

Original Article

Anxiety, depression, and oral health: A population-based study in Southeast of Iran

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ABSTRACT

Background: Depression and anxiety are two psychosocial illnesses that mostly are comorbid. The prevalence of these diseases is increasing worldwide. Both can affect general health also oral and dental health. The effects can be physiological and behavioral. Patients with these disorders are not willing to keep oral hygiene. The purpose of this study was to investigate the association between depression/anxiety and oral health indices in the 15–75-year-old population of Kerman.

Materials and Methods: This cross-sectional study recruited 5900 people aged 15–75 years through one-stage cluster sampling (Kerman coronary artery disease risk factors study, KERCADRS). Data were collected through Beck questionnaires for anxiety and depression and clinical examinations. Oral health indices including decayed, missing, filled teeth, gingival index (GI), and community periodontal index (CPI) were also measured. Data were analyzed by SPSS 21 software. Chi-square, *t*-test and regression analysis were used to determine the relationship between the variables. $P \leq 0.05$ was considered as the level of statistical significance.

Results: In the study, 1975 (33.6%) of patients showed moderate-to-severe anxiety and 3502 (59.5%) got the scores as depressed. There was a significant difference between GI and CPI indices of the normal and depressed group ($P < 0.01$), but the difference in the anxious and normal group was not statistically significant ($P > 0.05$).

Conclusion: The results of the study showed a significant relationship between depression and oral health indices but not with anxiety. Therefore, the present study suggests that more attention should be paid to the oral health of people with a history of depression.

Key Words: Anxiety, dental caries, depression, oral health, periodontal diseases

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INTRODUCTION

Oral health is an important issue that affects not only the teeth and mouth but also general health, appearance, and self-esteem. Recently, researchers have shown that there is a relationship between oral

diseases and conditions such as diabetes, heart, lung, and kidney diseases.^[1-5] The most common problems of the oral cavity are dental caries and periodontitis; however, these two are preventable.^[2] Based on the

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World Health Organization (WHO), 5%–20% of adults have periodontitis.^[6]

Mental disorders such as depression and anxiety are pervasive problems worldwide.^[7] Depression is the fourth leading cause of disability and will be the second by 2020 based on the WHO documents.^[8] Anxiety disorder is also frequent as a feature of modern life.^[9] The two disorders are comorbid, and the diagnosis should be done carefully. Although there are psychological and medical therapies for these disorders, half of the patients do not follow-up the treatment and the other half which seek the treatment do not receive suitable treatment.^[10]

It is proved that these two conditions can influence the physical health by several pathophysiologic mechanisms. Enhancing the risk of infections by modification of the immune system function and increasing pro-inflammatory cytokines and thereafter induction of vascular inflammation are of the most proposed mechanisms of action of depression and anxiety on the human body.^[11] It is proposed that these two conditions can cause oral and dental problems since emotional changes can influence oral mucosa.^[12] Several researches have also shown a relationship between anxiety or depression and periodontal health^[13-15] while others have not.^[16,17] Because of the controversy, the aim of this study was to investigate the relationship between oral health and depression/anxiety in a large general population in the southeast of Iran.

MATERIALS AND METHODS

Data collection

This cross-sectional study was part of a big cohort study Kerman coronary artery disease risk factors study (KERCADRS) started from 2010 in Kerman Province of Iran.^[18] The sampling was done by one-stage clustering from 250 postal codes randomly selected among Kerman city postal codes. The participants were a population of families who admitted to participating in the study and signed a written consent form after ensuring their understanding of the whole process. For participants under the age of 18 years, their parents/guardians signed the consent form. All procedures of this study were carried out according to the Declaration of Helsinki. The study was reviewed and approved by the Research Review Board of Kerman University of Medical Sciences (Ethic code: 88–110 KA). Some demographic

