

## Evaluating the role of stress and anxiety with clinical symptoms in TMD patients

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### ABSTRACT

**Introduction:** The etiology of TMD is complex and multifactorial, but it is thought that psychological factors contribute to the etiology and persistence of TMD. Therefore, the aim of this study was to investigate the role of anxiety and depression in the development of temporomandibular joint disorders in patients referred to Tehran University of Medical Sciences, School of Dentistry, International Campus.

**Materials and Methods:** This cross-sectional study was performed on patients referred to Tehran University of Medical Sciences, School of Dentistry, International Campus who had temporomandibular joint disorder. Hence the number of 224 people easily selected at random. They were given 3 questionnaires to assess their anxiety and depression (9-PHQ, 4-PHQ7 and-GAD-7). After collecting data using SPSS software version 22 and considering the error level at 0.50% probability and one-way analysis of variance and frequency analysis were performed.

**Results:** The rate of depression in patients with TMD was 8.83 according to the 9-PHQ questionnaire and 4.72 according to the 4-PHQ questionnaire, and the level of anxiety in patients with TMD according to the 7-GAD questionnaire was equal to 8.95 There was no significant relationship between patients' gender and their level of anxiety ( $p < 0.50$ ), but there was a significant relationship between patients' age and their level of anxiety ( $p > 0.50$ ).

**Conclusion:** Age and gender are not significantly associated with temporomandibular joint disorders. Also, anxiety and depression are positively related and there is a significant value achieved with the incidence of TMD in the participants. A reduction in the level of anxiety and depression within people, can have a great impact on the treatment of TMDs in individuals.

**Keywords:** Temporomandibular joint disorder; Anxiety; Depression.

### Introduction

TMD is one of the three most common chronic pain conditions following headache and lower back pain [1]. The word TMD is a collection of clinical

problems involving the masticatory muscles disorders [2] such as Myofascial Pain Disorders (MPDs) which present as pain sensation within the Temporomandibular region,

difficulty in TMJ functional movements and clicking sounds or crepitus during function [3] and the temporomandibular joint is referred to as joint disorder and its related structures. The chronic form of TMD pain may lead to a lack or reduction in the individual's social and work activities and connections, which in turn reduces the overall quality of life and it causes a lot of time and money for frequent referrals to various specialists [2].

Some researchers have cited patient's mood as a predisposing factor for Pain Dysfunction Syndrome. Stress has been considered as a significant factor in the development of teeth grinding and abrasion habits that lead to masticatory muscle spasm and pain in the TMJ joint area. Physical and mental therapy are essential to reduce the symptoms of TMD [4]. Another major area is mental disorders, especially anxiety, which leads to increased muscle tone and muscle pain, followed by masticatory pain disorder syndrome (MPDS). Conservative treatment is usually helpful in relieving pain and dysfunction. The dentist can use various treatment modalities such as prescribing medication, occlusal splint, biofeedback and physiotherapy to relieve these symptoms [5]. The cost of TMD treatment is very high, estimated at \$ 4 million in the United States in last century [6]. Signs and symptoms include pain and dysfunction in the temporomandibular joint and masticatory muscles and other areas of the face and neck, including the temporal, occipital, frontal, and head and ear areas [7].

One of these influential factors is the psychological problems of patients. An important factor in relation to psychological variables is their predictive value in relation to complete and excellent treatment of these patients [8]. Among the psychological variables, it seems that the Research on somatization in TMD 1 patients is more than other cases and it has been found that petroform toxin disorders are the most common of psychological problems in these patients [9,10]. The second psychological problem in these patients is depression which has less consensus than somatization. Some authors report high levels of depression in these patients, while others did not observe differences amongst TMD patients and normal control participants [11-14]. Another psychological problem in these patients is anxiety, which is one of the most common mental disorders and, like depression, the results of studies on anxiety in these patients are different [14-16]. Therefore, because the studies performed on the comparison of psychological parameters related to TMD have been mostly in Western and European societies. It seems that due

to contextual and general cultural differences, how to care for the disease and patients and other racial-physiological factors, more extensive and comprehensive studies should be conducted in Asian societies [17]. Given that a similar study has been conducted to date on TMD-related psychological problems in Iranian society; therefore, the aim of this study was to investigate anxiety and depression in temporomandibular joint disorders.

