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# Quality of life, general health and anxiety in dental students with temporomandibular disorders

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**ABSTRACT.** This study evaluated the prevalence of temporomandibular disorders (TMD) in dental students and its association with psychosocial factors (general health, quality of life and anxiety). Sixty students were initially selected and analyzed for TMD presence by the Diagnostic Criteria for TMD (DC/TMD). The participants answered self-administered questionnaires to assess general health (General Health Questionnaire – GHQ), quality of life (World Health Organization Quality of Life – WHOQOL-brief), and anxiety (State-Trait Anxiety Inventory – STAI). The prevalence of TMD among the participants was 43.33% (n = 26), 26% (n = 16) were diagnosed with painful disorders, being myalgia the most prevalent diagnosis (21.67%; n = 13). About 16.67% (n = 10) of the participants presented disc displacement with reduction. All indicators of general health showed statistically significant difference such as psychological stress ($p = 0.004$), death wish ($p = 0.006$), distrust in performance ($p < 0.001$), sleep disturbance ($p = 0.025$), psychosomatic disorder ($p < 0.001$), and general health ($p = 0.003$). Quality of life was associated with the presence of painful disorder in the physical ($p = 0.001$), psychological ($p = 0.003$) and general ($p = 0.015$) dimensions. The state of anxiety (STAI-S) showed statistically significant difference ($p = 0.042$). In conclusion, painful muscle disorder was the most prevalent TMD subtype in dental students and several psychosocial factors are important indicators of TMD presence.

**Keywords:** temporomandibular joint disorders; global health, quality of life; anxiety; physiological stress.

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## Introduction

Temporomandibular Disorder (TMD) is a term used to define a subgroup of orofacial disorders involving the temporomandibular joint (TMJ), masticatory muscles and associated structures (Gonçalves, Dal Fabbro, Campos, Bigal, & Speciali, 2010; Resende, et al., 2013; Ribeiro-Dasilva, Fillingim, & Wallet, 2017; Rocha et al., 2017; Karthik et al., 2017; Rokaya et al., 2018). TMD signs and symptoms are common among the individuals and they are characterized by TMJ pain, masticatory muscles or periauricular area, and TMJ sounds and changes in mandibular movements (Karthik et al., 2017; Lovgren, Osterlund, Ilgunas, Lampa, & Hellstrom, 2018; Lung, Bell, Heslop, Cuming, & Ariyawardana, 2018; Rokaya et al., 2018).

The prevalence of TMD signs and symptoms in the general population (20-75%) is higher than the number of individuals that seeks treatment (2-4%). In addition, the prevalence of TMD is four times more common in women than in men and the most affected age range varies from the second to the fourth decade of life (Pedroni, Oliveira, & Guaratini, 2003).

Considering the physical and functional limitations and the different morbidity levels caused by TMD, the etiological factors have been widely discussed in light of the development of better treatment protocols. TMD is known to be a complex and multifactorial process characterized by the presence of initiating, predisposing and perpetuating factors that decrease the physiological and structural adaptability and increase the severity of the dysfunction (Sharma, Gupta, Pal, & Jurel, 2011; Resende et al., 2013).

Several factors have been associated with the etiology of TMD, including traumatic injury, immune-mediated systemic disease, occlusal interference, poor positioning or tooth loss (Nomura et al., 2007), as well as factors related to anxiety and emotional stress (Ahuja, Ranjan, Passi, & Jaiswal, 2018; Alkhudhairy et al., 2018; Rokaya et al., 2018), postural habits (Moraes & Antunes, 2012; Souza, Pasinato, Correa, & Silva, 2014;

Chaves, Oliveira, & Damazio, 2017; Espinosa de Santillana, Garcia-Juarez, Rebollo-Vázquez, & Ustarán-Aquino, 2018), and sleep disorders and bruxism (Kurtoglu, Kurkcu, Sertdemir, Ozbek, & Gurbuz, 2016; Berger, Szalewski, Szkutnik, Ginszt, & Ginszt, 2017; Yeler, Yilmaz, Koraltan, & Aydin, 2017). The increasing incidence of chronic orofacial pain in individuals with TMD and its impact on quality of life and general health have been described in other studies (Wieckiewicz et al., 2014; Rocha et al., 2017; Azevedo, Camara-Souza, Dantas, Resende, & Babosa, 2018; Albuquerque et al., 2020).

