

Gender differences in periodontal status of depressive and non-depressive individuals

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Abstract

Aim: The purpose of the present study was to evaluate the gender-related differences in the relationship between periodontal diseases and depression in male and female adults.

Methodology: 171 females with periodontal disease (71 subjects with gingivitis and 100 subjects with periodontitis) and 168 males with periodontal disease (72 subjects with gingivitis and 96 subjects with periodontitis) were included in the study. Clinic periodontal parameters (probing pocket depth, gingival index, plaque index, and bleeding on probing) were used in the periodontal examination. Depressive symptoms were determined by the Beck Depression Inventory (BDI). According to BDI scores, 150 depressed subjects (77 females and 73 males) and 189 non-depressed subjects (94 females and 95 males) were present.

Results: There were similar BDI scores observed in female and male participants. All periodontal parameters were higher in males than females. While plaque index and gingival index were higher in depressed females than non-depressed females, probing depth was similar in female subgroups. Besides, all periodontal parameters were similar in male subgroups. When the relationship between periodontal status and depression scores in women was evaluated, women with periodontitis had higher BDI scores than women with gingivitis. In male subjects, there was no difference in BDI scores in individuals with periodontitis and/or gingivitis.

Conclusion: It can be said that depression is a risk factor that negatively affects periodontal status for females, who were more vulnerable to stress and pain than males.

Keywords: Depression, gender identity, periodontal diseases, Beck Depression Inventory, periodontal index

Introduction

Depression, a seen often mood disorder, including disease in cognitive, emotional, behavioral and somatic regulation, is described by loss of pleasure or interest, disturbed appetite or sleep, sadness, feelings of guilt or low self-worth, feelings of poor and concentration (1). It is a very common disease in current society and is the leading reason for disability worldwide (2). As a result of stress and depression, the HPA axis causes the release of cortisol, a glucocorticoid hormone, from the adrenal cortex and corticotropin-releasing hormone from the pituitary. This mechanism can reduce immune response by inhibiting lymphocyte, macrophage, and monocyte function, thereby increasing individual susceptibility to infection. So, there observe to be a meaningful association between psychological factors, stressors, and the host-immune system (3). Thus, it is hypothesized that depression and chronic stress reduce the immune responsiveness, causing more periodontal tissue destruction (4). Johansen et al. reported that long time exposure to stress may cause alteration in the immune system, and this may contribute to worse periodontal conditions in certain patients (5). Also, the biological effects of depression and stress can mediate the progression of periodontal disease through alters in health-related behaviors, such as smoking, oral hygiene, and diet (6,7).

In determining the role of sex as a discriminant factor in the progression, prevalence, and severity of periodontal disease, sex differences in oral health-related behavior and environmental factors and sex-specific differences in host susceptibility of immune function are considered (8,9). In a systematic review, Shiau and Reynolds observed that men appear at greater risk for destructive periodontal disease than women (10). However, there are also studies suggesting that women are more susceptible to periodontal disease due to hormonal and change of mood (11-14). Depression has also been associated with periodontitis in some studies in adolescents/young adults (15, 16) and adults (5, 17-21). However, information on depression, periodontal disease, and sex differences among adults is very limited.

The purpose of this study is to evaluate the gender-related differences in the relationship between periodontal diseases and depression in female and male adults.

Materials and Methods

Ethical approval

Ethical approval of the study was obtained from Research Ethics Committee (17-KAEK-079). The volunteer patients who gave verbal and signed the written consent form were included in the study. The study protocol was performed in accordance with the relevant guidelines of the Declaration of Helsinki. This

study was registered at ClinicalTrials.gov (NCT04682275).

Study design

The subjects were divided into two groups as male and female. All patients were asked to complete the Beck Depression Inventory (BDI) (22). Patients with a score of ≥ 17 according to the BDI were included in the depressed group (female $n=77$ and male $n=73$). Individuals with scale scores <17 were also included in the control (female $n=94$ and male $n=95$) group.

Exclusion criteria: 1) the presence of any systemic disease other than depression, 2) smoking and alcohol consumption, 3) the use of any drugs (antidepressants, anti-inflammatory, and antimicrobial medicaments, and hormonal supplements) that affect the periodontal condition; 4) have received any periodontal treatment in the last six months, 5) hormonal condition such as pregnancy or lactation and 6) having less than 15 teeth.

Psychosocial measurement

Beck Depression Inventory (BDI) (22), Turkish version (23): Self-report scale consists of 21 items. Each of the 21 statements is scored from 0 to 3.

