

Investigation of trait anxiety as a predictor of dental anxiety

Ocena lęku ogólnego jako predyktora lęku stomatologicznego

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Abstract

Introduction. Feeling of anxiety related to dental treatment is a fairly common phenomenon. Some studies have shown that there is an association between dental anxiety and general fears, neuroticism and general psychological disorders. **Aim of the study.** To examine the relationship between the dental, state and trait anxiety. Also the socio-demographic variables were considered in the study. **Materials and Methods.** The survey included 138 adult patients (65 women and 73 men) with the mean age (\pm standard deviation) of 39.3 (\pm 14) years that were admitted to the University Dental Clinic in Cracow, Poland. The Polish version of Corah's Dental Anxiety Scale (DAS) and State-Trait Anxiety Inventory (STAI) were used for the assessment of dental, state and trait anxiety. For statistical analysis the Cronbach's alpha coefficient, Pearson correlation coefficient and stepwise progressive regression were applied. The cutoff level of significance was taken as $p=0.05$. **Results.** Dental anxiety was significantly correlated to the state (0.9016) and trait anxiety (0.8643). Strong relation was found between dental anxiety and the socio-demographic variables: age (0.2093), sex (0.2216), education (-0.3814) and the date of the last dental appointment (0.8134). **Conclusions.** Dental anxiety is related to the general tendency to be apprehensive and to manifest anxiety. It seems reasonable to manage patient's dental anxiety symptoms properly, as this might increase their quality of life.

Streszczenie

Wstęp. Uczucie lęku towarzyszące leczeniu stomatologicznemu jest znanym zjawiskiem. Niektóre badania wykazują związek pomiędzy lękiem stomatologicznym a strachem czy innymi dysfunkcjami psychologicznymi. **Cel badania.** Celem badania było określenie związku pomiędzy lękiem stomatologicznym a lękiem jako cechą i stanem. W badaniu uwzględniono również parametry socjodemograficzne. **Materiał i metody.** 138 dorosłych pacjentów (65 kobiet i 73 mężczyzn) zostało włączonych do badania w Uniwersyteckiej Klinice Stomatologicznej w Krakowie. Badanie ankietowe składało się ze Skali Lęku Stomatologicznego Coraha (DAS) oraz Inwentarza do Pomiaru Lęku jako Stanu i Cechy (STAI). Do analizy statystycznej wykorzystano współczynnik alfa Cronbacha oraz współczynnik korelacji Pearsona. Poziom istotności statystycznej wynosił $p=0,05$. **Wyniki.** Lęk stomatologiczny korelował z lękiem jako stanem (0,9016) oraz lękiem jako cechą (0,8643). Silna korelacja wystąpiła pomiędzy lękiem stomatologicznym a badanymi parametrami socjodemograficznymi: wiek (0,2093), płeć (0,2216), wykształcenie (-0,3814). **Wnioski.** Lęk stomatologiczny ma związek z ogólną tendencją do odczuwania stanów lękowych. Odpowiednia opieka nad pacjentem z objawami lęku może znacznie wpłynąć na poprawę jakości jego życia.

KEYWORDS:

dental anxiety, state anxiety, trait anxiety, Corah's Dental Anxiety Scale (DAS), State-Trait Anxiety Inventory (STAI)

HASŁA INDEKSOWE:

lęk stomatologiczny, lęk, Skala Lęku Stomatologicznego Coraha (DAS), Inwentarz do Pomiaru Lęku Stanu i Cechy (STAI)

Introduction

A human being is a psychosomatic unity. All mental and vegetative processes in the body are closely related to each other. Psychological factors may participate in the development of somatic disorders and in turn each somatic disease may involve some psychological effects. In this two-way relationship emotions play an important role, and anxiety is the most common emotional reaction that appears at all stages of medical process: when the first symptoms are noted by the patient, during the time of the diagnostic procedures and finally during treatment. Thus, the responsible therapy is associated with the awareness that the treatment process is not only dedicated to the disease itself but to the “whole” patient: the man with his/her own feelings, emotions and problems. Anxiety reactions are individually varied and when untreated can lead to many negative consequences such as autonomic nervous system dysfunction and hypertension.¹

