Research / Araştırma Makalesi

The Comparison of Mood Factors in Individuals having Different Periodontal Status Using Depression Anxiety and Stress Scale-21 (DASS-21)

Farklı Periodontal Duruma Sahip Bireylerdeki Duygudurum Faktörlerinin Depresyon Anksiyete Stres Ölçeği-21 (DASÖ-21) Kullanılarak Karşılaştırılması

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ABSTRACT

Objectives: The purpose of this study was the evaluation and comparison of depression, anxiety, and stress levels in individuals who are periodontally healthy and who have gingivitis and periodontitis.

Material and Methods: This study involves 144 individuals in total, including 48 periodontally healthy patients, 48 patients who have gingivitis and 48 patients who have periodontitis. Clinical and radiological periodontal examinations of the individuals were conducted. Scores of gingival index (GI), plaque index (PI), pocket depth (PD), clinical attachment loss (CAL), and bleeding on probing (BOP) were recorded during intraoral examinations. Depression Anxiety and Stress Scale-21 (DASS-21) was used to determine levels of depression, anxiety, and stress.

Results: Depression, anxiety, and stress levels were meaningfully and statistically lowest in individuals who are periodontally healthy (p<0.001). Levels of clinical periodontal parameters in individuals who have periodontitis and gingivitis (PI, GI, BOP, PD, CAL) were seen to be meaningfully and statistically higher in comparison with individuals who are periodontally healthy (p<0.001). A positive correlation was observed among depression, anxiety and stress levels and clinical periodontal parameters (p<0.001).

Conclusions: Higher depression, anxiety and stress levels were seen in individuals with periodontitis. These mood factors may be some of the important situations that should be taken into consideration in the prevention and treatment of periodontal disease.

Keywords: Anxiety, depression, periodontal diseases, psychological stress

ÖZ

Amaç: Bu çalışmanın amacı; periodontal sağlık, gingivitis ve periodontitis görülen bireylerdeki depresyon, anksiyete ve stres seviyelerinin değerlendirilip karşılaştırılmasıdır.

Gereç ve Yöntemler: Bu çalışmaya 48 periodontal sağlıklı, 48 gingivitisli ve 48 periodontitisli olmak üzere toplam 144 birey dahil edildi. Bireylerin klinik ve radyolojik periodontal muayeneleri yapıldı. Ağız içi muayeneler yapılırken gingival indeks (Gİ), plak indeksi (Pİ), sondalanabilir cep derinliği (SCD), klinik ataçman kaybı (KAK) ve sondalamada kanama (SK) skorları kaydedildi. Depresyon, anksiyete ve stres düzeylerinin belirlenmesi için Depresyon Anksiyete Stres Ölçeği-21 (DASÖ-21) kullanıldı.

Bulgular: Depresyon, anksiyete ve stres seviyeleri periodontal sağlıklı bireylerde istatistiksel olarak anlamlı şekilde en düşük olarak gözlendi (p<0.001). Periodontitis ve gingivitis bulunan bireylerde klinik periodontal parametrelerin (Pİ, Gİ, BOP, PD, CAL) seviyeleri periodontal sağlıklı bireylere göre istatistiksel olarak anlamlı şekilde daha yüksek olarak görüldü (p<0.001). Depresyon, anksiyete ve stres seviyeleri ile klinik periodontal parametreler arasında pozitif korelasyon gözlemlendi (p<0.001).

Sonuç: Periodontitisli bireylerde daha yüksek depresyon, anksiyete ve stres seviyeleri görüldü. Bu duygudurum faktörleri, periodontal hastalığın önlenmesi ve tedavisinde dikkate alınması gereken önemli durumlardan biri olabilir.

