17%)[23].

Ethical approval for the study was obtained from the RBWH Human Research Ethics Committee with the reference number HREC/2021/QRBW/74417. Informed consent was obtained from all participants. The hospital admission team reviewed the surgical list to identify eligible participants. These patients were then sent an SMS containing a link to the information statement and consent form. Patients who were interested in participating in the study returned the signed consent form prior to the day of surgery.

Data collection and instrument

After obtaining written informed consent, participants were asked to complete the APAIS in the pre-operative holding area. The data were collected using the REDCap (V12.0.13) electronic clinical data management system[24]. In case participants encountered any difficulties while completing the questionnaire, the researcher was available to provide assistance. Demographic information, including age, gender and type of surgery, was extracted by the researcher from the patient's medical records.

The APAIS is a validated tool widely used to assess pre-operative anxiety levels among surgical patients. Its development was driven by the recognition of the importance of measuring anxiety before surgery, as anxiety can significantly impact patient outcomes and overall surgical experience. It consists of two scales: an anxiety-related scale and an information-needs scale (see Table 3). There are six questions that are rated on a Likert scale ranging from 1 (not at all) to 5 (extremely), allowing patients to express the intensity of their anxiety or information requirements.

The anxiety scale has four questions (1, 2, 4 and 5) that assess the severity of anxiety symptoms experienced by patients. The scores from these four questions are added to give an anxiety score between 4 and 20. A score of 11 or higher on the anxiety scale indicates a moderate to severe level of anxiety, suggesting that patients may benefit from additional support and interventions to manage their anxiety effectively[25–27].

The information-needs scale has two questions (3 and 6) that evaluate the patients' information needs and preferences. The scores from these two questions are added to give an information-needs score between 2 and 10. A score of 5 or higher on the information scale suggests a greater need for information, indicating that patients require additional communication and education regarding their upcoming surgery[25–27].

The validity of the APAIS has been extensively examined through comparisons with other established anxiety assessments. These studies have demonstrated the reliability and accuracy of the APAIS in measuring pre-operative anxiety[26,27].

Statistical analysis

Descriptive statistics were used to summarise the characteristics of the patients and APAIS questionnaire items. Continuous data were described using mean and standard deviation (mean ± SD) or median and interquartile range (IQR), while categorical data were presented as frequencies and percentages. Univariate logistic regression was used to evaluate the significance of independent variables including age, gender and surgery type. Subsequently, a multivariate logistic regression analysis was used to develop a model of patient characteristics associated with total anxiety score on the APAIS. Finally, the model was checked to ensure the logistic regression assumptions held true.

Results

Demographic characteristics

A total of 308 patients (179 (57%) women) were recruited for the study with an average age of 51 years (SD ± 17). The surgeries were classified into eight surgical specialties based on the study site's classification. These specialties were ear nose and throat surgery (14%), general surgery (13%), maxillofacial surgery (8%), neurosurgery (10%), orthopaedic surgery (22%), urologic surgery (7%), vascular surgery (7%) and 'other' surgeries (19%), which included but were not limited to skin graft and biopsy. Further details regarding gender, age and surgery type are shown in Table 1.

Prevalence of pre-operative anxiety

Overall, 32.4 per cent (95% CI, 27.24–37.70) of surgical patients in this study experienced a moderate to severe level of pre-operative anxiety, as indicated by a score of

Table 1: Patient demographics and surgery types

		N=308
Gender	female	179 (58%)
	male	129 (42%)
Age in years (mean ± SD)		51 (± 17)
Type of surgery	Ear, nose, throat	42 (14%)
	general	40 (13%)
	maxillofacial	26 (8%)
	neuro	31 (10%)
	orthopaedic	68 (22%)
	urologic	21 (7%)
	vascular	22 (7 %)
	other	58 (19 %)

11 or higher on the APAIS (see Table 2). The mean anxiety score, which combines both anaesthesia-related and surgery-related anxiety, was found to be 8.69 out of 20 (± 4.08).

Notably, patients had a higher level of anxiety about the surgical procedure itself, with a mean score of 5.04 out of 10 (± 2.48), compared to their anxiety about anaesthesia, which had a mean score of 3.65 out of 10 (± 2.07). Furthermore, patients expressed a greater need for information about the procedure compared to anaesthesia (mean scores 2.85±1.30 and 2.11± 1.10, respectively). The mean scores for each APAIS item are shown in Table 3.

