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# Stress and Musculoskeletal Disorders: TMJ Disorder as an Example

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## Abstract

**Introduction:** The stressful life was found to affect the body health through psychosocial mode of actions. Only few data available about the association between emotional stress and TMD problems. Thus, this review aimed to examine the association between stress and TMD incidence.

**Methods:** A literature search was carried out in the Cochrane, PubMed, Scopus and Web of Science databases covering the period before 2022. Various combinations of keywords related to TMJ dysfunction and aspects of etiology were used (etiologic factors, etiology, temporomandibular joint dysfunction, disorder, disc displacement, dental occlusion, estrogen hormones, emotional stress, anxiety, depression). Databases were searched for papers published in English. Of the initial 121 abstracts found 102 were excluded. Excluded abstracts were those of repeated studies and studies with unrelated scopes. Another 5 studies were also excluded because they were not clearly related to the review topics.

**Results:** A total of 14 articles being considered most relevant were selected for this review. The etiology of TMD is complex and multifactorial. There are numerous factors that can contribute to this disorder, which are grouped into three categories. Psychological factors such as stress, mental tension, anxiety or depression can cause TMD. Initiating factors lead to the onset of the symptoms and are primarily related to trauma or adverse loading of the masticatory system. Various studies have confirmed that patients with stress or myofascial pain associated with arthralgia, arthritis or osteoarthritis presented more advanced stages of temporomandibular joint disorder.

**Conclusions:** Stress, anxiety and other psychological factors induce muscle hyperactivity and muscle fatigue with the appearance of muscle spasms and the following consequences: contracture, occlusal disharmony, internal disturbances and degenerative arthritis. These factors can alter the occlusal scheme of the masticatory cycle, so that these alterations are more a result of TMD and not a triggering factor.

**Keywords:** *Temporomandibular joint, Stress, Anxiety, Myofascial pain.*

## Introduction

Temporomandibular Disorder (TMD) is defined as a group of clinical conditions that affect the masticatory system including the temporomandibular joint [1]. TMD had a multifactorial etiology such as occlusal problems, traumatic injury, stress and parafunctional habits [2]. The masticatory system showed high adaptive capacity to various harmful effects. However when the accumulative effect exceeds patients' adaptability, the symptoms appear [2]. The chronic pain associated with TMD was found, by a study of Dworkin et al., to be the third most common pain after headaches and lower back pain [3]. The prevalence of TMD in general population varies from 6% to 93% according to the age studied populations and criteria used in the assessment of TMD. However according to the criteria stated by World Health Organization (WHO), the prevalence was much less and age dependent. It ranged from 9.4% in 15 years age group to 23% in the 65-74 years age group [4]. The factors influencing the progression from acute condition to the chronic stage are still in debate. A study found that many patients with psychological problems including stress showed non-responsiveness to the treatment of acute TMD and progress into chronic stage [5]. The stressful life was found to affect the body health through psychosocial mode of actions [6]. Non-specific harmful effects of stress have associated with mental illness in addition to many physical conditions such as hypertension, ischemic heart diseases and diabetes mellitus [7, 8]. Tsai et al. found elevated activity in masticatory muscles as a response to experimental stress intervention [9].

University students are complaining of high stress, which can be attributed to poor academic performance, financial shortage, and ergonomic body problems due to setting for long periods during study or exams. An Australian study found higher level of stress in students population with considerable increase in TMD incidence than in general population.[10] Thus, in Saudi Arabia, few studies [12, 13] investigated TMD problems and most of them assessed the prevalence of signs and symptoms of TMD[ 11]. Only few data available about the association between emotional stress and TMD

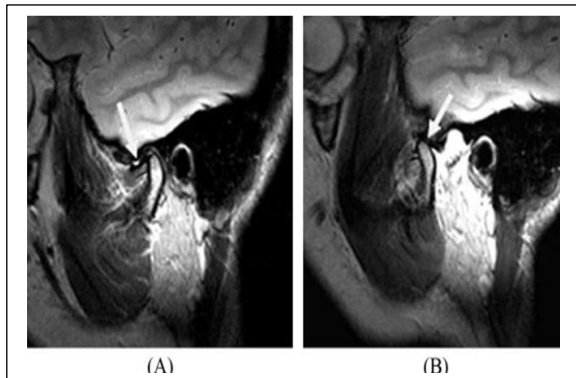
problems [14]. Thus, this review aimed to examine the association between stress and TMD incidence.