Anahtar Kelimeler: Anksiyete, depresyon, periodontal hastalıklar, psikolojik stres

Introduction

Periodontium refers to gingival, cement, alveolar bone and periodontal ligament tissues. Bone loss and attachment loss does not occur in healthy periodontium. Clinical periodontal health is the situation of not having inflammation clinically.[1] Periodontal health can occur in individuals who have no gingival inflammation and may also involve patients who were successfully treated with gingivitis or periodontitis or other periodontal situations protecting the teeth without symptoms of clinical gingival inflammation. Clinical gingival health in a healthy periodontium is characterised with absence of bleeding on probing, erythema and swelling, patient symptoms, attachment and bone loss.[2] The distinction between gingival health and gingivitis primarily relies on the presence or absence of bleeding on probing. Gingivitis is gum inflammation. In the presence of gingivitis, bleeding on probing or spontaneous bleeding is observed.[3] Periodontitis is the form of gingivitis that occurs in the absence of treatment and in which attachment loss and alveolar bone destruction is observed. In periodontitis, periodontal pocket, gingival recession, and mobility are observed.[4] The primary reason for periodontal diseases is the microorganisms included in the biofilm but lots of genetic, environmental and systemic factors shaping the host response also affect the initiation, progression, and severity of periodontal disease. The main reason in the occurrence of periodontal disease is microbial dental plaque, however the degree of the disease and the form of its spread are not directly linked with the amount of microbial dental plaque that exists alone. Host response to these pathogens is the main cause of periodontal tissue destruction and alveolar bone loss.[5,6] Occurrence and progression of periodontal diseases can be caused by a lot of factors such as psychosocial factors. The reason for this is that factors associated with mood such as depression, anxiety and stress change the ways of living and habits of the individuals and causes insufficient oral hygiene and also the present psychological stress increases the cortisol level in time and leads to a pro-inflammatory process causing periodontal destruction.[7,8]

Stress is the emotional and physical reactions due to incidents that individuals encounter such as family problems, financial issues, or losing someone that is loved. Stress can be simply defined as the status of difficulty and threat, therefore the mental stress perceived by the individual due to environmental factors.[9-11] Psychological stress is a condition that is faced by everyone and must be tackled. The stress felt by the individual may develop and last short term and may also take a long time.[12,13] Sometimes the anxiety that can't be associated with a stimulus mostly emerges when an undesirable situation is encountered by the individual. Anxiety can be defined as an emotion that results with an angry behaviour, concern or suffocation due to threat, stress or fear perceived from incidents that are experienced.[14,15] Anxiety may cause symptoms such as dryness of the mouth, difficulty in breathing,

shaking of the hands, nausea, cold, sweating or heart palpitation.[16,17] Depression, which is affecting one's life negatively, is a mood disturbance showing symptoms such as experiencing the state of sadness for at least couple of weeks; not being able to enjoy old routines, eating problems, feeling of worthlessness although symptoms may vary depending on each person, idea, and age.[18-21] Family history, being exposed to bad behaviour at an early age, stress factors experienced recently and metabolic and immune disorders are the potential risk factors for depression.[22]

Stress, anxiety and depression are thought to originate from molecular and cellular anomalies such as genetic and environmental factors. Chronic stress results in increasing the circulating proinflammatory cytokines and stimulating vascular inflammation. Stress, anxiety and depression are known to decrease immune system function and cause chronic inflammation.[23-26] Since gingivitis and periodontitis are inflammatory diseases progressing with the process of pathogen bacteria prevailing the immune system function,[5] mood factors have a bidirectional relationship with the present microbiota in different places of the body[27,28] and also many studies emphasise the importance of psychosocial stress, anxiety and depression on periodontal diseases;[28-31] the evaluation and comparison were done regarding the periodontal status and mood factors of the individuals included in groups of patients that are periodontally healthy, patients with gingivitis and periodontitis, Turkish validity and reliability were measured and one of the most important scales in the literature for measuring the psychological mood factors of the individuals, Depression Anxiety and Stress Scale-21 (DASS-21) was used in our study.[32-34]