Statistical analysis of factors associated with pre-operative anxiety

A logistic regression was performed to ascertain the effects of age and gender on the pre-operative anxiety of patients scheduled for surgery. The logistic regression model was statistically significant (X^2 (df=2, N = 308) = 25.22, p < .001). The model explained 11.0 per cent (Nagelkerke R2 = 0.11) of the variance in anxiety and correctly classified 67.2 per cent of cases. Females were three times as likely to experience anxiety before surgery compared to males (OR=3.39, 95%CI 1.98–5.83). Older patients were significantly less likely to experience anxiety with a reduction in anxiety of two per cent for each additional year above 18 years (OR=0.98, 95%CI 0.97–0.99). The type of surgery was not associated with pre-operative anxiety (see Table 4).

Table 2: Prevalence of pre-operative anxiety (N=308)

Anxiety level	APAIS anxiety score (range: 4–20)	n (%)
nil anxiety	4	45 (14.6 %)
mild anxiety	5 to 10	163 (53%)
moderate to severe anxiety	11 to 20	100 (32.4 %)

The APAIS anxiety score is the sum of scores for questions 1,2,4 and 5.

Discussion

This prospective observational study examined the prevalence of pre-operative anxiety among 308 adult surgical patients. The findings indicate that the majority of participants (85.4%) experienced some level of pre-operative anxiety, with over one third reaching a clinically significant level, indicating the need for treatment[25–27]. These results align with a recent study in Jordan that used the same assessment tool, the APAIS, and reported a prevalence of pre-operative anxiety at 30.1 per cent[28]. When comparing the prevalence of pre-operative anxiety across different countries, it is evident that the rates vary. A systematic review and meta-analysis, including 28 studies from developed and developing countries estimated the pooled prevalence of pre-operative anxiety at 48 per cent[6]. Similarly, another systematic review and meta-analysis that included 27 studies focusing on low and middle-income countries found a pooled prevalence of pre-operative anxiety at 55.7 per cent[7]. None of the studies included in these systematic reviews were conducted in Australia, which left a significant knowledge gap regarding pre-operative anxiety within the Australian population. This underscores the significance of our study in filling this gap and offering valuable insights specific to the Australian context.

Table 3: Pre-operative APAIS scores by item (N=308)

APAIS domain	APAIS item	Mean score (SD)
Anaesthesia-related anxiety	1. I am worried about the anaesthetic	1.96 (± 1.15)
	2. The anaesthetic is on my mind continually	1.69 (± 1.04)
	Total score for anaesthesia-related anxiety	3.65 (± 2.07)
Surgery-related anxiety	4. I am worried about the procedure	2.52 (± 1.26)
	5. The procedure is on my mind continually	2.52 (± 1.35)
	Total score for surgery-related anxiety	5.04 (± 2.48)
	Total anxiety score	**8.69 (± 4.08)**
Need-for-information	3. I would like to know as much as possible about the anaesthesia	2.11 (± 1.10)
	6. I would like to know as much as possible about the procedure	2.85 (± 1.30)
	Total need-for-information score	**4.96 (± 2.13)**

The mean anxiety score in this study was 8.69 (± 4.08) out of 20. It was observed that patients were more anxious about the surgical procedure itself than the anaesthesia. These findings align with a cross-sectional study of 3200 elective adult surgical patients in Germany, which also used the APAIS tool and reported higher anxiety levels related to the surgical procedure than anaesthesia[29].

To address the significant issue of pre-operative anxiety in health care, it is recommended to implement universal screening for pre-operative anxiety as a standard care practice for all surgical patients. One such screening tool is the APAIS, which helps identify patients with elevated anxiety levels and enables the provision of appropriate interventions[30]. Detecting patients with high levels of anxiety and prioritising them to receive appropriate interventions is crucial, as high levels of pre-operative anxiety can have negative impacts on post-operative outcomes, including increased pain, delayed wound healing, surgical site infection, prolonged recovery and extended hospitalisation[3–5].

Pre-operative anxiety prevalence rates vary across countries; this can be attributed to multiple factors, including the use of different assessment tools to measure anxiety levels. Therefore, it is crucial to standardise the assessment tool in future research to ensure consistency and facilitate meaningful comparisons across studies. Moreover, cultural, socioeconomic and health care system factors can significantly influence patients' experiences and pre-operative anxiety. These factors can be incorporated into the assessment and management of pre-operative anxiety, so health care providers can tailor their interventions accordingly.

In our study, female patients experienced three times the level of anxiety compared to male patients. This corroborates the findings of the systematic reviews by Bedaso et al.[7] which consistently demonstrated higher levels of pre-operative anxiety among females across 5575 surgical patients. This indicates a notable pattern of elevated anxiety in female patients during the pre-operative period[7]. However, the precise reasons behind this gender difference in pre-operative

Table 4: Logistic regression model: Influence of patient demographic characteristics on anxiety experienced before surgery (N=308)

Variable	Beta (β)*	Standard error (SE)	Significance	Odds ratio (OR) (95% OR)
Gender (female)	1.222	0.276	<0.001	3.393 (1.975–5.829)
Age (years)	-0.017	0.008	0.028	0.983 (0.968–0.998)
Constant	-0.660	0.425	0.120	0.517

* Standardised beta is similar to a correlation coefficient.

anxiety remain incompletely understood. A systematic review by Farhane-Medina et al.[10] that included 44 studies, of which 31 were empirical studies, suggested that a combination of psychosocial and biological factors may contribute to higher anxiety levels experienced by women, with factors such as gender roles, social support, hormones and genetics likely influencing this disparity[10]. In addition, gender differences in anxiety expression should be considered, as women may be more open in discussing and seeking support for their anxiety compared to men. Thus, variations in anxiety levels between genders do not necessarily imply that women inherently experience higher levels of anxiety.