There are a lot of scientific studies regarding the state of anxiety. They describe the symptoms, causes and consequences in a different way but anxiety is inseparable from existence. People have always experienced fear and nowadays they have more causes for concern than in the past. It is estimated that one in eighteen individuals is suffering from anxiety disorders.²

There are many theories of anxiety, none of them, however, is solely limited to the issue of anxiety itself as mostly they are the general theoretical systems. The definition of anxiety by *Spielberger* is a concept which considers it as a multidimensional phenomenon. This theory is based on the distinction between anxiety as a situationally conditioned state of the individual, and anxiety as a relatively stable personality trait. State anxiety is used to determine patient's present level of anxiety, while trait anxiety is used to describe an individual's long-term anxiety level. The results indicate that regardless of the situation higher level of trait anxiety is related to higher levels of state anxiety.³⁻⁶

Dental treatment and surrounding dental environment may provoke many different conditions and emotions. Dental anxiety is in the

fifth place in the ranking of the most common fears of modern man, and is a fairly common phenomenon in dentistry.⁷ The most obvious consequence of dental anxiety is the avoidance of dental appointments, deterioration of oral health, the growing need for treatment and a bad dentist-patient relationship.⁶ Patients with dental anxiety are trapped in a “vicious circle”. The bad condition of the mouth and the inability to accept treatment leads to feelings of shame and inferiority, which make the anxiety higher.⁸ Several studies have shown that population of people with higher levels of dental anxiety compared with non-phobic individuals have more teeth decayed and removed, and worse periodontal status. Such patients also have fewer fillings and are 4.6 times more likely to need immediate treatment for the relief of dental pain or infection.⁹⁻¹¹ Several factors have been implicated in the etiology of dental anxiety, including congenital determinants, negative attitudes in the family, fear of pain and perceptions of an unsuccessful and/or painful previous dental treatment.^{8,12}

Dental anxiety is not considered to be a hereditary predisposition but a conditional response to negative stimuli, and is described as state anxiety. Some investigations have shown an association between increased general and dental anxiety levels.^{6,13,14} It was investigated that anxious dental patients are prone to exaggerate pain expectations when the anticipated challenging situation is perceived as fear relevant. This suggests that individuals with higher trait anxiety tend to experience more intense anxiety during dental procedures and that they are likely to feel more pain.¹⁵ Another study suggested that dental anxiety is associated with negative beliefs about what may transpire during dental treatment.¹⁶ Recently some researchers have suggested that trait anxiety may be a useful predictor of patients' predisposition to dental anxiety, although in few previous studies trait anxiety was not strongly correlated to dental anxiety.^{13,17} This investigation was designed to examine the relationship between dental, state and trait anxiety. Also the socio-demographic variables were considered in the study.

Materials and Methods

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. All the participants enrolled in the investigation volunteered to take part in it, received comprehensive information about the study, and gave written consent for it.

Subjects, sampling and setting

The survey included 138 adult patients aged from 18 to 79 years of both genders, native Polish speakers. Respondents were randomly recruited from consecutive new patients in the University Dental Clinic in Cracow (Poland). The investigation was carried out just before the scheduled dental appointment. Patients were asked to complete an anonymous questionnaire. The survey specially created for the study purposes contained questions based on the Polish adaptations of scales: Corah's Dental Anxiety Scale (DAS),¹⁸⁻²⁰ State, Trait Anxiety Inventory (STAI) by Spielberger,^{3,21} questions regarding the last dental appointment and demographic data (age, sex, education). Detailed description of the variables is included in Table 1.

General and dental anxiety assessment

Dental anxiety was evaluated by the Polish version of the English-language Corah's Dental Anxiety Scale.²⁰ It contains multiple-choice items regarding the patient's subjective reactions about four different situations: going to the dentist, waiting in the dental office for the procedure and

anticipation of drilling and scaling. The patients were asked to choose an answer which describes their mood best. The answers are scored on a 1 to 5 scale, ranging from calm (score 1) to terrified (score 5). Total from 4 to 20 indicates the dental anxiety level (low from 4 to 7, medium from 8 to 11 and high from 12 to 20 points).