Material and Methods

Our study was initiated with the permission of Muğla Sıtkı Koçman University, Medicine and Health Sciences Ethical Committee dated 28th May 2023, numbered 55. The patients who applied to Muğla Sıtkı Koçman University Dentistry Faculty for routine examination were informed about the study and consent forms were taken from the participants. In the power analysis conducted before the study, the bidirectional Type 1 error ratio (α) was accepted as 0.05 and 144 individuals were voluntarily included in the study having 0.8 power (1-α) influence quantity. Depression Anxiety and Stress Scale-21 (DASS-21) was designed for the participants to fill out (**Table 1**). Depression, anxiety and stress status of the participants were evaluated with the scale form involving 21 close-ended questions. It has a 4 point Likert scale that includes Scale 0 referring to never, 1 referring to sometimes and occasionally, 2 referring to quite often, and 3 referring to always. In the scale, information about the participant was gathered from 7 questions regarding depression, 7 questions regarding anxiety, and 7 questions regarding stress.

Table 1. Depression Anxiety and Stress Scale 21

NO	YOUR STATUS OVER THE PAST WEEK	Never	Sometimes and Occasionally	Quite Often	Always
1 S	I have had difficulty in relaxing.	0	1	2	3
	I have realised dryness of the mouth.	0	1	2	3
3 D	I have realised I have not been able to experience any positive emotions.	0	1	2	3
	I have had difficulty in breathing *(for instance hyperventilation or feeling of breathlessness although I have not done any physical exercise)*	0	1	2	3
5 D	I have had difficulty in taking the first step to initiate work.	0	1	2	3
6 S	I am prone to overreact.	0	1	2	3
	Shakiness has occurred in my body *(for instance in the hands).*	0	1	2	3
8 S	I have felt that I have been using my neural energy too much.	0	1	2	3
	I have felt anxious about situations that I may panic and make a fool of myself.	0	1	2	3
10 D	I have had the feeling that I have no expectations.	0	1	2	3
11 S	I have felt that I have been provoked.	0	1	2	3
12 S	It has been difficult to relax and let go.	0	1	2	3
13 D	I have felt miserable and upset.	0	1	2	3
14 S	I have not been able to bear the things that keep me from my work.	0	1	2	3
15 A	I have felt being close to panicking.	0	1	2	3
16 D	Nothing has excited me.	0	1	2	3
17 D	I have felt worthless as an individual.	0	1	2	3
18 S	I have felt that I have been resentful.	0	1	2	3
19 A	I have felt my heartbeats even though there have been no physical exercise *(I have felt that my heartbeats have accelerated and I have had palpitation)*	0	1	2	3
20 A	I have felt scared without any particular reason.	0	1	2	3
21 D	I have had the feeling that life is meaningless.	0	1	2	3

Intraoral examination and radiographic examination of the participants were conducted. Gingival index (GI), plaque index (PI), pocket depth (PD), clinical attachment level (CAL) and bleeding on probing (BOP) scores were recorded during intraoral examinations. According to intraoral and radiographic examinations that were conducted, groups of 'Periodontal Health', 'Gingivitis' and 'Periodontitis' each of them including 48 individuals were created. These three groups were compared in terms of levels of depression, anxiety and stress.

The analyses were conducted using the IBM SPSS 20 statistical analysis program. Data were presented as mean, standard deviation, median, minimum, maximum, percentage, and count. Normality of continuous variables was assessed using the Shapiro-Wilk test and the Kolmogorov-Smirnov test. When the assumption of normal distribution was met for comparing continuous variables among more than two independent groups, the ANOVA test was employed; if the assumption was not met, the Kruskal-Wallis test was used. Following the ANOVA test, post-hoc tests were conducted using the Tukey test when variances were homogenous and the Tamhane's T2 test when variances were not homogenous. Post-hoc tests following the Kruskal-Wallis test were performed using the Kruskal-Wallis 1-way ANOVA (k samples) test. For comparisons between categorical variables larger than 2x2, the Pearson chi-square test was used when the expected value was (>5), and the Fisher-Freeman-Halton test was used when the expected value was (<5). When comparing two quantitative variables, the Pearson correlation was used if the normal distribution assumption was met, and the Spearman correlation test was used if it was not met. A significance level of $p < 0.05$ was considered.