The total score allows the classification of depression severity. Scores less than 10 indicates lack of the depression. The scores between 10-16 indicate minimum depression, the scores between 17-29 observe moderate depression, scores greater than 30 observe severe depression.

Periodontal clinical measurements

The periodontal clinical measurements (probing pocket depth (PPD), gingival index (GI) (24), plaque index (PI) (24), and bleeding on probing (BOP)) were recorded. PPD and PPD was measured in millimeters from the gingival margin to the base of the periodontal pocket.

BOP was recorded based on the presence or absence of bleeding up to 40 s after probing at the experimental sites. Diagnosis of gingivitis and periodontitis was performed using the 2017 World Workshop Periodontal and Peri-Implant Diseases and Conditions Classification Criteria (25).

Statistical analysis

Analyses were performed by using SPSS software (IBM SPSS Statistics version 19, IBM Inc., Armonk, NY, USA). Nominal data were expressed as mean $\pm$ standard deviation. Chi-square test was used for the data recorded as scores.

Independent samples t test analysis of variances was used to the for periodontal diagnosis and clinic parameters and BDI measures data among groups. p-value <0.05 was considered significant.

Results

There were statistically significant differences in demographic characteristics of patients between groups, except for the number of teeth. The individuals in the male group were found to be more educated than individuals in the female group ($p < 0.05$). The demographic characteristics including education level, gender, age, number of teeth and periodontal diagnosis of the patients in the female and male groups are summarized in Table 1.

Psychosocial measurements levels of individuals in the female and male groups are presented in Table 1. There was no significant difference in BDI scores of the subjects between the female and male groups ($p > 0.05$).

Table 2 presents clinical periodontal parameters (PPD, GI, BOP and PI) of the patients in the female and male groups. While the clinical periodontal parameters

were similar between depressed and non-depressed men groups ($p^b > 0.05$), depressed female group had significantly higher PI, GI and BOP values compared to non-depressed female group ($p^a < 0.05$). Non-depressed men group had a higher GI value than the non-depressed female group ($p^c < 0.05$), other clinical measurements were similar between non-depressed men and female groups ($p^c > 0.05$). In depressed female and male groups, periodontal parameters showed no difference ($p^d > 0.05$).

There was presented in Table 3 BDI scores of subjects with different periodontal diagnosis. While BDI scores between male and female participants with gingivitis and periodontitis were similar ($p > 0.05$). BDI scores were similar among male participants with gingivitis and periodontitis ($p > 0.05$), while female participants with periodontitis had higher BDI scores than female participants with gingivitis ($p < 0.05$).

Table 1. Descriptive demographic characteristics of groups

	Female (n=171)	Male (n=168)	<i>p</i>
Education level [n (%)]			0.001**
Primary school	17 (9.9)	23 (13.7)	
Middle School	23 (13.5)	33 (19.6)	
High school	70 (40.9)	35 (20.8)	
University	61 (35.7)	77 (45.8)	
Periodontal diagnosis [n (%)]			0.803
Gingivitis	71 (41.5)	72 (42.9)	
Periodontitis	100 (58.5)	96 (57.1)	
Number of teeth (mean±SD)	25.27±2.72	25.02±2.82	0.394
Age (mean±SD)	35.51±10.80	37.39±9.86	0.096
BDI	13.52±12.39	14.44±9.74	0.448
PI	1.10±0.69	1.08±0.67	0.842
GI	1.83±0.55	2.02±0.62	0.005*
PPD (mm)	3.10±0.99	3.41±1.33	0.016*
BOP (%)	51.36±28.96	53.32±26.93	0.023*

Statistically significant *p* values ($p < 0.05$) are indicated with bold. Probing pocket depth (PPD), gingival index (GI), bleeding on probing (BOP), plaque index (PI), Beck Depression Inventory score (BDI)

* Independent samples *t* test statistics

** Chi-square statistics

Table 2. Periodontal status and psychosocial measurement according to the study groups

Variable	Female (n=171)		p^a	Male (n=168)		p^b	p^c	p^d
	Non-depressed females	Depressed females (n=77)		Non-depressed males	Depressed males (n=73)			
PI	0.70±0.48	1.41±0.69	0.000*	0.84±0.45	1.26±0.75	0.074	0.139	0.095
GI	1.74±0.57	1.94±0.51	0.020*	1.87±0.53	2.19±0.69	0.100	0.011*	0.810
PPD (mm)	3.15±1.07	3.05±0.90	0.523	3.45±1.22	3.35±1.47	0.074	0.131	0.082
BOP (%)	40.88±30.05	63.78±22.11	0.000*	49.43±31.92	59.70±23.78	0.060	0.278	0.359
BDI	3.90±4.96	25.31±7.55	0.000*	7.42±4.98	23.57±6.17	0.000*	0.126	0.095