Possibility of various abnormalities in the temporomandibular joint, including TMJ developmental anomalies, subluxation of soft tissue disorders, remodeling, arthritis, trauma and tumors. These abnormalities cause symptoms such as asymmetry in the face, pain and swelling, difficulty pairing teeth, cramps and muscle spasms that eventually lead to problems in a person's daily life. Even if this condition persists, there is a possibility of psychological conflicts such as depression or interference with the normal course of one's life [18]. According to most researchers, the causes of TMD are multifactorial and complex. Macrotrauma has been suggested as one of the important causes of temporomandibular disorder [19]. Also, systemic diseases, occlusion disorders, posterior edentulousness and orthodontic treatment are effective in its occurrence [20]. Studies have also shown that Temporomandibular Disorders (TMDs) are associated with certain risk factors such as anxiety and depression, oral habit, poor socioeconomic status, and genetic predisposition [20-24].

The prevalence of temporomandibular joint disorder, its causes and factors, its symptoms and clinical signs in different societies according to age, race, geographical location and time of study. According to various studies, the percentage of people with temporomandibular disorder in the international community and among Iranians is between 10 and 91% [25-26]. It is generally reported to be more common in women than men. This disorder is 1.5 to 2 times more common in women than men and this difference is attributed to behavioral, hormonal, anatomical and psychological factors [23-26]. Some studies have shown that TMD is more common in adults in terms of age [25]. However, some epidemiological studies indicate a similar prevalence in young people and adults [23,24] Stanizovsky et al. in their study in 2018 examined TMD disorders related to HPA2 stress and regulation-driven (hypothalamo-pituitary-adrenal gland). They concluded that patients with TMD may have higher levels of hypothalamic-pituitary-adrenal activity with higher secretion

from the adrenal cortex. They also stated that anxiety and depression and high pain rate were significantly higher in TMD groups and psychological factors may help increase chronic HPA concentrations [27]. In their 2016 study, Jati Patil et al. Examined the psychological evaluation of TMD patients and they concluded that their findings were consistent with previous research and showed a significant relationship between depression and anxiety and the rate of TMD. Also, screening for symptoms of this disease should be done regularly [28].

Lakshmi and Disanor [4] in 2016 in their study examined the relationship between anxiety and depression in patients with TMD and they found that anxiety and depression were high in TMD patients. There was no significant relationship between cortisol level in TMD group with anxiety and depression. They stated that patients with temporomandibular joint disorders should always be evaluated for anxiety and depression [29]. In 2016, Augusto et al. examined temporomandibular joint disorders, jaw stress, anxiety, and joint mental disorders in students and found that there is a significant relationship between CMD6 and TMD and variables such as depression, anxiety and congenital muscular dystrophy [30].

In a study done in 2013, Bojikian et al. examined the association between anxiety and depression and TMD disorders amongst students. They concluded that the symptoms of anxiety and depression and the rate of TMD disorders were significantly associated with TMJ functionality as well as anxiety and depression. They also stated that due to the origin of TMD, more studies should be performed on patients with more mobility limitations [31]. Basir Shabestari and Shirin Beck in their study done in 2011, investigated the prevalence of temporomandibular disorders and related factors in patients referred to the Islamic Azad University, School of Dentistry in Tehran, concluded that there was a significant association between temporomandibular joint disorders and age, sex, parafunctional habits, trauma, orthodontic treatment, posterior edentulousness, anxiety and depression. They also stated that due to the known complications of this disorder and widespread contradictions, it is recommended to study the etiology of this complication [32]. In a research done in 2007 by Vojdani et al. anxiety and depression were compared in people with confusion and jaw joint disorders with a healthy group. They found that anxiety and depression were more prevalent in TMD patients than in healthy individuals. The same level of depres-

sion and anxiety in men and women in the case group should be considered in the treatment plan for both sexes [33]. Moreover, Lavaf, Azizi and Allameh in 2007 compared the effect of occlusal interference and psychological problems in patients with TMD symptoms and healthy people referred to the School of Dentistry at Ahvaz University of Medical Sciences and concluded that occlusal interference could play a role in the development of TMD only as a cofactor. Because occlusal interventions are relatively common in the general population, but only a small percentage of people show symptoms of TMD. Psychological factors seem to play an important role in causing temporomandibular joint problems [34].