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Results

144 individuals in total, involving 48 periodontal health, 48 gingivitis and 48 periodontitis were included in the study. 24 (%50) of the individuals that are periodontally healthy are female and 24 (50%) of them are male, 24 (50%) of the patients with gingivitis are female and 24 (%50) of them are male, and lastly 25 (%52.1) of the patients with periodontitis are female and 23 (%47.9) are male (**Table 2**). The age average of the individuals in periodontal health group is 32.02±3.78, the age average of the patients in gingivitis group is 34.67±7.86 and the age average of the patients in periodontitis group is 40.75±10.32 and a statistical and meaningful difference was observed between groups (p<0.001) (**Table 3**).

Table 2. Gender distribution by groups

		Gingivitis		Periodontitis		Healthy		Chi-Square	p
		Count	Column N %	Count	Column N %	Count	Column N %		
Gender	Male	24	50.0%	23	47.9%	24	50.0%	0.056	0.973
	Female	24	50.0%	25	52.1%	24	50.0%		

Table 3. Age distribution by groups

|	Age					Kruskal-Wallis H	P
	Mean	Standard Deviation	Median	Minimum	Maximum		
Gingivitis	34.67	7.86	33.00	23.00	57.00		
Periodontitis	40.75	10.32	38.50	23.00	60.00	21.426	<0.001
Healthy	32.02	3.78	33.00	24.00	39.00		

When the relationship between the clinical periodontal parameters regarding the three groups included in the study was evaluated, PI, GI, BOP, PD, CAL scores of the individuals included in the periodontitis and gingivitis groups were observed to be statistically and meaningfully higher in comparison with the individuals that are periodontal health (p<0.001). Considering BOP and PI scores, the values were observed to be statistically and meaningfully higher in the periodontitis group in comparison with the gingivitis group (p<0.001) (**Graphic 1**).
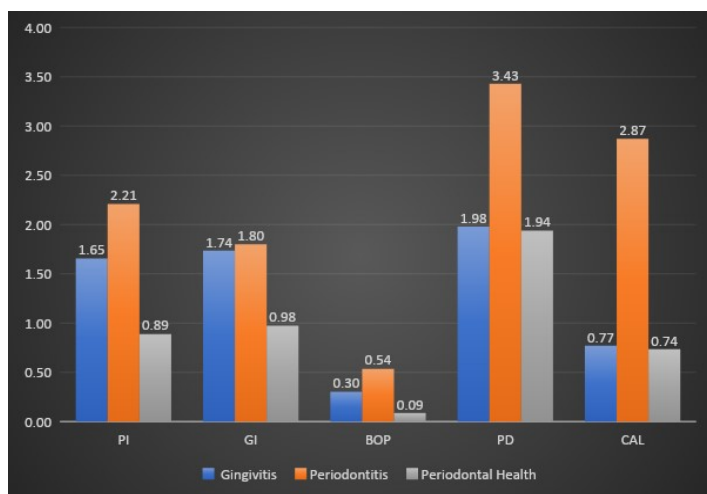
(PI: Plaque Index, GI: Gingival Index, BOP: Bleeding on Probing, PD: Pocket Depth, CAL: Clinical Attachment Loss)

Graphic 1. The relationship between clinical periodontal parameters and periodontal status

