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# Predictors of preoperative anxiety in patients scheduled for various surgical procedures under general anesthesia: Our experience with 301 patients

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**Abstract**

Anxiety is an unpleasant condition that includes thinking of tension, apprehension, uneasiness, and it is associated with high autonomic activity. Anxious patients need higher doses of anesthetic induction medications, and they tend to recover poorly. Our aim was to determine the predictors of preoperative anxiety in adult patients scheduled for surgery under general anesthesia. A total of 301 adult patients (217 women, 84 men; average age: 42.18±14.41) who were scheduled for various surgical procedures under general anesthesia. Spielberger's State-Trait Anxiety Inventory (STAI) was used to assess the level of preoperative anxiety. All patients filled out STAI questionnaires that consisted of 40 items investigating the state and trait of anxiety. Responses to 40 questions were categorized into 2 separate groups: 23 questions were associated with the anxiety-positive scale, whereas 17 questions were termed as the anxiety-negative scale. Baseline descriptives including age, gender, body-mass index, smoking habits, comorbidities, and history of previous surgeries were recorded. Anxiety-positive and anxiety-negative scales of the STAI questionnaire were assessed to figure out the predictors of preoperative anxiety. Male patients ($p<0.001$) and employed or retired patients ($p<0.001$) were less anxious than their counterparts in the anxiety-negative scale of STAI. While women ($p<0.001$), unemployed patients ($p=0.002$), and smokers ($p=0.036$) seemed to be more anxious according to the results of anxiety-positive scale of STAI. Our results indicated that baseline characteristics and personal features of patients must be reviewed carefully during preoperative evaluation for general anesthesia. Further trials on larger series are necessary to test the validity of STAI in different populations. Revision of the number and content of the questions must be conducted carefully during these studies.

**Keywords:** preoperative anxiety, general anesthesia, questionnaire, State-Trait Anxiety Inventory

## 1. Introduction

The preoperative period is characterized by specific emotional, cognitive, and physiological responses in patients, which can lead to surgery-related anxiety. This anxiety is a normal reaction during the preoperative period and can exacerbate stress levels, negatively impacting psychological and physiological parameters. Preoperative anxiety has been associated with adverse effects such as hypertension, increased heart rate, bleeding, and increased need for pain relief. It is also known to impair thinking, decision-making, perception, and concentration (1).

Evaluating preoperative anxiety and preparing appropriate sedation are crucial in dental surgery performed under local anesthesia. Spielberger's State-Trait Anxiety Inventory (STAI) has been proven effective in predicting preoperative anxiety. Simplifying the assessment of anxiety by reducing the number of state anxiety items (questions) would be clinically significant (2). Trait anxiety refers to an individual's underlying tendency to perceive situations in a certain way. Previous studies have utilized STAI to assess preoperative anxiety (3-8). Careful review of patients' basic characteristics and personal characteristics to determine the level of anxiety in patients scheduled for surgery under general anesthesia must be done. In this study, we aimed to evaluate the validity of the State-Trait Anxiety Inventory (STAI) in different populations and to show how gender, occupation, smoking habits, and previous surgical experiences affect the anxiety level in adult patients.

## 2. Materials and Methods

### 2.1. Study Design

This cross-sectional study received approval from the local ethics committee of our institution (KAEK/2021.04.144). The study utilized the STAI-TX questionnaire. A total of 301 fully completed questionnaires were analyzed, which were obtained from adult patients scheduled for various surgical interventions under general anesthesia at our tertiary care center. Uncooperative and unoriented people, illiterate people and children were not included in our study. Adults who

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volunteered and those who would receive general anesthesia were included. When the patients for whom the operation was planned applied to the anesthesia clinic a few days before, the STAI forms were filled out by them and the forms were recorded.

The STAI-TX answer sheets consisted of 2 pages: the front page contained items related to state anxiety, while the questions on the back page were linked to trait anxiety (see Appendix 1). Patients were instructed to complete the STAI forms. The questions on the front page were related to their feelings on the consultation day, while the questions on the back page reflected their usual feelings, irrespective of surgery. Both the state and trait pages consisted of 20 items, and responses were scored on a scale of 1 to 4. The questions included both direct and reverse-worded items, with scores ranging from 20 to 80. The questions were divided into two scales: anxiety-positive scale and anxiety-negative scale. Higher scores indicated higher levels of anxiety in the anxiety-positive scale, while higher scores indicated lower levels of anxiety in the anxiety-negative scale.

In this study, we followed the methodology suggested by Iwata et al., which involved evaluating the responses to anxiety-present and anxiety-absent items independently (9). This approach allowed us to accurately reflect the level of anxiety and analyze the responses to our STAI forms.

