RESEARCH ARTICLE

Predictive Factors of Preoperative Anxiety in the Anesthesia Clinic: A Survey of 231 Surgical Candidates

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Background: Despite the growing advancements of surgical and anesthetic techniques resulting in decreased morbidity and mortality, the period before surgery remains stressful for most patients. Considering the adverse effect of preoperative anxiety on anesthesia and surgery outcomes, we conducted this study to evaluate the level of anxiety in the anesthesia clinic among Iranian patients undergoing surgery and also to determine its associated factors.

Methods: This was a cross-sectional study performed on 231 patients admitted to the anesthesia clinic of Imam Khomeini hospital, Tehran, Iran. Data were collected by using a three-part questionnaire consisting of demographic data, clinical findings and the translated version of Spielberger state-trait anxiety inventory (STAI). Chi-square test and binary logistic regression model were performed for univariate and multivariate analysis, respectively. A p-value< 0.05 was considered statistically significant.

Results: The mean (SD) score for state and trait anxiety were 39.8 (13.4) and 36.5 (12.2), respectively. A significant association was seen between state anxiety and age, gender, occupation, level of education, marital status, patients' awareness of type of anesthesia and patients' awareness of anesthesia adverse events (p< 0.05). The most predictive factors for state anxiety were age, patients' awareness of anesthesia adverse events and female gender, and for trait anxiety these factors were age, place of residence and female gender.

Conclusion: Screening for anxiety and identifying individuals vulnerable to preoperative anxiety (e.g. younger patients, females…) can help reduce undesirable surgery outcomes and their economic burden on the healthcare system.

Keywords: Anesthesia; Preoperative anxiety; Spielberger questionnaire; Spielberger state-trait anxiety inventory (STAI); Surgery

Anxiety is defined as a feeling of fear, tension or vexation. Surgical candidates are prone to significant psychological distress in the preoperative period. Various factors can have an impact on preoperative anxiety such as previous experiences, degree of knowledge about the upcoming surgical procedure or anesthesia, and also one's own personality traits. It has been shown that the prevalence of preoperative anxiety varies widely with a range of 11-80% among patients [1]. Anxiety in the preoperative period can lead to an unstable hemodynamic status through stimulating the autonomic and endocrine system. Studies have shown that preoperative anxiety may result in suppression of the immune system, increased heart rate and blood pressure during and after the operation, difficulty in performing daily activities and decreased concentration [2-3]. It also causes a decreased response to analgesics and anesthetic drugs [4-7]. Due to the reasons mentioned above, preoperative anxiety is considered a major morbidity factor during and after surgical operation [8]. It has been reported that severe preoperative anxiety is associated with longer hospital stays, delayed wound healing and a higher incidence of post-operative complications such as pain, nausea and vomiting. All of these factors contribute to an economic burden on the healthcare system [9-13]. In addition, satisfaction of management, a marker used for commercial purposes and quality of patient care, reduces with anxiety [14]. In 1958, Janis et al investigated the role of anxiety on recovery time after surgery for the first time. According to his "anxiety work" theory, a curved relationship exists between preoperative anxiety and postoperative pain, indicating that moderate levels of anxiety help the patient most in coping with the distress of surgery, whereas low or high anxiety levels are incompatible with the surgery outcome [15].

Unfortunately, despite the undesirable clinical outcomes of preoperative anxiety, the level of anxiety of patients awaiting surgery is not taken into consideration by physicians. Not many years ago, surgery itself was also a neglected aspect of global health. However, recently, agreement has been made that surgery represents a considerable component of health services and has a

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significant impact on the global burden of disease. As Debas et al have stated, approximately 11% of global DALYs can be subdued with surgical procedures [16]. Based on published data by World Health Organization (WHO) in 2012, annually 4106 surgeries per 100000 population are performed in Iran [17]. Despite progress in technology, techniques, and knowledge, major surgical procedures are still associated with high mortality and morbidity rates.