## Methods

A literature search was carried out in the Cochrane, PubMed, Scopus and Web of Science databases covering the period before 2022. Various combinations of keywords related to TMJ dysfunction and aspects of etiology were used (etiologic factors, etiology, temporomandibular joint dysfunction, disorder, disc displacement, dental occlusion, estrogen hormones, emotional stress, anxiety, depression). Databases were searched for papers published in English. Of the initial 121 abstracts found 102 were excluded. Excluded abstracts were those of repeated studies and studies with unrelated scopes. Another 5 studies were also excluded because they were not clearly related to the review topics. Only 14 studies met the inclusion criteria and included it this review. The screening was conducted by 2 reviewers independently and they set together to solve any disagreement. The data were extracted of the included studies using data extraction sheet. The results were presented and discussed in a narrative approach in the following section.

## Results and discussion

A total of 14 articles being considered most relevant were selected for this review. The etiology of TMD is complex and multifactorial. There are numerous factors that can contribute to this disorder, which are grouped into three categories. Predisposing factors increase the risk of developing TMD, initiating factors cause the onset of the disease and perpetuating factors interfere with the healing process or enhance the progression of TMD. In some instances, a single factor may serve one or all of these roles. The successful management of TMD is dependent on identifying and controlling the contributing factors. Etiological factors include occlusal abnormalities, orthodontic treatment, bruxism and orthopedic instability, macrotrauma and microtrauma, joint laxity and exogenous estrogen. Psychological factors such as stress, mental tension, anxiety or depression can cause TMD. Initiating factors lead to the onset of the symptoms and are many



primarily related to trauma or adverse loading of the masticatory system. Temporomandibular disorder (TMD) is a global term that includes alterations of the temporomandibular joint (TMJ) and associated structures, including face and neck muscles [6]. The literature describes greatly varying prevalence of symptoms (6-93%) and clinical signs (0-93%), probably as a result of the diverging clinical criteria used in the studies [4]. There is facial discomfort, pain in the temporomandibular joint, tenderness to facial and joint palpation, uncoordinated jaw movements and joint sounds. Epidemiologically, males are affected by pain in the temporal region, followed by joint sounds, while females show predominance of joint sounds followed by pain in the temporal region. The prevalence of TMD in children is low, increasing among teenagers and young adults, declining again after the forties, and rare in older adults [7]. In a review about TMD, the authors considered the following potential risk factors such as age. Older adults may have a greater number of clinical and radiological signs, but fewer symptoms than adults, and even fewer than 12- to 18-year-olds, who represent 7% of TMD cases.

Many factors can affect the association between stress and TMJ disorder. Regarding gender, females are markedly more affected due to hormonal and emotional factors. Occlusal factors are reported that there is no clear relationship, although there are known correlations with disharmonies between Centric Relation (CR) and Maximum Habitual Intercuspatation (MHI) and unilateral crossbite. Among other factors, local or systemic joint hypermobility and parafunctional habits and bruxism. In addition, these

authors study the relationships between stress and myofascial pain, noting that genetic factors and disorders related to orthodontic treatment were not proven to be potential risk factors for TMD [9]. Psychological disturbance may thus lead to an increase in bodily tension, triggering or worsening painful TMD-related symptomatology. This would explain the presence of TMD signs and symptoms in people who are continually subject to tension, anxiety and stress. In 2006, a study used the craniomandibular index (CMI) to show the influence of psychosomatic factors on signs and symptoms of craniomandibular dysfunction, specifically observing the generalized anxiety disorder, which was shown to have a great influence on the TMD etiology and even pain potentiation [13]. TMJ disorder usually took place with an increase in muscle tension. The relationship between TMD symptomatology and stress by studying the presence of stress in 3225 subjects together with muscle tiredness, joint sounds, pain, teeth clenching during the day and bruxism at night [14]. A significant correlation was found between stress and joint sounds, muscle tiredness, pain and the parafunction. It was thus recognized that stress has a great influence on the development of TMD, and can exacerbate its signs and symptoms. Manfredi et al. evaluated TMD sufferers and found that 90.9% of them had some degree of stress [15].

Anxiety can also interfere in TMD conditions. Its influence on TMD was evaluated, and the results showed considerable influence of generalized anxiety disorder on TMD etiology, potentiating pain primarily due to an increase in muscle tension [16]. Psychological disturbance would thus lead to an increase in body tension, triggering or worsening the painful symptomatology associated to TMD. This would explain the presence of TMD signs and symptoms in individuals constantly exposed to tension, anxiety and stress. Adolescent students are considered to be a group at risk of developing psychological alterations and have thus been the object of many TMD studies. These psychological alterations often lead to a reduction in learning [17]. Another study evaluated the presence of clinical signs of TMD and its relationship to sex, anxiety, depression and bite force in 217 students (aged 12 to 18 years) attending the public schooling system. The authors noted that the