### 2.2. State and Trait Anxiety Scale Rating

If more than three statements were left unanswered, the completed form was considered invalid and not scored. The response options were divided into four classes for the State Anxiety Scale: (1) None, (2) a little, (3) a lot, and (4) a complete form. For the Trait Anxiety Scale, the response options were: (1) Almost never, (2) sometimes, (3) much of the time, and (4) almost always. The scales included both direct and reverse expressions. Direct expressions represented negative emotions, while reverse expressions indicated positive feelings. In the scoring, direct expressions were assigned weights of 1 to 4, with 4 indicating a high level of anxiety. In reversed expressions, a weight value of 1 indicated high anxiety, while a weight value of 4 indicated low anxiety. For example, the expression "uneasiness" was directly stated as "I feel calm" in reverse. If a 4-weighted option was chosen for "uneasiness" and a 1-weighted option was chosen for "I feel calm," these responses would reflect high anxiety. The State Anxiety Scale contained ten reversed expressions (articles 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20). The Trait Anxiety Scale had seven reversed expressions (articles 21, 26, 27, 30, 33, 36, and 39). Scoring could be done manually or by computer.

### 2.3. Manual Scoring

Separate keys were prepared for direct and reverse statements. The total weight of the expressions reversed with the second key was calculated directly using that key. The total weighted score for direct expressions was subtracted from the total weighted score. A predetermined constant value was added to this number. For the State Anxiety Scale, the constant value was 50, and for the Trait Anxiety Scale, it was 35.

### 2.4. Interpretation of Scores

Scores obtained from both scales theoretically ranged from 20 to 80 points. Higher scores indicated higher levels of anxiety, while lower scores indicated lower levels of anxiety. The same interpretation applied when considering percentile rankings. For example, a low percentile ranking (1, 5, 10) indicated low anxiety. The average score level in the applications ranged from 36 to 41.

### 2.5. Statistical Analysis

Data analysis was performed using IBM Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 21. Descriptive statistics were presented as mean and standard deviation for quantitative variables, while categorical variables were expressed as numbers and percentages. The normality of parametric variables was assessed using the Shapiro-Wilk test. T-tests were used to compare differences between two groups, while the Tukey test was used for comparisons involving more than two groups. Pearson correlation coefficient was calculated to analyze the correlation between variables under investigation. The significance level was set at $p < 0.05$.

## 3. Results

Table 1 presents the baseline characteristics of our study population. The age range of the patients included in the study was 19-74. The average age was 42.18±14.41 years, and the average body mass index (BMI) was 27.38±5.68. Of the 301 patients included in the study, 217 (72.1%) were female and 84 (27.9%) were male. Eighty-five patients (28.2%) were employed, while 189 (62.8%) were either unemployed or housewives. Twenty-seven patients (9%) were retired. The number of smokers was 96 (31.9%). Eighty-nine patients (29.6%) had comorbidities, and 185 patients (61.5%) had a history of previous surgery.

**Table 1.** Baseline descriptives in our population (n=301)

| | | Mean±Standard deviation | |
|---|---|---|---|
| **Age** | | 42.18± 14.41 (19-74 years old) | |
| **Body-mass index** | | 27.381 ± 5.677 | |
| | | **Number** | **Percentage** |
| **Gender** | **Female** | 217 | 27.9 |
| | **Male** | 84 | 72.1 |
| **Occupation** | **No** | 189 | 62.8 |
| | **Yes** | 85 | 28.2 |
| | **Retired** | 27 | 9.0 |
| **Smoking** | **No** | 205 | 68.1 |
| | **Yes** | 96 | 31.9 |
| **Comorbidity** | **No** | 212 | 70.4 |
| | **Yes** | 89 | 29.6 |
| **Previous surgery** | **No** | 116 | 38.5 |
| | **Yes** | 185 | 61.5 |

A comparative analysis of the anxiety-absent and anxiety-present scales of the STAI is presented in Table 2. According to the anxiety-absent scale, males ($p<0.001$) and employed or retired patients ($p<0.001$) had significantly higher scores, indicating lower levels of anxiety. In contrast, according to the

anxiety-present scale, females (p<0.001) and smokers (p=0.036) had higher scores, indicating higher levels of anxiety. Retired patients had significantly lower scores on the anxiety-present scale compared to employed or unemployed patients, suggesting lower stress levels. Comorbidities or history of previous surgery did not appear to have a significant impact on the level of anxiety according to both the anxiety-absent and anxiety-present scales.

**Table 2.** Comparison of anxiety absent and anxiety present scales of STAI with respect to baseline descriptives

| | | Anxiety Absent Scale | p-value | Anxiety Present Scale | p-value |
|---|---|---|---|---|---|
| **Gender** | **Female**<br>**Male** | 42.91 ± 7.09<br>48.42 ± 8.02 | ***<0.001**** | 43.10 ± 8.92<br>36.88 ± 7.53 | ***<0.001**** |
| **Occupation** | **No**<br>**Yes**<br>**Retired** | 43.04 ± 6.99[a]<br>46.42 ± 8.54[b]<br>48.04 ± 7.94[b] | ***<0.001**** | 39.15 ± 8.83[a]<br>39.15 ± 9.39[b]<br>38.63 ± 6.76[a.b] | ***0.002**** |
| **Smoking** | **No**<br>**Yes** | 44.34 ± 7.66<br>44.68 ± 7.97 | 0.723 | 42.11 ± 8.61<br>39.78 ± 6.61 | ***0.036**** |
| **Comorbidity** | **No**<br>**Yes** | 44.64 ± 7.83<br>43.98 ± 7.58 | 0.498 | 40.83 ± 8.96<br>42.65 ± 8.98 | 0.108 |
| **Previous surgery** | **No**<br>**Yes** | 44.82 ± 8.23<br>44.21 ± 7.45 | 0.508 | 42.59 ± 9.51<br>40.59 ± 8.58 | 0.060 |

(Abbreviations: *: statistically significant)

There was no significant correlation between age, BMI, and the anxiety-absent scale of the STAI. However, a positive and significant correlation was found between age, BMI, and the anxiety-present scale of the STAI (Table 3).

