Original Article

Anxiety and Dental Fear: Could these Factors Deteriorate Periodontitis in Patients With Good Ola Hygiene?

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Abstract

Background: Periodontitis is a chronic disease that affects alveolar bone loss.
Aim: In this study, we aimed to evaluate the role of anxiety and dental fear in the deterioration of periodontitis in adult dental patients who had already undergone periodontal treatment and had very good oral hygiene.
Methodology: During the study, 114 adult dental patients were examined, 58 with good dental hygiene but deterioration of periodontitis and 56 without periodontitis, who filled in a questionnaire consisting of three parts: a) a form with individual characteristics, b) the Modified Dental Anxiety Scale and c) the State Trait Anxiety Inventory of Spielberger. The study took place in a dental clinic in Larissa, Greece.
Results: The mean values of the permanent, transient and total anxiety, as well as the dental fear of the patients with deteriorate periodontitis, were higher than those without periodontitis. Based on these findings, transient anxiety and dental fear are directly correlated with the deterioration of periodontitis in adult patients with good oral hygiene.
Conclusion: Therefore, dental teams play an essential role in reduce anxiety and dental fear and help patients not only to complete the treatment but also to sustain it.

Keywords: Anxiety, Dental fear, STAI, MDAS, Periodontitis, Adult patients

Introduction

Periodontitis is a chronic inflammatory condition that causes the destruction of periodontal tissues and alveolar bone resulting in mobility and the ultimate loss of affected teeth. Analyses performed on patients with periodontitis show the presence of microbial agents that are inextricably linked to its occurrence. In addition to pathogenic microorganisms, other risk factors for periodontitis are: poor oral hygiene, age, sex, smoking, alcohol, socioeconomic factors, obesity and various systemic diseases such as diabetes (Kolte et al 2016; Hong, Noh, Kim, 2016; Mohd-Dom, et al, 2014, Dye, 2012).

However, in recent years two more risk factors have been identified that are directly related to the onset of periodontitis, which are anxiety and dental fear (DF). Studies have examined the negative impact of anxiety on our body and especially on our immune system, supporting its association with various inflammatory diseases such as periodontitis. Also, anxiety, in addition to its

immunosuppressive properties, adversely affects the lifestyle of patients, ignoring their oral health with consequent adverse effects on gum health (Fenol et al, 2017; Kotle et al, 2016; Ng, Keung Leung, 2006).

DF is widespread among the patient population and is referred to as fear of treatment. An important component of DF is the pain patients experience during a dental procedure. Its association with periodontitis is also known as partly due to poor oral hygiene and reduced care seeking. Studies have shown that the effect of DF contribute significantly to both the burden of dental diseases and patients' quality of life (Wright et al, 2017; Vermaire et al, 2016; Bhola, Malhorta, 2014).

This study aimed to evaluate if there is a link between anxiety, DF and periodontitis. In particular, we examined the role of anxiety and dental fear in the deterioration of periodontitis in adult dental patients who, however, had good oral hygiene. Inception of this research hypothesis was followed after clinical observation of patients with good oral hygiene and the presence of severe bleeding gums and/or periodontal swelling pockets, without the essential calculus and plaque to justify the occurrence of these symptoms.

Methodology - Study population: A descriptive, cross – sectional study was conducted in a dental clinic (Larissa, Greece). The sample consisted of 114 dental patients, 58 of whom had deterioration of periodontitis, as well as good oral hygiene and as a control group, a sample of 56 adult dental patients without periodontitis and attended for a preventive or therapeutic dental procedure. Exclusion criteria were; medications such as contraceptives and anticoagulants, ferritin deficiency, pregnancy, incorrect prosthetic structures, occlusal factors and age.

Procedure: All procedures were performed by an experienced general dentist and his dental team. The questionnaire was administered to the dental patients and appropriate instructions were given for filling it in at the dental clinic waiting room. The participation of dental patients was voluntary, anonymous and all ethical rules of research were ensured. This paper was approved by the human subjects' ethics board of the Committee of Education and Research of University of Thessaly and was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2013.

The empirical research material was collected using a special, fully structured and self-completed questionnaire. Specifically, the questionnaire consisted of three parts:

A) Individual characteristics registration form: It included questions on socio-demographic characteristics (gender, age, marital status, educational level, profession), smoking habits and dental hygiene practices (frequency of dental visits and frequency of dental brushing) of the dental patients. Additionally, there were two questions about the reason of their dental visit from the previous time and on that day.