most prevalent subjective symptoms were joint sounds (26.72%) and headache (21.65%) and that TMD symptomatology can be influenced significantly by the presence of anxiety and depression [18]. In 2007, a study assessed the prevalence of TMD signs and symptoms in 304 individuals aged 9 to 15 years and their anxiety levels [19]. They found that most of the sample (64.5%) had TMD signs and symptoms and high levels of anxiety as a state, i.e. "how I feel" (96.7%) and anxiety as a feature "how I usually feel" (63.5%), showing that students are subject to anxiety and its consequences. In a study of adolescents with TMD and the influence of dental and psycho-social factors, the researchers analyzed 63 patients of both sexes aged 12 to 18 years, and compared them to 64 patients without TMD [20]. They found no difference in occlusal factors, although regarding psychosocial factors, patients with TMD had higher levels of stress, somatic ailments and aggressive behavior than the control group. It was concluded that psycho-social factors have a greater influence on adolescent TMD than occlusal factors do. Rosenblatt et al. studied the prevalence of joint sounds and myofascial pain in adolescents aged 16 and 17 years, finding a significant prevalence of myofascial pain and joint sounds, which should be considered as a priority for public healthcare [21]. The authors suggest that studies should be performed to determine the factors associated to these disturbances, such as stress, depression and iatrogenesis caused by treatments, among others.

In a study on adolescents in Saudi Arabia, a study analyzed the presence of TMD signs and symptoms and parafunctional habits in 358 adolescents aged 12 to 16 years. The results show that the most prevalent sign was joint sounds, and the most prevalent symptom was headache. Among the most common parafunctional habits were lip, cheek and nail biting [22]. A student preparing for a college examination is entering a world of challenges. Adolescence is in itself a period of turbulence<sup>28</sup> during which young people undergo identity-building changes and situations. This is all the more true for those who wish to pursue an academic degree and face an entrance examination which they perceive as an obstacle. The student takes on a commitment with the aim of succeeding as a professional in the future, and knows that he/she is about to take a decision that will reflect upon the rest

of his/her life [23]. Choosing a college and preparing for the admission examination is a source of great psychological disturbance during this stage. Many factors can trigger stress during the admission period and interfere with the student's mental health, increasing tension, reducing memory and speed of reaction, causing irritability and increased errors, which could lead to the onset of psychopathological manifestations. In a study evaluating stress among 295 young people from different schools using Lipp's Stress Symptoms Inventory for Adults (ISSI), Calais, Andrade and Lipp<sup>29</sup> found higher values in students preparing for their college entrance examination than in students at high school or in their first years of college. Among the main causes of anxiety are fear of failure and fear of disappointing the family [24]. In addition to having to choose a profession during adolescence, which requires knowledge of the different areas of professional activity, job market, income, and routines. Moreover, when family opinion does not match the student's choice, anxiety may increase. Rocha et al. studied a sample of 791 students to evaluate depressive symptoms at the end of the third year of high school and pre-university education. They found twice as much depressive symptomatology in females, with a significant increase in depression according to academic progress.

Psychological evaluation of students was suggested. These students who are subject to the continuous stress, anxiety and tension of the admission period may be potentially at risk for the onset of TMD [25]. According to other studies, the universe of adolescents who are preparing for college admission exams does not receive the necessary attention in the scientific literature of Brazil, as shown by the small number of studies performed up to that time [26]. In 2018, a study was performed with the aim of checking the prevalence of anxiety indicators during the admission process. It evaluated 1046 students, average age 18 years. The results showed that 23.5% of them had a moderate to serious level of anxiety. Females were significantly more affected by symptoms. The authors concluded that further studies should be performed on these students in order to direct attention to them, as psychological or even psychiatric treatment is often needed [27]. The role of stress and personality in the etiology of the temporomandibular pain dysfunction

syndrome has undergone extensive scrutiny. Psychological studies have shown that patients with TMD have similar psychological profiles and psychological dysfunction as other chronic musculoskeletal pain disorders, such as tension type headache and back or arthritic pain [26,27]. There is considerable evidence that psychological and psychosocial factors are of great importance in the understanding of TMD, but there is less evidence that these factors are etiologic.

### Conclusions

Stress, anxiety and other psychological factors induce muscle hyperactivity and muscle fatigue with the appearance of muscle spasms and the following consequences: contracture, occlusal disharmony, internal disturbances and degenerative arthritis. These factors can alter the occlusal scheme of the masticatory cycle, so that these alterations are more a result of TMD and not a triggering factor. Various studies have confirmed that patients with stress or myofascial pain associated with arthralgia, arthritis or osteoarthritis presented more advanced stages of temporomandibular joint disorder.

### Conflict of interests

The authors declared no conflict of interests.

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