Health professionals have high levels of anxiety, which begins in the undergraduate degree. The repercussion of this condition has not only influenced the academic performance, but also brings the risk of developing TMD and other diseases (Karthik et al., 2017; Rocha et al., 2017). Studies have shown high prevalence of TMD signs and symptoms, especially in undergraduate students (Oliveira, Dias, Contato, & Berzin, 2006; Zwiri & Al-Omiri, 2016; Rocha et al., 2017; Ahuja et al., 2018; Alkhudhairy et al., 2018; Lovgren et al., 2018; Lung et al., 2018).

The Research Diagnostic Criteria for TMD (RDC/TMD) has been used internationally to help the diagnosis; however, the RDC/TMD has presented difficulties of clinical applicability. Updated definitions of TMD subtypes are needed (Steenks & Wijer, 2009; List & Greene, 2010). Recently, a new diagnostic system entitled Diagnostic Criteria for TMD (DC/TMD) was developed from the RDC/TMD to be a diagnostic tool for use in clinical and research environments (Schiffman et al., 2014; Schiffman & Ohrbach, 2016).

Thus, the primary objective of this study was to determine the prevalence of TMD among dental students by DC/TMD. Secondly, the objective was to analyze the association of painful disorders with psychosocial aspects, such as general health, quality of life and anxiety. Based on the null hypothesis that there is no association between these variables.

## Material and methods

### Study design

This manuscript describes the results of a cross-sectional study, with information collected by the DC/TMD and general health, quality of life and anxiety questionnaires applied to dental students. The complete protocol was approved by the Research Ethics Committee of the University of Pernambuco – UPE, Recife, Brazil (protocol number: 2.701.453; CAAE registration: 88144617.4.0000.5207).

### Subjects

The participants recruited for this study were students (from 1st to 5th year) of the Arcoverde School of Dentistry, University of Pernambuco. Sample size estimation was based on the prevalence of TMD in a population, using the statistical software OpenEpi 3.01 Web(Dean, Sullivan, & Soe, 2013). The parameters used in this calculation were: a universe of 88 students, TMD prevalence in dental students of 36.2% (Azevedo et al., 2018), significance level of 5% and a test power of 90% ($\beta = 0.10$). Based on these parameters, a sample size of 56 participants was determined to be adequate for detecting relevant differences.

Initially, 71 students (80% of each class) were randomly selected for the study using a free online program available at http://www.sealedenvelop.com. Exclusion criteria included: (1) questionnaires unanswered or answered incorrectly; (2) systemic health disorders, such as neurologic disorders, fibromyalgia, neuralgia or headache, and earache; (3) use of medications of any kind; and (4) students that were submitted to recent surgeries (to avoid confusion with TMD symptoms).

### Assessment

Data regarding age, gender and graduation year were previously collected. The researchers (V.S.S. and R.F.P.) performed the TMD diagnosis of the participants, which was based on DC/TMD Axis I. The instrument consists of a symptom questionnaire (14 questions) and a clinical examination form (10 questions) (Schiffman et al., 2014). The participants were divided into groups of (1) painful disorders (myalgia, myofascial pain, arthralgia and headache attributed to TMD) and/or (2) joint disorders (disc displacement with reduction, disc displacement with reduction and intermittent locking, disc displacement without reduction and with limited opening, disc displacement without reduction and without limited opening, degenerative joint disease and dislocation). Kappa coefficient ($\kappa = 0.82$) was previously performed with 10 participants to certify intra-examiner calibration.

Questionnaires to assess general health (General Health Questionnaire – GHQ) (Pasquali, Gouveia, Andriola, & Miranda, 1994), quality of life (World Health Organization Quality of Life – WHOQOL-brief) (Fleck et al., 1999) and anxiety (State-Trait Anxiety Inventory – STAI) (Biaggio & Natalício, 1979) were applied by other researchers (F.A.S. and N.E.M.) to ensure blinding results in relation to the TMD diagnosis of the participants.