The general anxiety was measured by the Polish version of the State and Trait Anxiety Inventory (STAI) validated by *Wrzesniewski* and *Sosnowski*.²¹ It consists of two separate subscales: one is used to measure the state anxiety (X-1) and the second to assess the trait anxiety level X-2. The trait anxiety refers to the tendency to be apprehensive and to manifest anxiety even without external stress. The state anxiety is a temporary emotional state, whose dominant feature is the strong feeling of threat. Each of the subscales contains twenty items in the form of short statements regarding subjective feelings of the individual. Patients are asked to mark one of the four responses to each statement that best describes their general feeling. The selected responses are scored from 1 to 4, with total from 20 to 80.

The data regarding the last appointment prior to the study were divided into three groups: less than 6 months, from 7 to 12 months and over 12 months.

Data analysis

Descriptive statistics were used to characterize the study population and the tested variables. The estimation of internal consistency based

Table 1. Description of variables

Variable	Description
DAS	Dental Anxiety Scale; score points from 4 to 20; levels: low (4 to 7 points), medium (8-11 points), high (12-20 points)
Age	Age in years
Sex	Gender; 1 – female, 0 – male
Education	Education, 1 – none or preschool, 2 – primary, 3 – secondary, 4 – tertiary or above
STAI X-1	State and Trait Anxiety Inventory; State anxiety; result in points from 20 to 80
STAI X-2	State and Trait Anxiety Inventory; Trait anxiety; result in points from 20 to 80
Last dental appointment	Last dental appointment before the study; 0-6 months – 1; 7-12 months – 2; over 12 months – 3

on Cronbach's alpha coefficient was used to determine the reliability of the DAS. To determine the relationship between variables and the level of dental anxiety Pearson correlation coefficient and stepwise progressive regression were applied. All analyses were performed using the statistical software (SPSS 15.0). The cutoff level of significance was taken as $p=0.05$.

Results

The demographic characteristics of the study population are shown in Table 2. The sample consisted of 138 adult patients (47.1% women, 52.9% men) aged from 18 to 79 years (mean age = 39.3 yrs). Twenty six percent of patients were in the age group from 20 to 29 years, 4.3% of them in the group of less than 20 years and 8% in the one over 60 years. In the other age groups (from 30 to 59 yrs) the number of respondents estimated to the similar level (17.4% - 24%). One hundred and three of the study sample (74.64%) had received secondary school education or above. Respondents' last dental appointment was on average from 7 to 12 months prior to the investigation. Seventy-six patients had attended the dental office less than six months before the study was performed and 30 of them over a year before it.

Cronbach's alpha coefficient of internal consistency used to determine the DAS scale was 0.85, which means that the scale was a reliable tool. Descriptive statistics of variables are shown

Table 2. Demographic characteristics of subjects (n = 138)

Variable	Sample n (%)
Sex	
Female	65 (47.1%)
Male	73 (52.9%)
Age in years	
<20	6 (4.3%)
20-29	36 (26.1%)
30-39	33 (24%)
40-49	24 (17.4%)
50-59	28 (20.2%)
>60	11 (8%)
Education	
None/Preschool	18 (13.04%)
Primary	17 (12.32%)
Secondary	64 (46.38%)
Tertiary or above	39 (28.26%)

in Table 3. All data collected in this study were valid. Average dental anxiety level (DAS) of the respondents was 8.85, which corresponds to the medium level of dental anxiety (Table 1). The lowest value of DAS score achieved in the study was 4 points and the highest was 19 points. Forty two percent of patients demonstrated low level of dental anxiety and the group of respondents with

Table 3. Descriptive statistics of variables

	n of valid	Average	Minimum	Maximum	SD
DAS	138	8.85507	4.00000	19.00000	3.64391
Age	138	39.33333	18.00000	79.00000	14.01685
*Sex	138	0.47101	0.00000	1.00000	0.50098
Education	138	2.89855	1.00000	4.00000	0.96122
X-1	138	43.92029	20.00000	77.00000	16.01963
X-2	138	43.13768	20.00000	71.00000	13.97244
last visit	138	1.66667	1.00000	3.00000	0.81351
* ratio 1					

Table 4. DAS levels frequency

	n	Cumulated	%	Cumulated%	% of total	Cumulated% of total
Low	58	58	42.02899	42.0290	42.02899	42.0290
Medium	46	104	33.33333	75.3623	33.33333	75.3623
High	34	138	24.63768	100.0000	24.63768	100.0000