B) Modified Dental Anxiety Scale (MDAS): Dental fear levels were measured by MDAS (Humphris et al, 1995), which is based on the DF Scale of Corah N.L. (1969). This consists of five questions about how anxious the patient is at the dental visit. The answers are given on a 5-point Likert-type scale ranging from "not anxious = 1" to "extremely anxious = 5". The cut-off point used was a score ≥ 16, indicating that the patient felt somewhat anxious about dental procedure. A score of 19 or more indicated a highly anxious patient. A Greek version of MDAS was used to asses dental anxiety, the reliability of this scale has already been demonstrated (Coolidge et al, 2008).

C) State Trait Anxiety Inventory (STAI)

Anxiety levels were measured by STAI [13]. STAI Scale consists of a total of 40 statements, which relate to two Sub-Scales: (a) the emotional state of the person at the time of completing the questionnaire (Temporary or as a Condition Anxiety, A-State) through 20 statements; and b) the emotional state of the individual in general (Permanent or as a Personality Trait Anxiety, A-Trait) with 20 statements. All items are rated on a 4-point Likert-type scale ranging from "almost never = 1" to "almost always = 4". In a total of 16 statements the answers are graded inversely. Higher scores indicate higher levels of Anxiety [13]. A Greek version of STAI was used to assess anxiety, the reliability of this scale has already been demonstrated (Liakos, Gianitsi, 1984).

Statistical analysis: Means and standard deviations for continuous data and frequencies and percentages for categorical data are presented to demonstrate patient's characteristics (independent variables). The occurrences of anxiety, DF

and periodontitis were used as the outcomes (dependent variables) of the under research correlations. Odds ratio with 95% confidence interval was used as measure of association. Associations between potential prognostic determinants and outcomes were examined using univariate logistic regression analysis. Predictors univariately associated with outcome (*p*-value < 0.10) were included in a multivariate logistic regression model. All reported *p*-values were two-tailed, and a p-value under 0.05 was considered statistically significant. Statistics of the research's empirical data were processed with IBM SPSS for Windows (version 21.0, SPSS Inc., Chicago, IL, USA).

Results

Sample characteristics

A total of 114 individuals were included in this study. The number of men and women were roughly equal (women = 54.4%; men = 45.6%). The mean age of the patients was 38.74 years (SD=13.66) with their age ranged from 18 - 72 years. The majority of patients were higher education graduates (68.4%) and 70.1% were employed while 29.9% were non-employed (retired, unemployed). About 1/3 of dental patients were smokers (31.6%). Those with periodontitis represented 50.9% (n = 58) and without periodontitis 49.1% (n = 56) of the sample. The 3/4 (76.3%) of dental patients had their last dental visit within the year. Half (50.0%) brushed their teeth twice a day and 1/3 (32.5%) brushed their teeth once a day. Preventive check/cleaning was the most common reason for dental visits at the previous (60.5%) and current (57.9%) time. Sociodemographic characteristics, periodontitis, frequency of dental visits, tooth brushing, and ratio of dental visits of dental patients are provided in Table 1.

Anxiety and Dental Fear in dental patients

The overall MDAS and STAI scores indicate that patients had relatively low values of DF, total anxiety, permanent anxiety, and transient anxiety. Specifically, the median value for total DF was 9.00, for transient anxiety (A - State) 39.00, for permanent anxiety (A - Trait) 39.00 and for STAI total anxiety score 79.50. Cronbach's alpha coefficient values are above 0.70, which indicates very good internal consistency reliability and high consistency of questions on all scales (Table 2).

Association between the deterioration of periodontitis in patients with good oral hygiene with DF and anxiety

Simple and multiple logistic regression analysis were performed to explore the association between Anxiety, DF and the deterioration of periodontitis in patients with good oral hygiene, by introducing the characteristics of dental patients with statistical significance at the 10% level. Thus, the estimated Ratio of Odds was tailored to gender, age, marital status, educational level and smoking habits. The crude odds ratios are shown in Table 3. The results indicated that both DF and total, transient, and permanent anxiety were statistically significantly associated with the deterioration of periodontitis in patients with good oral hygiene. Particularly, in Table 3 we can see that the risk of periodontitis deterioration was increased by 15% for each unit of increase in total DF, (AOR = 1.15; *p* = 0.031). As well, for each unit of increase in Total Anxiety, the risk of periodontitis deterioration increased by 5% (AOR = 1.05; *p* < 0.001). Likewise, for each unit of increase in Permanent Anxiety, the risk of deterioration increased by 6% (AOR = 1.06; *p* = 0.020). In addition, the biggest association was between Transient Anxiety. Specifically, the risk of deterioration increased by 9% for each unit of increase in Transient Anxiety (AOR = 1.09; *p* < 0.001).