Previous studies have used various questionnaires for measuring anxiety. The most common include the State-Trait Anxiety Inventory (STAI), Amsterdam Preoperative Anxiety Information Scale (APAIS), Hospital Anxiety and Depression Scale (HADS), and Visual Analogue Scale (VAS) [18]. To date, the Spielberger questionnaire remains the gold-standard for measuring anxiety [19]. Certain factors have been shown to predict the preoperative anxiety scores such as age, gender, education, and marital status. History of surgery and anesthesia has also been investigated in a number of studies. However, there are conflicting results on this matter, with some studies finding no significant association, while others stating decreased levels of anxiety in patients who have experienced a previous surgery [1, 20-25]. Earlier studies in Iran have investigated potential factors causing anxiety in the operation room [26-27]. However, no study has been carried out to assess patients' anxiety in the anesthesia clinic before entering the operation room. The purpose of this study was to assess the preoperative anxiety level among Iranian patients undergoing surgery in the anesthesia clinic and to identify the predictive factors of anxiety.

Methods

This study was a cross-sectional study in which patients were recruited from the anesthesia clinic of Imam Khomeini hospital in Tehran between October-December 2018. The study protocol was approved by the ethical committee of Tehran University of Medical Sciences and the principles of Helsinki Statement have been followed. Patient selection was randomized in the way that patients with even admission numbers were selected on even days and patients with odd admission numbers were recruited on odd days. All the patients selected for the study were referred to the investigators after an anesthetic consultation by an anesthetist not involved in the study. The questionnaires were given to the patients after obtaining written informed consents and explanation about the confidentiality of the information. If a patient was not able to read/write, the questionnaire would be filled out by a blind investigator after reading out the questions for her/him. Additional explanation was provided by blind evaluators upon patients' request. Patients aged 18 years or older undergoing elective surgery with sufficient fluency in Persian language met our inclusion criteria. Our exclusion criteria were emergency surgeries, history of cognitive disorders, history of psychological disorders, previous history of smoking or any other substances, and refusal to participate in the study. No restrictions were made based on the type of surgical operation or anesthesia (local, regional or general). The patients were planned to have their surgery performed in at least 2 weeks after their visit to the clinic. Data were collected using a three-part questionnaire: the first part consisted of demographic data (age, sex, occupation, level of education, ethnicity, marital status, and place of residence), the second part consisted of clinical information such as type of anesthesia (based on p, previous history of anesthesia, patients' awareness of the type of anesthesia, and patients' awareness of anesthesia complications and in the final part of the questionnaire, the State-Trait Anxiety Inventory (translated into Farsi) was used to measure anxiety levels. Validity and reliability of this version of the Spielberger questionnaire has been approved in the Iranian population by Dehghan-nayeri et al, in which the Cronbach's alpha value was 0.94 [28]. The Spielberger questionnaire has two sets of 20 questions, one set addressing state- and the other addressing trait-anxiety. The minimum score that can be achieved in each set is 20 meaning absence of anxiety, while the maximum score is 80 meaning the highest amount of anxiety. Scores ranging from 21-39 indicate mild anxiety, 40-59 moderate anxiety, and 60-79 severe anxiety. Data were entered in SPSS version 23 software after collection.

Statistical analysis

The Kolmogorov-Smirnov test was used to assess the normal distribution of continuous variables. Categorical data were reported as frequencies and percentages and for quantitative variables, mean and standard deviation (SD) was reported. The Chi-square test was used to analyze relationships between level of anxiety and independent variables. After performing univariate analysis, variables with a p-value of 0.2 or less entered the binary logistic regression model with forward elimination. In order to make the analysis more convenient at this stage, the level of anxiety was divided into two groups. Patients with absent or mild anxiety formed the first group and patients with moderate or severe anxiety were placed in the second group. In this study, p-value$<$ 0.05 was considered statistically significant.

Results

Initially 263 patients were enrolled but due to incomplete data, a total of 231 participants were included in the final analysis. The mean age (SD) of our patients was 48 (15) years with a range of 18-87 years. 58.9% (n=136) of the patient population consisted of females. A summary of the demographic characteristics is shown in (Table 1). The mean (SD) score for state and trait anxiety was 39.8 (13.4) and 36.5 (12.2), respectively. There was a significant association between state and trait anxiety (p$<$ 0.001). Regarding state anxiety, 12% of patients had severe anxiety and 35% had a moderate level of anxiety. As for trait anxiety, these figures were 7% and 35% for severe and moderate anxiety, respectively.

State Anxiety (s-STAI)

There was a statistically significant association between state anxiety and age, gender, occupation, level of education, marital status, patients' awareness of type of anesthesia and patients' awareness of anesthesia adverse events (p$<$0.05).