**Table 3.** Correlation analysis between age, body-mass index and anxiety-absent and anxiety-present scales

| | Anxiety Absent Scale | | Anxiety Present Scale | |
|---|---|---|---|---|
| | **r** | **p** | **r** | **p** |
| **Age** | 0,059 | 0,309 | 0,132 | ***0,022**** |
| **BMI** | -0,011 | 0,848 | 0,119 | ***0,040**** |

Abbreviations: BMI: body-mass index; *: statistically significant

## 4. Discussion

This study aimed to assess the determinants of preoperative anxiety in patients scheduled for surgery under general anesthesia. Our results showed that gender, smoking habits, and occupation were associated with the level of anxiety. Female gender, smokers, and unemployed patients were more prone to preoperative anxiety. On the other hand, there was no significant correlation between age, BMI, and the anxiety-absent scale, but a significant positive correlation was observed between age, BMI, and the anxiety-present scale. We used the STAI to evaluate preoperative anxiety, and the ability to predict anxiety with fewer questions has clinical importance, as it reduces the mental burden on patients and shortens the examination duration (2). Anxiety, as a component of mental stress, can significantly influence respiration and hemodynamics, leading to complications and morbidities (10).

Patients with higher levels of anxiety are more sensitive to pain during procedures, so assessing preoperative anxiety and managing it effectively can contribute to better pain control. Therefore, a comprehensive evaluation of preoperative anxiety is crucial for implementing appropriate measures for analgesia during and after the procedure (11).

The STAI has been recognized as a useful tool for assessing anxiety and fear levels in patients before surgery (12-13). It is based on the state-trait model of anxiety (3). The timing of administering the STAI can significantly affect the responses given by patients since their anxiety levels may change before the surgery. It is recommended that the test be performed without revealing the results to the patient during the first visit or at the time of treatment (2). It has been reported that anxiety levels may decrease before surgery compared to the initial visit, possibly due to the development of trust and confidence between the patient and physician, as well as a sense of acceptance of the situation (2,14). Careful evaluation of anxiety, along with providing adequate explanations about the disease and procedure, can be useful in reducing anxiety levels.

Koga et al. suggested that administering the STAI at the first visit may be more appropriate for estimating preoperative anxiety. However, elderly patients may have difficulty filling out the forms, and a higher number of questions may require more time, leading to reduced compliance and reliability of answers. Consistent with previous publications, we recommend efforts to reduce the number of questions in the STAI to facilitate easier and more accurate evaluation of preoperative anxiety (2).

Further research is needed to study the applicability of the state-trait concept to the anxiety-absent and anxiety-present scales. Similar to the study by Bedaso et al., which reported a high prevalence of preoperative anxiety (47%), our findings indicate that factors such as strong social support, unexpected surgical outcomes, harm due to medical errors, the need for blood transfusion, and inability to recover significantly influence preoperative anxiety. They also recommend regular assessment of anxiety during preoperative visits (1).

Our results revealed that women, smokers, and unemployed patients had higher levels of preoperative anxiety.

During the preoperative period, it is important to identify these risk groups and prepare appropriate measures for analgesia and anxiety management. Additionally, health services and smoking cessation programs should be implemented specifically for patients scheduled for surgery, utilizing the preoperative period as an opportunity to quit smoking altogether.

The main limitations of our study include a small sample size, data collected from a single center, and the potential impact of ethnic, cultural, social, and environmental factors that may influence anxiety levels. Therefore, caution should be exercised when extrapolating our findings to larger populations and making associations.

In conclusion, our study provides basic data on the correlates and predictors of preoperative anxiety in Turkish patients scheduled for surgery under general anesthesia. Gender, occupation, and smoking habits appeared to influence anxiety levels in adult patients. Females, unemployed patients, and smokers tended to experience higher levels of preoperative anxiety. However, further research involving larger cohorts is needed to validate the STAI in different populations and to refine the number and content of items included in the questionnaire.

**Conflict of interest**

Authors declare that there is no conflict of interest for this article.

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The authors declare no competing interests.

**Authors' contributions**

Concept: N.A., Design: N.A., Data Collection or Processing: N.A., Analysis or Interpretation: O.E., Literature Search: N.A., O.E., Writing: N.A., O.E.

**Ethical Statement**

This cross-sectional study received approval from the local ethics committee of our institution (KAEK/2021.04.144).

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