When depression, anxiety and stress levels among the groups were analysed, values in the periodontitis and gingivitis groups were observed to be statistically and meaningfully higher in comparison with the periodontally healthy group (p<0.001). These values were higher in the periodontitis group in comparison with the gingivitis group, however this difference was not statistical and meaningful (p>0.001) (**Graphic 2**).
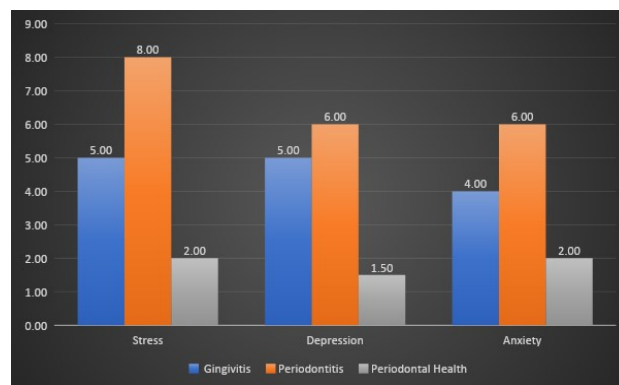
Graphic 2. The relationship between depression, anxiety and stress and periodontal status

When mood factors and clinical periodontal parameters were analysed separately, a positive correlation was observed between depression, anxiety and stress levels and PI, GI, BOP, PD, CAL scores (p<0.001) (**Table 4**).

Table 4. Correlations between mood factors and clinical periodontal parameters

Correlations		Age	PI	GI	BOP	PD	CAL	Stress	Depression	Anxiety
Age	r	1000	.320**	.264**	.357**	.335**	.394**	.209*	0.148	.242**
	p		0.000	0.001	0.000	0.000	0.000	0.012	0,077	0.003
	N	144	144	144	144	144	144	143	144	144
PI	r		1000	.839**	.830**	.666**	.643**	.477**	.345**	.500**
	p			0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N		144	144	144	144	144	143	144	144
GI	r			1000	.839**	.629**	.638**	.461**	.360**	.466**
	p				0.000	0.000	0.000	0.000	0.000	0.000
	N			144	144	144	144	143	144	144
BOP	r				1000	.725**	.698**	.549**	.431**	.536**
	p					0.000	0.000	0.000	0.000	0.000
	N				144	144	144	143	144	144
PD	r					1000	.893**	.420**	.316**	.401**
	p						0.000	0.000	0.000	0.000
	N					144	144	143	144	144
CAL	r						1000	.413**	.262**	.349**
	p							0.000	0.002	0.000
	N						144	143	144	144
Stress	r							1000	.653**	.648**
	p								0.000	0.000
	N							143	143	143
Depression	r								1000	.539**
	p									0.000
	N								144	144
Anxiety	r									1000
	p									
	N									144

*. Correlation is significant at the 0.05 level.
**. Correlation is significant at the 0.01 level.

(PI: Plaque Index, GI: Gingival Index, BOP: Bleeding on Probing, PD: Pocket Depth, CAL: Clinical Attachment Loss)

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Discussion

Transition between periodontal health to periodontal disease is a chronic complex inflammatory process being affected by a lot of factors. The main reason for the development and progression of this process if no precautions are taken is the role of microbial dental plaque and immune system.[35] Although gingivitis and periodontitis in the following process are initiated with the increase in the number of periodontopathogen bacteria in the dental plaque and paving the way of damage along with host response in periodontal tissues; mood factors such as depression, anxiety and stress can play a role in this inflammatory process.[28,36] Behavioural and physiological mechanisms lie between these mood factors and periodontal disease. Behavioural factors that affect immune system and periodontal tissues negatively such as smoking, alcohol consumption, insomnia and malnourishment are commonly seen in individuals having high levels of depression, anxiety and stress.[37,38] Furthermore, bad oral hygiene causing gingival inflammation and consumption of food that have high fat and sugar are seen more in individuals who have high levels of these mood factors.[39] Another physiological process causing a relationship between periodontal diseases and depression, anxiety and stress is the alterations that these mood factors make on hypothalamus-hypophysis-adrenal (HPA) axis. As a result of these alterations, colonisation of periodontopathogen bacteria on oral tissues is facilitated and balance is disrupted in the immune response with the proinflammatory cytokines that systemically increase.[40-43] In addition, in studies which the effect of stress and depression on periodontal status was examined, it was indicated that biomarkers associated with the severity of periodontal disease such as cortisol, dehydroepiandrosterone (DHEA) and chromogranin A were observed to be higher in saliva and serum samples of individuals having higher stress levels.[44-46]