The study's specific objectives were to determine the role of anxiety in the development of temporomandibular joint disorders, determining the role of depression in temporomandibular joint disorders, determining the relationship between gender and anxiety and depression in the development of temporomandibular joint disorders, determining the relationship between age and anxiety and depression in the development of temporomandibular joint disorders all in the patients referred to Tehran Dental University and Tehran International Campus.

## Materials and Methods

The statistical population included all patients referred to Tehran University of Medical Sciences, Dental Campus and International Campus who had temporomandibular joint disorders. Sample selection method Sample selection was done randomly in order to complete the desired number in the sample size (250 people). Inclusion criteria included patients with temporomandibular joint disorder for more than six months elapsed from joint sounds, deviation or restriction when opening the mouth, -pain when touching joints or muscles, and headache. The Exclusion criteria included patients who did not consent to participate and continue the study and those who have connective tissue disorders. The present study is a descriptive-analytical study and was conducted in 2019. After determining the sample size using Cochran's formula, 250 samples that were eligible for inclusion were selected. After determining the samples, three questionnaires were randomly given to each person identified by the code and they were asked to respond carefully and without the help of others, and they were assured that participating in the study would not affect their treatment process. The names and personal details of

patients were not included in the questionnaires. The questionnaires used in this research include: Patient Health Questionnaire (4-PHQ) and (PH-9-9) and General Anxiety Disorder Questionnaire (7-GAD). These questionnaires were standardized with good validity and reliability that had been examined in previous studies. The 4-PHQ Questionnaire includes 4 questions that assess feelings of nervousness, anxiety or irritability, inability to stop or control anxiety, low interest or enjoyment of work, and feelings of depression or frustration. The 9-PHQ Questionnaire consists of 9 questions that assess low interest or enjoyment of work, feeling depressed or hopeless, having trouble sleeping or sleeping too much, feeling tired or having low energy, low appetite or overeating, Feeling negative about yourself, having trouble relating to work, checking for verbal anxiety, the possibility of self-harm. The 7-GAD Questionnaire has 7 questions that assess feeling nervous, anxious or agitated, inability to stop or control anxiety, excessive worry about different things, relaxation problem, restlessness, irritability and fear.

After completing the questionnaires, patient responses to the questionnaires were examined and distorted and incomplete questionnaires were excluded from the study process and the number of alternative patients was selected to answer. Following the data collection using SPSS software version 22 and considering the level of error probability of 0.05% and one-way analysis of variance and frequency tests, the results were analyzed. Statistical analysis was performed at both descriptive and inferential levels. At the descriptive level, in order to evaluate the status of the study population, the statistics of mean, standard deviation, percentage and drawing of graphs are used. At the inferential level,

one-way analysis of variance and Pearson correlation coefficient were used to answer the research questions and hypotheses.

## Results

In the present study, based on the calculation of the sample size, 250 patients were determined as the sample size. After completing the questionnaire information by patients and the final review, 26 questionnaires were deleted due to data scatter and during the research, the responses of 224 patients were evaluated. The results are as follows:

According to Table 1-4, 224 people answered the questionnaire questions. The maximum score of PHQ9 was 22 and the mean score of PHQ9 was  $72/5 \pm 83/8$ . The maximum score of PHQ4 was 12 and the mean score was  $03/3 \pm 72/4$ . Maximum score of GAD7 20 questionnaire and the mean score was  $45/4 \pm 95/8$ .

|                           | <i>N</i> | <i>Minimum</i> | <i>Maximum</i> | <i>Mean</i> | <i>Std. Deviation</i> |
|---------------------------|----------|----------------|----------------|-------------|-----------------------|
| <i>PHQ9</i>               | 224      | 00/0           | 22/00          | 8/8348      | 5/72262               |
| <i>PHQ4</i>               | 224      | 00/0           | 12/00          | 4/7277      | 3/03078               |
| <i>GAD7</i>               | 224      | 00/0           | 20/00          | 8/9598      | 4/45135               |
| <i>Valid N (listwise)</i> | 224      |                |                |             |                       |

Table 1-4. Descriptive statistics of the questionnaires.