information was recorded. The methodology of the whole project has been published in Iranian journal of public health.^[18] Beck anxiety questionnaire and Beck Depression Inventory-IA were used to determine the score of anxiety and depression.^[19,20] The decayed, missing, filled teeth (DMFT) index was measured based on the WHO protocol using a mouth mirror under the light of the dental unit and DFMT were assessed.^[21] Gingival status was assessed using Silness and Leo's index of the gingival bleeding, gingival index (GI). For assessing this index, patient's teeth were dried, and then, index teeth were examined on the basis of index criteria.^[22] The community periodontal index (CPI) was assessed by CPI probe (Fresno-Surge, Pakistan), and index teeth were coded by standard codes of the index.^[22] A trained dentist performed the oral examination. The beck questionnaires were completed by participants and they were helped by a health worker if it was necessary.

Psychometric instruments

Psychometric instruments used in this study were Beck's Depression and Anxiety Scales for the assessment of depression and anxiety symptoms.^[19,20] Persian versions of both questionnaires are also validated.^[23-25]

Beck depression index

Beck depression index (BDI) scale is a questionnaire for the assessment of depression symptoms which includes 21 items. Each item is scored from 0 to 3. BDI score is a sum of the value of each item (total: 63). A total score of 1–10 is assumed normal and total score above 10 as a level of depression (11–16 as mild mood disturbance; 17–20 as borderline clinical depression; 21–30 as moderate depression; 31–40 as severe depression; and over 40 as extreme depression).^[19] In this study, the severity of depression was considered for analysis, and patients with moderate depression and above were considered as depressed.

Beck anxiety index

Beck anxiety index (BAI) scale is a questionnaire for the assessment of anxiety symptoms which includes 21 questions about anxiety symptoms. Each question is scored from 0 to 3. BAI total score is a sum of the value of each question (total: 63). The score of 0–21 is assumed as low anxiety or normal, score of 22–35 as moderate anxiety, and score of 36 and above as potentially concerning levels of anxiety.^[20] In this study, the severity of anxiety was considered for

analysis, and patients with moderate and above score were considered as anxious population.

Statistical analysis

Data of noneligible people (smoking, opium abuse, complete denture, and pregnancy and a history of hemorrhagic diseases, epilepsy, immune system deficiency diseases, malignancies, chronic inflammatory diseases, and bulimia) were excluded from analysis.

The SPSS software version 21 (IBM Corp., Armonk, NY, USA) was used for data analysis. The groups' relationships were performed using Chi-square, *t*-test, and ordinal or linear regression. $P = 0.05$ and less was considered as the statistically significant level.

RESULTS

The participants in the project were 3238 female and 2662 male (total 5900 people) aged 15–75 years. The data of 4574 participants were analyzed for CPI index, 4591 for GI index, and 4640 for DMFT.

In this study, the educational state of 48.5% of participants was below diploma, 32.7% diploma, and 18.8% higher than diploma. The mean DMFT index was 13.58 (with the standard deviation of 5.96) in participants; 73.8% had mild GI; and 92.2% had CPI score 2 (calculus). The analysis of questionnaires revealed that 1975 (33.6%) of participants showed medium and severe anxiety and 3502 (59.5%) showed low, medium, and severe depression. The results of the study were analyzed in four age groups (15–24, 25–34, 35–54, and 55–74) and two sex groups. The depression showed an association with the GI index in people with the age of 40–70 years ($P < 0.001$). However, the relationship between depression and CPI index was not statistically significant.

GI and CPI indices were higher in anxious people compared to normal people; though it was not statistically significant. However, the relationship between depression and both GI and CPI indices was statistically significant ($P < 0.001$).

To determine the association of dependent variables of oral health with independent variants of depression and anxiety, the ordinal (for GI and CPI) or linear regression (for DMFT) analysis was also done. It showed that there was neither a significant association between GI and anxiety nor GI and depression. However, GI score was higher in women and in elders [Table 1]. The other oral indices (CPI and

DMFT) were significantly higher in elders and patients with depression but not in patients with anxiety [Tables 2 and 3].