Table 5. Simple correlations between DAS and other variables

	Age	Sex	Education	X-1	X-2	Last visit
DAS	0.2093	0.2216	-0.3814	0.9016	0.8643	0.8134
	$p=0.014$	$p=0.009$	$p=0.00$	$p=0.00$	$p=0.00$	$p=0.00$

Table 6. One-dimensional test of significance for DAS (stepwise progressing regression)

	SS	Degrees	MS	F	p
Intercept	0.3843	1	0.38426	0.18934	0.664173
X-1	85.0677	1	85.06768	41.91672	0.000000
X-2	31.9303	1	31.93029	15.73351	0.000119
Sex	6.5246	1	6.52460	3.21497	0.075257

Table 7. Parameters' assesment for DAS (stepwise progressing regression)

	Level Effect	Column	Comment.	DAS Parameter	DAS Std Error	DAS t	DAS p	-95.00% Conf. interval
Intercept		1		0.222331	0.510945	0.43514	0.664173	-0.788368
X-1		4		0.115246	0.017801	6.47431	0.000000	0.080035
X-2		5		0.081119	0.020451	3.96655	0.000119	0.040665
Sex	0	12		-0.223559	0.124682	-1.79303	0.075257	-0.470193
	+95.00% Conf. interval		DAS Beta (□)		DAS Std. Error □		-95.00% Conf. interval	+95.00% Conf. interval
Intercept	1.233031							
X-1	0.150457		0.506653		0.078256		0.351855	0.661450
X-2	0.121573		0.311047		0.078418		0.155930	0.466165
Sex	0.023074		-0.061471		0.034283		-0.129287	0.006345

high level of dental anxiety constituted 25% of the investigated population (Table 4).

Mean result obtained in the State-Trait Anxiety Inventory in this study for the state anxiety (STAI X-1) was 43.9 (from 20 to 80 possible, Table 1), whereby the lowest was 20 and the highest 77 (Table 3). Also the trait anxiety (STAI X-2) scored similarly with the average 43.1, minimum 20 and maximum 71 (Table 3).

Simple correlations between DAS and other variables are shown in Table 5. All of them were statistically significant ($p < 0.05$). DAS was correlated negatively with the level of education. The degree of dental anxiety decreased with the higher level of education (correlation -0.3814). The other correlations were positive: the level of dental anxiety increased together with the value of included variables. The strongest correlation was noticed between DAS and STAI (0.9016 for X-1 and 0.8643 for X-2).

Other analyses of correlations between investigated variables and DAS tested by stepwise progressing regression are presented in Table 6 and Table 7. The results were similar. The state anxiety (STAI X-1) (parameter 0.11; $p = 0$) and the trait anxiety (STAI X-2) (parameter 0.08, $p = 0.0001$) were positively correlated with DAS. As the coefficient of significance for sex had the border value

($p = 0.07$) the test of diversity of expected marginal averages was performed. It revealed that the dental anxiety level increased with the values (women-1, men-0), which means a higher anxiety level among females.

Correlation between state and trait anxiety (STAI X-1 and X-2) are presented in Table 8. It was statistically significant ($p < 0.05$) and strongly positive (0.8824).

The tests showed that anxiety was associated with the frequency of dental appointments. Almost 95% percent of patients from low anxiety level group visited the dental office not later than 6 months prior to the investigation. In comparison, 88.24% of respondents who demonstrated high level of dental anxiety had their last appointment at least a year before the study was performed (Table 9).

Discussion

It is reported that despite continuous progress in medicine dental anxiety in developed countries remains at the same level.²² The study conducted by *Smith* and *Heaton* on the sample of ten thousand adults confirms that the degree of fear of dental care has not changed over the past fifty years.²³

The most common tool used in the dental anxiety level analysis is the Corah's Dental Anxiety Scale (DAS).^{18,19} In our study the coefficient of internal consistency of this scale was 0.85. Comparable values were obtained in a number of studies.²⁴⁻²⁶

The statistical analysis showed that the level of dental anxiety decreased with patients' higher degree of education, increased with age and was lower among men than women. Similar results were noted by *Acharya* who reported correlation