Health care providers should be attentive to the higher levels of pre-operative anxiety experienced by female patients. Implementing gender-specific approaches to address anxiety, such as providing additional support, adequate information and reassurance, may help alleviate anxiety levels in this patient population. For instance, educational resources that concentrate on coping strategies could be provided, family members or support networks could be involved in the care process or access to specialised counselling services could be facilitated.

Our study findings suggest that age is negatively associated with pre-operative anxiety. Older patients experienced significantly less anxiety, as anxiety decreased by two per cent with each additional year over 18. This finding was consistent with findings from research in Turkey in which 186 younger elective surgical patients (≤30 years) had a significantly higher pre-operative anxiety score[31]. Similarly, a study of 155 patients undergoing foot nail surgery in Spain reported higher levels of pre-operative anxiety in younger patients compared to those over 65 years old[32], and research in Ethiopia found higher anxiety levels in patients between 18 and 31 years of age than patients between 31 and 45[33]. In contrast, Woldegerima et al.[34] suggest that older patients may be more prone to anxiety due to comorbidities. Therefore, it is important to take age into account as a significant determinant of pre-operative anxiety and develop tailored interventions to effectively alleviate anxiety and improve patient outcomes in different age groups.

In this study, the surgical specialty was not identified as a predictor of pre-operative anxiety. However, the literature shows inconsistency regarding the influence of surgical type on anxiety levels. Some studies report no significant impact of surgical specialty on anxiety[18,26], while others suggest that orthopaedic and cardiac surgery patients may experience higher anxiety levels[35,36]. To address the inconsistent findings regarding the relationship between surgical specialty and pre-operative anxiety, it is recommended to implement pre-operative anxiety screening for all surgical patients, regardless of their surgical specialty. This ensures that patients at risk of anxiety are identified and provided with tailored interventions and support, regardless of their specific surgical specialty.

Limitations

There are several limitations that should be acknowledged in this study. Firstly, the assessment of anxiety did not consider other potential factors that could influence anxiety levels, such as previous surgical history, education level, chronic anxiety or depression. Secondly, the variability in waiting times experienced by participants resulted in an inconsistent measurement of anxiety. Some patients had longer waiting times – up to six hours – while others had just arrived in the pre-operative holding area. This variation in waiting times may have impacted anxiety levels and potentially contributed to higher levels of anxiety among specific individuals.

Relevance to clinical practice

Identifying the significant prevalence of pre-operative anxiety among elective surgical patients highlights the importance of incorporating pre-operative anxiety screening into routine assessments to identify those with high anxiety levels. Elevated anxiety levels have been associated with negative post-operative outcomes, including delayed recovery, prolonged hospital stays, increased post-operative pain and higher rates of complications. Recognising that women and younger patients are at higher risk of experiencing anxiety enables clinicians to prioritise interventions and support for these groups. The use of a standardised assessment tool is essential for assessing pre-operative anxiety accurately in clinical practice.

Conclusions

A significant prevalence of pre-operative anxiety among elective surgical patients is highlighted in this study, with moderate to severe anxiety experienced by approximately one-third of the participants. Pre-operative anxiety is found to be more prevalent in females and younger patients, while lower levels of anxiety are observed in older patients. The study does not find surgical specialty to be a significant predictor of pre-operative anxiety. The importance of screening surgical patients

for pre-operative anxiety is emphasised, and the understanding and management of pre-operative anxiety can be enhanced through the standardisation of assessment tools. Further research is needed to explore potential interventions for alleviating pre-operative anxiety.

Declaration of conflicting interests and funding statement

The authors have declared no competing interests with respect to the research, authorship and publication of this article.

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All authors have contributed equally. All authors have read and approved the final version of the manuscript.

Ethics approval and consent to participate

Ethical approval for the study was provided by the Royal Brisbane and Women's Hospital Human Research Ethics Committee with the reference number HREC/2021/QRBW/74417. Informed consent was obtained from all participants. Any information taken from the participants was kept confidential. We used codes rather than names of the participants while we were collecting the data.

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Data access

The data presented in this study are available, on request, from the corresponding author.

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