Assessment and evaluation of psychological situations such as depression, anxiety and stress are issues that need to be taken into consideration. They are mostly assessed using self-report scales such as DASS-21 that we used in our study, however it should be kept in mind that the individuals who provide information may misinform and situation bias may occur. In this respect, it was specified that these assessments involve important psychometric problems such as being based on individual perception and subjective evaluation of the individuals.[47,48]

Along with self-report scales in the evaluation of mood factors, physiological markers such as hormones and cytokines being in relation with these factors can be used as to eliminate these problems.[49,50] However, it has been known that relationships between these physiological markers and current psychological situations have some limitations.[51,52] In addition, these biomarkers are also affected by many systemic and local factors.[53,54] Therefore, self-report scales that significantly ensure validity and reliability are preferred in the assessment of depression, anxiety and stress instead of neuro-physiological assessments.[51,55] Considering these, an assessment method that targets demonstrating these through self-report was preferred in this study instead of physiological assessments.

Some studies analysing the relationship between depression and periodontal diseases pointed out a positive correlation between depression and periodontal disease.[37,56] Similar to these studies, depression level was found to be highest in patients with periodontitis and the lowest in periodontally healthy individuals in the findings of our study. Other studies conducted on this issue showed that there is no significant relationship between periodontal disease and depression.[36,57,58] The reason for this is that the nature of participants and age range were associated in these studies. It was identified that clinical periodontal parameter values that occurred in patients with periodontitis being higher than periodontally healthy individuals is because individuals in periodontitis group had a high age average and they were exposed to dental plaque longer. In addition, it was emphasised that the relationship between periodontal disease and depression can be verified with further studies about individuals that are exposed to depression longer.

The relationship between stress and periodontal diseases was analysed in the conducted studies. It was stated in many studies that stress can be a potential risk factor for periodontal diseases.[59-61] Supporting these studies, our study concluded that stress level was observed to be highest in patients with periodontitis and the lowest in periodontally

healthy individuals. However, a relationship between stress and periodontal disease could not be found in previous studies analysing this relationship.[44,62-64] The reason for this is that in these studies there occurred no relationship between the current stress levels of the individuals and inflammatory cytokines and DHEA and also the questionnaires evaluating stress were not homogenous and standard. It was thought that the results of this studies are related with individuals having different psychological status when they encounter negative living conditions and these emotional states being described subjectively. Moreover, as a limiting factor in these studies, it was emphasised that the number of the patients that were studied were not enough to reach sufficient results.

In studies analysing the relationship between anxiety and periodontal disease, a correlation was observed between these two situations.[37,65-68] In parallel with these studies, it was observed in our study that the degree of gingival inflammation and periodontal disease increased with the increase in anxiety level. In studies observing the opposite, error rates of self-report scales related with anxiety and the need to have a more homogenous age range among groups were mentioned. In addition, it was demonstrated that instead of cross-sectional studies, longitudinal and prospective studies including groups that are observed and analysed for a certain amount of time are more appropriate to evaluate the relationship between psychological situations such as anxiety and stress and periodontal disease.[58,62]

Within the limitations of our study, it can be stated that the study design is a cross-sectional study, the responses given to the scale that we used are subjective and education, financial income and occupation status of the participants have not been evaluated. Despite these limitations, our study provides insight in terms of the relationship between mood factors such as depression, stress and anxiety and periodontal status.

Conclusion

Depression, anxiety and stress levels were observed to be highest in patients with periodontitis and the lowest in individuals that are periodontally healthy. According to the results of our study, one may say that there is a positive relationship between these mood factors and periodontal disease. This situation may contribute to the prevention and treatment of periodontal diseases. However, further studies are needed for a better understanding of the relationship between these psychological situations and periodontal diseases.

Acknowledgements

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