Comparing normal and depressed participants' scores showed that the difference between GI and CPI indices in normal and depressed people was statistically significant ($P < 0.001$) [Table 4]. However, the difference between GI and CPI indices between normal and anxious participants was not statistically significant ($P > 0.05$) [Table 5].

DISCUSSION

Since mental conditions affect the whole body and also oral health, it is estimated that anxiety and/or depression may have an influence on the incidence of oral diseases.^[12] Several studies tried to detect this association, but the results are inconsistent.

In this cross-sectional study, the relationship between depression and anxiety and oral health indices were investigated in 5900 participants aged 15–75 years. About 33.6% of participants were marked with anxiety and 59.5% of participants with depression. There was a significant relationship between depression and oral health indices. Regression analysis indicated that depressed patients are at the greater risk of tooth missing and developing dental caries and presenting poor periodontal and gingival status; however, no significant relationship was found between anxiety and oral health indices. Because of the established effect of smoking and opium on periodontal diseases, people who smoke or use opium were excluded from this study.

Table 1: Association of gingival index with anxiety and depression by ordinal regression analysis

Variable	Estimate	SE	Wald	df	Significant
Depression	-0.024	0.034	-0.498	1	0.480
Anxiety	0.057	0.069	0.684	1	0.408
Age	0.048	0.003	213.461	1	0.000*
Sex	-0.219	0.079	7.640	1	0.006*

*Significant. SE: Standard error

Table 2: Association of community periodontal index with anxiety and depression by ordinal regression analysis

Variable	Estimate	SE	Wald	df	Significant
Depression	0.118	0.052	5.144	1	0.023*
Anxiety	-0.057	0.104	0.306	1	0.580
Age	0.011	0.005	5.584	1	0.018*
Sex	-0.021	0.121	0.029	1	0.866

*Significant. SE: Standard error

Table 3: Association of decayed, missing, filled teeth with anxiety and depression by linear regression analysis

Variable	Unstandardized coefficients		Standardized coefficients (β)	t	Significant
	B	SE			
Depression	0.326	0.070	0.072	4.684	0.000*
Anxiety	0.185	0.138	0.021	1.348	0.178
Age	0.183	0.005	0.450	34.281	0.000*
Sex	0.034	0.161	0.003	0.209	0.834

*Significant. SE: Standard error

Table 4: Comparing oral health indices in normal and depressed groups

Oral health indices	GI-score			Total	CPI-score				Total
	Mild	Medium	Sever		1	2	3	4	
Depression severity									
Normal									
Count	478	1488	50	2016	67	1855	90	0	2012
Percentage within depression score	23.7	73.8	2.5	100.0	3.3	92.2	4.5	0.0	100.0
Percentage within GI/CPI score	48.2	43.1	35.2	44.0	48.2	44.7	33.2	0.0	44.1
Percentage of total	10.4	32.5	1.1	44.0	1.5	40.6	2.0	0.0	44.1
Depressed									
Count	514	1962	92	2568	72	2296	181	6	2555
Percentage within depression score	20.0	76.4	3.6	100.0	2.8	89.9	7.1	0.2	100.0
Percentage within GI/CPI score	51.8	56.9	64.8	56.0	51.8	55.3	66.8	100.0	55.9
Percentage of total	11.2	42.8	2.0	56.0	1.6	50.3	4.0	0.1	55.9
Total									
Count	992	3450	142	4584	139	4151	271	6	4567
Percentage within depression score	21.6	75.3	3.1	100.0	3.0	90.9	5.9	0.1	100.0
Percentage within GI/CPI score	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of total	21.6	75.3	3.1	100.0	3.0	90.9	5.9	0.1	100.0

P<0.01 (GIxdepression); P<0.001 (CPIxdepression). 1: Normal; 2: Mild; 3: Moderate; 4: Severe. GI: Gingival index; CPI: Community periodontal index