As shown in (Table 2), age, patients' awareness of anesthesia adverse events and gender were the strongest predictors for state anxiety, respectively. Among them age was a protective factor with each one year increase in age resulting in a 5% decrease in preoperative state anxiety (OR= 0.95, 95% CI= 0.93-0.97). However, patients' knowledge of anesthesia adverse events and female gender had an adverse effect increasing the risk of state anxiety.

Trait Anxiety (t-STAI)

A statistically significant association was observed between trait anxiety and age, gender, occupation, level of education, marital status, place of residence, patients' awareness of type of anesthesia and patients' awareness of anesthesia adverse events ($p< 0.05$). Binary logistic regression performed for each independent variable suggested age, place of residence and gender as predictive factors for trait anxiety.

According to our results, being a female increased the risk of trait anxiety by 2.5 times (95% CI= 1.32– 4.74) and urban residence raised this risk by 3.73 times (95% CI= 1.65– 8.44) compared to rural residence. Similar to state anxiety, age also had a protective role for trait anxiety (OR= 0.94, 95% CI= 0.91– 0.96) (Table 2).

Table 1- Demographic characteristics of patients

		Mean±SD	Min-Max
Age		48±15	18 - 87
		n	%
Gender			
	Female	136	58.9
	Male	95	41.1
Occupation			
	Health-related	17	7.4
	Non health-related	123	53.2
	Homemaker	91	39.4
Ethnicity			
	Fars	100	43.3
	Kurd	26	11.3
	Lor	22	9.5
	Turk	57	24.7
	Other	26	11.3
Education			
	Illiterate	35	15.2
	Primary school	63	27.3
	Secondary school	91	39.4
	University degree	42	18.2
Marital status			
	Single	29	12.6
	Married	171	74
	Other (widowed, divorced, …)	31	13.4
Place of residence			
	Rural	52	22.5
	Urban	179	77.5
History of anesthesia			
	Yes	122	52.8
	No	109	47.2
Type of anesthesia			
	General	194	83.8
	Local / Regional	37	16.2
Awareness of type of anesthesia			
	None or Little	197	85.3
	Adequate	34	14.7

Table 2- Predictive factors of state and trait anxiety after performing multivariate analysis

		OR	95% CI	SE	P-value
s-STAI					
Gender					
	Female	2.33	1.26 – 4.29	0.31	0.007
	Male	1			
Age		0.95	0.93 – 0.97	0.11	<0.001
Awareness of anesthesia AEs					
	None or Little	1	1.53 – 7.67	0.41	0.003
	Adequate	3.43			
t-STAI					
Gender					
	Female	2.51	1.32 – 4.74	0.32	0.005
	Male	1			
Age		0.94	0.91 – 0.96	0.01	<0.001
Place of residence					
	Rural	1	1.65 – 8.44	0.41	0.002
	Urban	3.73			

AEs: Adverse Events

Discussion

Anxiety is defined as a sense of unease characterized by fear, nervousness and tension and is associated with a broad array of physiological and psychological outcomes. It is one of the most common events that patients awaiting surgery experience. This study was performed to assess the level of anxiety among patients undergoing elective surgery in the anesthesia clinic prior to surgery. In this study, we found a significant association between state and trait anxiety which was consistent with the study performed by Beuhrer in 2015 [29]. Also, the mean (SD) score of state and trait anxiety in our study was 39.8 (13.4) and 36.5 (12.2), respectively, which was in close agreement with the results of a study published by Caumo estimating the mean scores of state and trait anxiety to be 39.2 and 39.6, respectively [30]. Although in the current study state anxiety was higher than trait anxiety, Erkilic and his colleagues found trait anxiety to be higher than state anxiety [25]. Our study demonstrated that gender is an independent predictor for preoperative anxiety and that females tend to experience a higher level of anxiety compared to men. This finding is similar to many previous studies and could possibly be due to higher emotional sensitivity in females and also sex hormone fluctuations resulting in mood disorders and anxiety [22, 31-32]. This finding can also be due to the reason that women express their anxiety more easily than men. Age appeared to be a protective factor against preoperative anxiety with each one year increase in age resulting in a 5% decrease in state anxiety and 6% decrease in trait anxiety. This finding was in accordance with multiple previous studies [21, 25, 33]. In contrast, Basak et al. concluded that preoperative anxiety is higher among elderly patients possibly due to higher risk of comorbidities in the older population [34].