|                |      | PHQ9                    | Q10    | PHQ4   | P5     | GAD7   | G8     |        |
|----------------|------|-------------------------|--------|--------|--------|--------|--------|--------|
| Spearman's rho | PHQ9 | Correlation Coefficient | 1/000  | .517** | .274** | .283** | .267** | .367** |
|                |      | Sig. (2-tailed)         |        | 0/000  | 0/000  | 0/000  | 0/000  | 0/000  |
|                |      | N                       | 224    | 224    | 224    | 224    | 224    | 224    |
|                | Q10  | Correlation Coefficient | .517** | 1/000  | .253** | .464** | .324** | .561** |
|                |      | Sig. (2-tailed)         | 0/000  |        | 0/000  | 0/000  | 0/000  | 0/000  |
|                |      | N                       | 224    | 224    | 224    | 224    | 224    | 224    |
|                | PHQ4 | Correlation Coefficient | .274** | .253** | 1/000  | .407** | -0/001 | 0/050  |
|                |      | Sig. (2-tailed)         | 0/000  | 0/000  |        | 0/000  | 0/986  | 0/461  |
|                |      | N                       | 224    | 224    | 224    | 224    | 224    | 224    |
|                | P5   | Correlation Coefficient | .283*  | .464** | .407** | 1/000  | 1.99** | .285** |
|                |      | Sig. (2-tailed)         | 0/000  | 0/000  | 0/000  |        | 0/003  | 0/000  |
|                |      | N                       | 224    | 224    | 224    | 224    | 224    | 224    |
|                | GAD7 | Correlation Coefficient | .267** | .324** | -0/001 | .199** | 1/000  | .317** |
|                |      | Sig. (2-tailed)         | 0/000  | 0/000  | 0/986  |        | 0/003  | 0/000  |
|                |      | N                       | 224    | 224    | 224    | 224    | 224    | 224    |
|                | G8   | Correlation Coefficient | .367** | .561** | 0/050  | .285** | .317** | 1/000  |
|                |      | Sig. (2-tailed)         | 0/000  | 0/000  | 0/461  | 0/000  | 0/000  |        |
|                |      | N                       | 224    | 224    | 224    | 224    | 224    | 224    |

\*\* . Correlation is Significant at the 0.01 level (2-tailed).

Table 2-4. examines the correlation between patients' response to questionnaires. Thus, according to Table 2-4, a positive and significant correlation is observed between the scores of the questionnaires at a significant level of 99%.

|   | Model      | Unstandardized Coefficients |            | Unstandardized Coefficients Beta | T      | Sig.  |
|---|------------|-----------------------------|------------|----------------------------------|--------|-------|
|   |            | B                           | Std. Error |                                  |        |       |
| 1 | (Constant) | 11/343                      | 2/401      |                                  | 4/725  | 0/000 |
|   | Sex        | -0/039                      | 0/030      | -0/086                           | -1/290 | 0/199 |
|   | Age        | -0/579                      | 1/140      | -0/034                           | -0/508 | 0/612 |
| 2 | (Constant) | 10/278                      | 1/167      |                                  | 8/806  | 0/000 |
|   | Sex        | -0/039                      | 0/030      | -0/087                           | -1/309 | 0/192 |
| 3 | (Constant) | 8/835                       | 0/382      |                                  | 23/106 | 0/000 |

Table 3-4. Correlation between age and gender of study participants.

According to Table 3-4, significant differences between age (P<0.199) and gender (P <0.612) were not observed in the score of the questionnaires (P<05.0).

## Discussion

In the present study, the sex ratio of patients was 6 to 1 and women were 6 times more than men. Also, no significant value was observed between the incidence of TMJ symptoms and gender in the study population. On the other hand, the age of patients ranged from 10 to 61 years, which showed a significant value between the age of patients and the frequency of TMD. The highest frequency was reported in the age group of 41 to 50 years, but the highest incidence of anxiety and depression was reported in the age group of 51 to 60 years. This result clearly indicates the effect of age on the incidence of TMD symptoms. In this way, the incidence of TMD increases with age. As with many other studies, most patients referred for treatment of TMD were women, but the point to be made is that it is incorrectly assumed that women suffer from TMD more than men. Figures from patient surveys report a female-to-male ratio of three to one to eight [4,8,35]. However, extensive epidemiological studies show that the proportion of signs and symptoms of TMD is the same in both sexes [36]. Women are more likely to seek treatment than men. They are also more receptive to pain. In addition, in general, most patients, especially dental patients, are women. It seems that the combination of these factors has caused a disproportion between the two sexes.