The GHQ created by Goldberg (1972) and validated in Brazil by Pasquali et al. (1994) was used to assess general health of the subjects. This questionnaire analyzes mental health through the presence or absence of nonpsychotic mental disorders (minor psychiatric disorders). The GHQ contains 60 questions, divided into six segments (minimum → maximum score): psychological stress (13 → 52), death wish (8 → 32), distrust oftheir own performance (17 → 68), sleep disturbances (6 → 24), psychosomaticdisorders (10 → 40), and general health (60 → 240). Each question is answered on a 4-point scale, ranging from 1 (not severe) to 4 (very severe). High scores represent higher severity of psychiatric disorders.

Quality of life was assessed using the WHOQOL-brief, as described by Fleck et al. (1999). This questionnaire was adapted from WHOQOL-100 and is used as a specific assessment instrument. The WHOQOL-brief contains 26 questions, two general questions of quality of life and others 24 questions divided in four segments: physical (7 questions), psychologic (6 questions), social (3 questions), and environmental (8 questions). Each scale should be answered by a 5-point scale (1 to 5) and the total score of each dimension is determined by the syntax developed by Fleck et al. (1999). Therefore, higher scores represent better quality of life.

Finally, STAI was used to quantify subjective components related to anxiety. The questionnaire was developed by Spielberger, Gorsuch and Lushene (1970), translated and adapted to Brazil by Biaggio and Natalício (1979). STAI presents a scale that assesses anxiety as a state (STAI-S) and anxiety as a trait (STAI-T). STAI-S reflects a transient reaction directly related to a situation of adversity that presents itself at a given moment and the STAI-T refers to a more stable aspect related to the individual's propensity to deal with more or less anxiety throughout his life. Each segment consists of 20 questions, and each question is rated on a 4-point scale ranging from 1 (not at all) to 4 (very much), which are added in order to obtain a summary score ranging from 20 to 80. Higher scores represent high levels of anxiety.

### Statistical analysis

Blind researcher from the other stages of the research (R.R.R.) performed the statistical analysis. The results obtained were recorded in the database of the Statistical Package for the Social Sciences (IBM SPSS Inc., 20.0 version, Armonk, NY, USA) and initially submitted to descriptive analysis, establishing mean values, percentages, absolute and relative frequencies. Subsequently, demographic variables were analyzed using Student t-test (age), Fisher's exact test (gender) and chi-square (graduation year). Difference between means was assessed by Student t-test (general health, quality of life and anxiety). All tests were performed using a significance level of 5% ($\alpha < 0.05$).

## Results

Seventy-one dental students were randomly selected to compose the sample. Of these, 11 participants were excluded by the study eligibility criteria. Thus, a total of 60 students were allocated for evaluation (Figure 1), representing a response rate of 84.5%.

The prevalence of TMD (painful or joint disorders) using the DC/TMD was 43.33% (n = 26). Of this total, 26.67% (n = 16) were diagnosed with pain disorders, with myalgia being the most prevalent diagnosis (21.67%; n = 13). Disc displacement with reduction was present in 16.67% (n = 10) of the participants (Table 1). Joint disorders do not necessarily cause painful symptoms and, although they are classified as a subtype of TMD, it was decided to re-categorize the two groups (with painful disorders vs. without painful disorders) in order to analyze the association with socio-demographic data and psychosocial factors.

The mean age of dental students in the final sample (n = 60) was 21.20 ± 2.57 years (range = 18 to 28) and females represented the highest number interviewed (n = 45; 75.0%). The participants of the 1st year corresponded to 25% of the sample (n = 15), followed by the 3rd (20%; n = 12), 5th (20%; n = 12), 2nd (18.3%; n = 11) and 4th (16.7%; n = 10) years. No demographic variable showed a statistically significant difference (Table 2).