In this study, a lower level of anxiety in the preoperative period was observed in married participants compared to others (e.g. single, divorced or widowed patients) which could possibly show the role of emotional and social family support on reducing anxiety. Yilmaz and his colleagues had also demonstrated that preoperative anxiety is lower among married patients [32]. The present results also showed that patients residing in urban areas experienced significantly higher trait anxiety compared to rural residents although they did not differ in terms of state anxiety. This finding is consistent with the results of a study conducted by Woldegerima in 2018 and could be due to the fact that urban residents face more daily life struggles exposing them to higher trait anxiety [35]. Previous studies have indicated a variable effect of patients' level of education on preoperative anxiety. Some of these studies, in line to our study, have shown the negative effect of higher education on the level of anxiety before surgery [32, 36]. It has been suggested that educated people have more of an information-seeking character and a higher tendency to receive medical information from their physicians [37-38]. Also, patients with a higher level of education are more likely to be aware of the risks and side effects associated with anesthesia and surgery thus causing them more stress. The result of our study which pointed to patients' knowledge of anesthesia adverse events as an independent predictor of preoperative anxiety supports this notion. In contrast, there have been studies showing higher level of preoperative anxiety among less educated patients and they have related it to the "fear of unknown" among this population [1, 34]. As mentioned above, we observed a markedly higher level of anxiety in patients aware of the adverse events related to anesthesia. Although numerous studies have studied the association of patients' knowledge about type of anesthesia and anxiety, no study so far has exclusively investigated the role of patients' knowledge of anesthesia adverse events on preoperative anxiety [37, 39-40]. We also demonstrated that patients with an occupation related to the healthcare system seem to

experience a significantly higher anxiety compared to others. To the best of our knowledge, the relationship between exposure to the healthcare environment on a daily basis and preoperative anxiety has not yet been studied.

Regarding previous history of anesthesia, our study failed to show a significant relationship between prior experience of anesthesia and current preoperative anxiety. A number of previous studies support this finding while some studies have shown a prior experience of anesthesia and surgery to be linked with lower levels of anxiety [22-23, 41]. In our questionnaire, we did not clarify whether the patient's previous experience was positive or negative which might justify this result. Type of anesthesia was not associated with preoperative anxiety in our study. However, in a study conducted in Pakistan, patients awaiting surgery under general anesthesia were significantly more anxious as compared to spinal anesthesia [42].

Conclusion

In conclusion, considering the fact that almost all of the factors significantly associated with preoperative anxiety in our study were unamenable to change, identifying vulnerable patients (e.g. females, younger people…) and providing social and psychological support for them can be beneficial in reducing their anxiety. This support can either be administered through the nursing system or psychologic/ psychiatric consultations. Methods such as music therapy and more recently, aromatherapy have also been applied to reduce low or moderate levels of preoperative anxiety. Besides, the most mentioned anesthesia- related adverse events among our patients were "not waking up after surgery" and "gaining consciousness while under operation" thus providing sufficient information about the very low incidence of these adverse events by the patient's anesthesiologist might help reduce the fear and anxiety related to these events. All of the methods mentioned above can help control preoperative anxiety and subsequently reduce undesirable surgery outcomes and their economic burden on the healthcare system. Above all, patient satisfaction will increase due to fewer complications experienced while at the hospital.

Our study was conducted in a governmental teaching hospital located in central Tehran with most patients coming from a low socio-economic background. Results of studies performed in wealthier parts of the city or private hospitals can vary due to the different socio-economic status of admitted patients. Moreover, the overcrowded space of non-private clinics could itself result in agitation and anxiety of patients thus introducing bias to our study. Another limitation to our study was that we did not evaluate the effect of present comorbidities on preoperative anxiety which could have provided the opportunity to predict this outcome more precisely. We suggest a more comprehensive study investigating patients from different socioeconomic backgrounds and evaluating further independent variables to overcome the limitations of this study. Further studies evaluating preoperative anxiety prior to anesthetic consultation (as in the surgery clinic) or after anesthetic consultation (e.g. immediately before entering the operation room) could also be valuable in predicting preoperative anxiety based on the time remaining to surgery.

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