Therefore, TMD should not be considered as a gender-related dysfunction [39,38]. Based on the results of the present study, TMD is not related to gender. Therefore, it can be said that gender has no significant relationship with the incidence of TMD. The results of the present study are in line with the study of Greene et al. and Helkimo et al. [36,37]. In terms of the role of psychological factors in TMD, an electromyographic study showed that there is a strong relationship between mental stress and increased activity and muscle tension [38]. In addition, increased stress levels have been shown to activate the sympathetic nervous system, which may act as a source of pain. Autonomic nervous system activation appears to be associated with other psychophysiological disorders commonly associated with TMD. For example, irritable bowel syndrome, premenstrual syndrome, interstitial cystitis, etc [4]. In addition, after an extensive study, it was stated that the accumulation of catecholamines and steroid hydroxyl-17 in the urine of TMD patients compared to the control group could be the result of more intense emotional stress in these patients [6]. In the present study, after examining the anxiety and depression of patients with TMD, a significant effect was observed

between anxiety and depression and the incidence of TMD. And this relationship was shown to be positively correlated. In other words, with increasing age, the rate of depression and anxiety in TMD patients increases. In 2008, Okseon considered TMD to be the basis for factors such as anxiety, frustration, hostility, anger, or fear, and believed that these factors increased muscle activity [39]. It is also associated with increased muscle tone. When the patient presents with symptoms of TMD, stress should be considered as an etiological factor [40].

However, Dawson in 2012 attributed TMD problems to occlusal interference and argued that when occlusal interference causes TMD, there is interference in the central relationship and in extracentric movements, especially on the non-working side, all of which should be eliminated [41]. In 2012, Dawson hypothesized that occlusal muscle disorders and intracapsular disorders (TM) were the two main causes of TMD [41]. Interferes, there is no way to do it skillfully and predictably [40]. Regarding the type of psychological stress affecting TMD, some researchers have shown that TMD patients have personalities that make them more vulnerable to life pressures than the control group [11].

However, Dawson reported TMD problems in 2012, but other studies did not report any differences in personality type, disease response, and coping styles between the TMD group and other groups with other diseases, as well as the control group [1]. Contrary to the personality traits shown is that mental and emotional states can play an effective and active role in TMD. Among the mental states studied in Western societies, one is anxiety and the other is depression compared to the role of somatization, there is less consensus. Some researchers report high levels of depression and anxiety in TMD patients, while others found no difference in the above patients and normal control groups [11-16]. An analytical study conducted by Rudy et al. showed that more than half of the samples with TMD had severe emotional anxiety [40]. In the present study, 107 patients were also shown to have severe anxiety.

In this study, 107 patients had severe anxiety, so the results are in line with the research done by Rudy et al. Two other related studies support the theory that the severity of anxiety plays a key role in determining clinical manifestations. [16,14]. The fact that a group of TMD patients show higher levels of anxiety does not mean that every patient with a high level of anxiety necessarily has increased muscle activity. On the other hand, it is important to be aware that there is such a link between anxiety levels and increased muscle ac-

tivity because it can be helpful in choosing the right treatment [42]. Another emotional state associated with TMD is depression. Depression has been shown to be more common in patients who do not respond to routine treatment. Therefore, a theory was proposed that patients with masticatory and temporomandibular joint disorders who do not respond to conventional therapies should be considered for depression [12,43]. A study also found that 50% of TMD patients who did not respond to electromyographic biofeedback therapy responded to the antidepressant amitriptyline [44].

In the study of Tversky et al., supportive psychotherapy was performed for all patients and it was shown that if antidepressant drug is prescribed along with occlusal splint, the effect of treatment will be significant [45]. One study found that a combination of anxiety and depression symptoms was more common than depressive symptoms alone. Based on the results of the present study and previous studies, it can be stated that the role of anxiety and depression in TMD patients is positive and significant, which increases the rate of depression and anxiety in patients with delayed recovery and treatment.

## Conclusion

Anxiety and depression have a positive and significant relationship with the incidence of TMD in individuals and so by reducing the level of anxiety and depression in people can have a great impact on the treatment of temporomandibular joint disorders in people.

## Conflict of Interest

There is no conflict of interest to declare.

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