Table 8. Correlation between STAI X-1 and STAI X-2

p < 0.05000; N=138	
	X-2
X-1	0.8824
	p=0.00

Table 9. The statistics of DAS and the last visit

Last visit	DAS Low level	DAS Medium level	DAS High level
1	94.83%	39.13%	8.82%
2	5.17%	60.87%	2.94%
3	0.00%	0.00%	88.24%

between less educated patients and high degree of anxiety.²⁷ Hakeberg, Berggren and Carlsson showed that demographic variables such as income and education do not correlate with dental anxiety.²⁸ In the study by Acharya the higher level of dental anxiety was also noted among females but in comparison to our study it was inversely related to age. Most research results acknowledge that mean DAS-scores of women are higher than men's.²⁷⁻²⁹ Milgrom has shown that women are 1.8 times more likely than men to experience high anxiety.³⁰ Individuals most prone to experience dental anxiety are women between 26 and 35 years of age who did not visit a dentist regularly.³¹ Stonthard and Hoogstraten speculate that women easily demonstrate their emotions and possibly they also exaggerate their reactions.³¹ In the study by Hakeberg and co-authors patients aged from 20 to 39 years reported the highest level of dental anxiety.³² Kunzelmann and Dunninger confirm that older people are expected to represent lower level of dental anxiety.³³ Summarizing the impact of socio-demographic factors on the degree of dental anxiety it can be concluded that they correlate, however they are not the only important parameter in this relationship and it is necessary to take into account a number of other situational variables.²⁸

The results of our investigation showed also an association between dental anxiety and the frequency of dental appointments. 88.24% of respondents with high level of dental anxiety had their last appointment at least a year before the study was performed. Several studies confirmed that people with high level of dental anxiety compared with non-phobic patients avoid dental appointments, which leads to deterioration of oral health and the growing need for treatment.⁸⁻¹¹ It can be concluded that the psychosocial aspects of anxiety, especially feelings of shame and inferiority, play a key role in avoidance of dental visits.³⁴

Our study showed a very strong positive correlation between dental, state and trait anxiety even when other variables were considered. A similar relationship can be found in several other studies. De Joungh concluded that patients with a high level of dental anxiety reported higher level

of general anxiety.³⁵ Hakeberg et al. demonstrated the relationship between dental anxiety, general anxiety and mood of the respondents.³² The analysis carried out by Daini et al. showed that dental appointments are not only the risk of a higher level of dental anxiety but also of general anxiety. In addition, this study indicated that 22% of people with a high level of dental anxiety reported two or more other fears. It is twice the rate in comparison with patients with low dental anxiety, where only 11% of respondents indicated the coexistence of other fears.³⁶ In a similar study conducted in Gothenburg among dental phobic patients it was found that 93% of them had at least one other extreme anxiety, and 50% reported the co-existence of five or more severe anxieties.³⁷

The correlation coefficients of the state and trait anxiety scales in our study were 0.96 (X-1) and 0.80 (X-2). Average X-1 and X-2 scores achieved in our study were 43.9 and 43.13, respectively, which is very similar to the results obtained by Weisenberg et al. who had estimated the X-1 and X-2 at an average of 42.3 and 41.5.¹⁷ The correlation level between the DAS, X-1 and X-2 in our study was 0.11 ($p=0$), 0.11 ($p=0$) and 0.08 ($p=0.0001$), respectively. Similar results were obtained in the study cited above, however, the authors put forward a proposal that dental anxiety is more correlated with the state than trait anxiety.¹⁷ Lago-Mendez et al. concluded that higher level of general anxiety is a very accurate predictor of dental anxiety.¹³ The study by Yusa et al. showed that STAI is a reliable tool to predict dental anxiety.³⁸ A similar conclusion was reached by Kvale et al. who estimated the correlation between STAI and DAS at 0.76 suggesting that to some extent these two scales measure the same phenomenon.²⁵ A significant linear correlation was observed between trait and dental anxiety in a study by Akarslan et al..³⁹ Fuentes et al. showed a significant association between high dental anxiety and trait anxiety.⁴⁰

Although general trait and dental anxiety are different phenomena the present study revealed a relationship between them. The findings indicate that patients having dental anxiety could also have constitutional vulnerability to generalized

anxiety, which remains stable over time. It also confirms that dental anxiety is associated with socio-demographic factors, although they are not the only important parameters in this relation.

An awareness of dental and general anxiety mechanisms could be helpful in understanding patients' feelings and in improving dental care and quality of their life.

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