The Predictive Factors for the deterioration of periodontitis in patients with good oral hygiene.

Table 4 summarize the analysis of predictive factors for deterioration of periodontitis in patients with good oral hygiene. From the multivariate regression model, 3 significant factors were found that predict deterioration of periodontitis. From this analysis, it was shown that primary / secondary school graduates had a 3.7 – fold higher risk of deterioration than higher education graduates had (OR = 3,728; *p* = 0.009). The second significant predictive factor was smoking habits. Particularly, smokers had about 4.6 higher risk of deterioration of the disease than non-smokers had (OR = 4,587; *p* = 0,003). In addition, an interesting finding is that compared to other STAI and MDAS subscales, only Transient Anxiety belongs to predictive factors. Specifically for each unit of Transient Anxiety increase, the risk of periodontitis deterioration increased by 9.3% (OR = 1.093; *p* <0.001). This multivariable model explained 41.3% of the variance in deterioration risk and correctly classified 75.4% of cases.

Table 1. Sociodemographic characteristics, periodontitis, frequency of dental visits, tooth brushing, and ratio of dental visits to dental patients, of dental patients (n = 144)

Characteristics		n	%
Sex			
	Male	52	45.6%
	Female	62	54.4%
Age (years)			
	Mean ± SD	38,74 ± 13,66	
	Min - Max	18 – 72	
Marital status			
	Married	56	49.1%
	Unmarried	52	45.6%
	Divorced	3	2.6%
	Widowed	3	2.6%
Educational level			
	Primary	5	4.4%
	Secondary	31	27.2%
	Higher	78	68.4%
Profession			
	Freelance	25	21.9%
	State employee	15	13.2%
	Private employee	37	32.5%
	Farmer	3	2.6%
	Retired	10	8.8%
	Non-employed	24	21.1%
Periodontitis			
	Yes	58	50.9%
	No	56	49.1%
Smoking habit			
	Yes	36	31.6%
	No	78	68.4%
Last visit to Dentist			
	<1 year	87	76.3%
	1 - 3 years	8	7.0%
	> 3 years	19	16.7%
Teeth brushing frequency per day			
	0	2	1.8%
	1	37	32.5%
	2	57	50.0%
	3	16	14.0%
	≥ 4	2	1.8%
Reason for a dental visit last time			

Dental pain	35	30.7%
Prosthetic work	10	8.8%
Preventive inspection/cleaning	69	60.5%

Reason for a dental visit today

Dental pain	24	21.1%
Prosthetic work	24	21.1%
Preventive inspection/cleaning	66	57.9%

Table 2. MDAS Scale and STAI Scale of Dental Patients (n = 114).

Scale	Cronbach's alpha	Mean ± sd*	Median
MDAS Dental Fear			
Total DF	0.88	9.77 ± 4.00	9.00
STAI Anxiety			
Transient Anxiety	0.93	39.63 ± 12.17	39.00
Permanent Anxiety	0.89	40.57 ± 8.94	39.00
Total Anxiety	0.94	80.20 ± 19.08	79.50

Note.. sd = Standard Deviation.

Table 3. Correlation of the MDAS DF Scale and the STAI Anxiety Scale of dental patients with the deterioration of the clinical picture of periodontitis.

Scale	Periodontitis		COR*		AOR	
	Yes (n=58)	No (n=56)	(95% CI)	P value	(95% CI)	P value
DF MDAS						
Total DF	10.47 ± 4.41	9.05 ± 3.40	1.10	0.065	1.15	0.031
			(0.99 – 1.22)		(1.01 – 1.30)	
Anxiety STAI						
Transient Anxiety	45.07 ± 11.91	34.00 ± 9.68	1.10	<0.001	1.09	<0.001
			(1.05 – 1.14)		(1.05 – 1.14)	
Permanent Anxiety	42.52 ± 9.06	38.55 ± 8.43	1.05	0.020	1.06	0.020
			(1.01 – 1.10)		(1.01 – 1.12)	
Total Anxiety	87.59 ± 19.05	72.55 ± 15.97	1.05	<0.001	1.05	<0.001

			(1.03 – 1.08)	(1.02 – 1.08)

Note. *Data are given as mean ± sd. COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio

Tablet 4. Multiple logistic regression * with dependent variable the deterioration or non-deterioration of periodontitis in patients with good oral hygiene and independent variables the MDAS Scale, the STAI Scale and the characteristics of dental patients.