Table 5: Comparing oral health indices in normal and anxious groups

Oral health indices	GI-score			Total	CPI-score				Total
	Mild	Medium	Sever		1	2	3	4	
Anxiety severity									
Mild									
Count	688	2329	90	3107	98	2814	180	2	3094
Percentage within anxiety score	22.1	75.0	2.9	100.0	3.2	91.0	5.8	0.1	100.0
Percentage within GI/CPI score	69.3	67.5	63.4	67.8	70.5	67.8	66.4	33.3	67.7
Percentage of total	15.0	50.8	2.0	67.8	2.1	61.6	3.9	0.0	67.7
Medium and severe									
Count	305	1120	52	1477	41	1337	91	4	1473
Percentage within anxiety score	20.6	75.8	3.5	100.0	2.8	90.8	6.2	0.3	100.0
Percentage within GI/CPI score	30.7	32.5	36.6	32.2	29.5	32.2	33.6	66.7	32.3
Percentage of total	6.7	24.4	1.1	32.2	0.9	29.3	2.0	0.1	32.3
Total									
Count	993	3449	142	4584	139	4151	271	6	4567
Percentage within anxiety score	21.7	75.2	3.1	100.0	3.0	90.9	5.9	0.1	100.0
Percentage within GI/CPI score	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of total	21.7	75.2	3.1	100.0	3.0	90.9	5.9	0.1	100.0

P>0.05 (GI and CPI anxiety). 1: Normal; 2: Mild; 3: Moderate; 4: Severe. GI: Gingival index; CPI: Community periodontal index

Several researches reported similar data to the present paper. Rosania *et al.* showed that depression, stress, and the amount of salivary cortisol are associated with periodontal diseases in a cross-sectional

pilot study. Although the number of subjects (45 periodontal patients) participated in the study was few. This means that in this study, the measurement of depression and anxiety was done in a group of people

with oral diseases.^[13] Furthermore, Suresh *et al.* performed an observational study on 278 anxiety and 398 depression patients and 676 healthy controls. In this study, the results showed that depression (like the present study) and anxiety (unlike the present study) increase the incidence of oral diseases. The percentage of people suffering from oral diseases in anxiety, depression, and control groups were about 21%, 9%, and 5%, respectively. The difference of this study with the present study is that their research was done on patients with depression and anxiety, but the present study was done on a general population.^[12]

In contrast, there are some studies that found no relation between anxiety/depression and periodontal diseases. Solis *et al.* performed a cross-sectional study on 153 people and could not find a relationship between depression/anxiety and periodontitis.^[16] Viana *et al.* also did not find a significant association between depression and periodontitis in 191 elderly people over the age of 60.^[26] Delgado-Angulo *et al.* performed a large population-based survey on 8028 participants which <5000 people had completed the survey and were included in the analysis. They reported that depression was associated with the number of decayed teeth but not with periodontal diseases. They also found that there was no relationship between anxiety and neither the number of decayed teeth nor periodontal diseases.^[17] Finally, a systematic review published in 2016 could not find a relation between depression and periodontitis because of the heterogeneity among the researches.^[27]

It should be mentioned that the number of participants in the present study was large. This can be the strength of this study. However, there are drawbacks for this research. For example, although self-reporting questionnaires used in this study are validated instruments, they are not diagnostic tools. Another drawback is that dental and periodontal diseases are chronic conditions and their progression takes time. It is recommended to search for a relationship between anxiety/depression and oral diseases in patients with a long history of anxiety disorders or depression.

The differences among studies done so far may refer to the different sample size of the studies, the type of the studies, the anxiety and depression questionnaires used, the difference between the races, the range of the ages of people participated in the researches, etc., For further research, it is also recommended to do the same project considering people with dental anxiety since a relationship between poor oral health and anxiety has been proposed.

CONCLUSION

Based on the results of this study, there is a relationship between depression and oral diseases; therefore, it is recommended that people who are diagnosed with depression receive more dental services. Although we did not find a significant relationship between anxiety and oral diseases, it is better to pay more attention to this group of people's oral health.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, and financial or nonfinancial in this article.

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