Statistically significant p values ($p < 0.05$) are indicated with bold. Data are presented mean ±standard deviation. Probing pocket depth (PPD), gingival index (GI), bleeding on probing (BOP), plaque index (PI), Beck Depression Inventory score (BDI)

p^a : statistical difference between non-depressed and depressed females,

p^b : statistical difference between non-depressed and depressed males,

p^c : statistical difference between non-depressed females and males,

p^d : statistical difference between depressed females and males

* Independent samples t test statistics

Table 3. Periodontal diagnosis and Beck Depression Inventory measurement between to the study groups

	Beck Depression Inventory		p^a
	Female	Male	
Gingivitis	10.41±13.22	13.69±9.35	0.088
Periodontitis	15.73±11.31	15.00±10.03	0.634
p	0.005*	0.392	

Statistically significant p values ($p < 0.05$) are indicated with bold. Data are presented mean ±standard deviation.

p: statistical difference between patients between gingivitis and periodontitis,

p^a : statistical difference between females and males

* Independent samples t-test statistics

Discussion

The overall aim of this study was to evaluate gender dependent differences in periodontal status of depressed and non-depressed individuals. To the best of the authors' knowledge, no studies to date have evaluated the relationship of periodontal status and depression depending on gender.

Evidence observes that psychological stress and ineffective coping can mediate the progression of periodontitis through changes in life and health-related behaviors (4). Although stress and depression adversely affect these health-related behaviors, there is strong evidence that stress acts a role in the pathophysiology of periodontal disease (26). It should be kept in mind that the owing to which stress causes inflammation is complex and bidirectional, and stress can create inflammation

and inflammation can cause stress (4). Genco et al. suggested that distress and stress revealed as depression was an important risk factor for periodontitis in a cross-sectional study of 1,426 subjects (18). Johannsen et al. reported higher gingival inflammation and deeper pockets in depressed patients (5). Kurer et al. found a relationship between depression and plaque accumulation (27). Rai et al. showed that stress scores and salivary stress markers are significantly associated with periodontal clinical parameters (28). Sundararajan et al. demonstrated that periodontal patients have a significantly higher BDI score than healthy controls (29). In the present study, there was no difference between the BDI scores of male patients with gingivitis and male patients with periodontitis. In contrast, depressed females had significantly higher clinical periodontal parameters such as GI, PI, and BOP than non-depressed

females. In addition, BDI scores of female individuals with periodontitis were found to be significantly higher than female individuals with gingivitis. In depressed females and males, periodontal parameters showed no difference, non-depressed males have higher GI values than non-depressed females. However, PI values are similar. When considered in terms of non-depressed individuals, this result is consistent with the results of a systematic review by Shiau et al., who reported that adult males are at higher risk for periodontal disease than females (10). However, no difference was found between depressed male and female and between non-depressed male and female in PI values. This result is also different from United States surveys which demonstrate that males were more likely to exhibit calculus than females (30, 31). However, it should be kept in mind that the individuals participating in the present study do not smoke and the size of the study was small compared to national surveys.

Many studies have been conducted on the sex differences in depressive disorders (32). Females incline to report and remember depressive symptoms more often than men (33). Additionally, Marcus et al. reported results confirming previous research that suggested more depression episodes and higher depression rates in women than men (34). Underlying this disparity may be social and economic factors, such as the fact that women are more exposed to financial and social disadvantages during their life course than men, as well as biological factors resulting from gender differences (35). It is also assumed that fluctuations in estrogen levels in women play a role in the pathogenesis of depression in women (32). In this study, the periodontal clinical parameters of depressed females were higher than non-depressed females. There was no difference between depressed males and non-depressed males. In addition, females with periodontitis had higher BDI scores than females with gingivitis. The reason why periodontal disease is more severe in depressive women may be that women are more affected by the negative effects of depression on the immune system due to biological reasons.

Conclusion

Platelet concentrates are used in several domains, such as soft tissue improvement, plastic periodontal surgery, gingival enlargement, MRONJ, regeneration of bone defects, ridge preservation, sinus augmentation, immediate implant placement, and implant osseointegration. They are preferred in patient treatments because of their ease of use and low cost.

Disclosures

Ethical Approval: Ethics committee approval was received for this study from Tokat Gaziosmanpaşa University, Faculty of Medicine, Research Ethics Committee, in accordance with the World Medical Association Declaration of Helsinki, with the approval number: 17-KAEK-079). This study was registered at Clinical Trials. gov (NCT04682275).

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