Independent variables	B	SE	OR (95% CI)	P value
Fixed (a)	-4.341	0.943		<0.001
Educational level				
Higher (reference category)	1			
Primary / Secondary	1.316	0.506	3.728 (1.383 to 10.051)	0.009
Smoking habit				
No (reference category)	1			
Yes	1.523	0.508	4.587 (1.695 to 12.414)	0.003
Transient Anxiety	0.089	0.022	1.093 (1.047 to 1.141)	<0.001

Note. *Method stepwise, Adjusted Nagelkerke R^2 = 41.3%   Overall Predictive Ability = 75.4%

Discussion

The purpose of this study was to evaluate the association between anxiety, DF and deterioration of periodontitis in dental patients with good oral hygiene. Most of the results respond to the research hypothesis. Those who met the diagnostic criteria of the study, reported higher Anxiety and DF values than in the comparative population.

As in previous studies, it has been found that there is a direct relationship between Anxiety and periodontitis (Boyanova, 2017; Akcali et al, 2014; Mannem & Chava, 2012). Some studies have concluded that responsible for deterioration of periodontitis are the significant changes that occur during the immune and cellular response to stress (Lorenz & Anders, 2014; Hilgert et al, 2006). In addition, Corsalini et al. (2013) argue inter alia that in Anxiety Disorders a very common phenomenon that deteriorates periodontitis, is the appearance of signs bruxism, while Di Venere et al. (2015) in their study conclude that substance abuse by people with severe anxiety, such as tobacco and alcohol, plays a role in re-

ducing salivary secretion and increasing the risk of periodontitis (Laforgia et al, 2015; Friedlander, Mahler, 2001).

Concerning DF, the results have shown that there is a direct association with deterioration of periodontitis. Specifically, taking into account the characteristics of the patients, the risk of deterioration of periodontitis increased. This is partly supported by other studies arguing that the situation of phobic patients worsens due to avoidance of dental appointments. In addition, every time they miss an appointment, they also miss the opportunity for a milder dental procedure, as a result of which they find themselves in a vicious circle and their fear perpetuating along with their problem (Armfield, 2013; Schuller et al, 2003).

The present study found that certain variables such as educational level, smoking habit and transient anxiety were able to predict whether there could be a risk of periodontitis deterioration. As can be seen from the results, the lower the education level of the patients, the higher risk of deterioration of the disease. The results are in concordance with other studies examining the

prevalence of periodontitis (Almerich-Silla et al, 2017; Valerio et al, 2017; Carasol et al, 2016; Eke et al, 2015) pointing that socioeconomics factors showed significant association with periodontal pockets than some other variables such as tooth brushing. With regard to smoking, the sample represented the general population both periodontal patients and not, confirming the risk of deterioration by smoking to periodontitis since smokers had 4.6 higher risk of deterioration than non-smokers. In literature, it has been found that their relationship is direct to both the onset of the disease and the outcome of the therapeutic process (Almerich-Silla et el, 2017; Nociti et al, 2015; Ebersole et al, 2014). Finally, surprising was the result that only transient anxiety was as predictive factor, compared to the other MDAS and STAI subscales. This may be explained by the association of inflammatory diseases with anxiety, possibly due to the stress-induced immune suppression (Fenol et al, 2017; Kotle et al, 2016; Ng, Keung Leung, 2006).To conclude, compared with healthy controls, patients with good oral hygiene and deterioration of periodontitis were positively associated with higher levels of anxiety and DF. With this study, we have shown that mental health, in addition to general physical health, also plays an important role in oral health. Therefore, dental teams play an essential role in reduce anxiety and dental fear and help patient not only to complete the treatment but also to sustain it.

Limitations: The present study has some limitations. The sample is relative low due to the exclusive criteria set for this research, so a larger population is likely to give us better results. Also, a cross – sectional study does not provide statistical information on the variation that periodontitis can have in time.

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