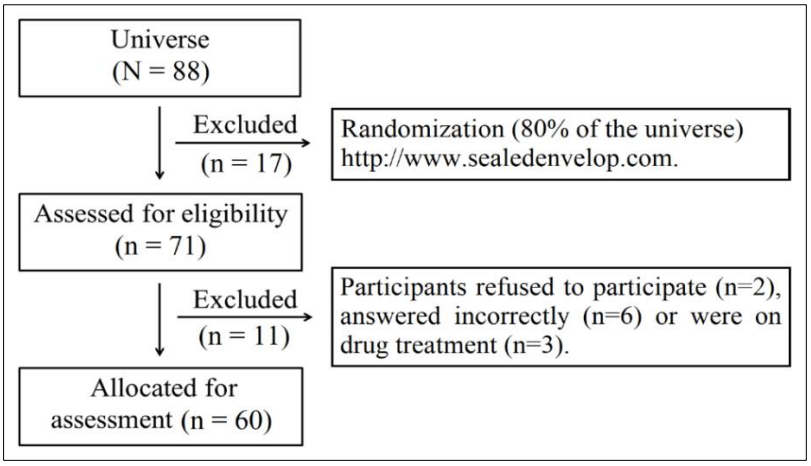


**Figure 1.** Flow diagram of participants.

**Table 1.** TMD diagnosis using DC/TMD in the study sample (n = 60 participants).

| | n (%) |
|---|---|
| TMD-free | 34 (56.67) |
| With TMB | 26 (43.33) |
| Painful disorders | 16 (26.67) |
| Myalgia | 13 (21.67) |
| Myofascial pain | 1 (1.67) |
| Headache attributed to TMD | 2 (3.33) |
| Arthralgia | - |
| Joint disorders | 12 (20.0) |
| DD* with reduction | 10 (20.0) |
| DD* with reduction, with intermittent locking | 1 (1.67) |
| DD* without reduction, with limited opening | - |
| DD* without reduction, without limited opening | - |
| Degenerative joint disease | 2 (3.33) |
| Dislocation | - |

*Disc displacement.

**Table 2.** Demographic characteristics of participants according to the presence or absence of painful disorders (PD).

| | Group | | Total | p |
|---|---|---|---|---|
| | With PD | PD-free | | |
| Age, mean ± SD (years) | 21.06 ± 2.26 | 21.25 ± 2.69 | 21.20 ± 2.57 | 0,805* |
| Gender, n (%) | | | | |
| Male | 3 (5.00) | 12 (20.00) | 15 (25.00) | 0.378** |
| Female | 13 (21.67) | 32 (53.33) | 45 (75.00) | |
| Total | 16 (26.67) | 44 (73.33) | 60 (100.00) | |
| Graduation year, n (%) | | | | |
| 1st year | 4 (6.67) | 11 (18.33) | 15 (25.00) | 0.269*** |
| 2nd year | 2 (3.33) | 9 (15.00) | 11 (18.33) | |
| 3rd year | 6 (10.00) | 6 (10.00) | 12 (20.00) | |
| 4th year | 1 (1.67) | 9 (15.00) | 10 (16.67) | |
| 5th year | 3 (5.00) | 9 (15.00) | 12 (20.00) | |
| Total | 16 (26.67) | 44 (73.33) | 60 (100.00) | |

Date compared by *Student t, **Fisher's exact and ***chi-squared tests. SD, standard deviation.

Considering the presence of minor psychiatric disorders assessed by GHQ, painful disorders were associated with all dimensions, including psychological stress ($p = 0.004$), death wish ($p = 0.006$), distrust oftheir own performance ($p < 0.001$), sleep disturbances ($p = 0.025$) and psychosomatic disorders ($p < 0.001$), as well as general health factors, represented by all questions in the questionnaire ($p = 0.003$) (Table 3).

The presence of painful disorders was associated with quality of life only in the following dimensions: physical ($p = 0.001$), psychological ($p = 0.003$) and general ($p = 0.015$), with statistically lower mean values for the group that presented painful disorders (Table 4). Finally, considering the STAI, only the STAI-S showed statistically significant difference ($p = 0.042$), indicating higher levels of anxiety in patients with painful disorders (Table 5).

**Table 3.** Absolute frequency (n), mean and standard deviation (SD) for the six dimensions of the General Health Questionnaire (GHQ), according to the presence or absence of painful disorders (PD).

| GHQ | PD | n | Mean | SD | t† | p |
|---|---|---|---|---|---|---|
| Psychological stress (13→52) | Presence | 16 | 39.31 | 10.45 | 2.985 | 0.005* |
| | Absence | 44 | 31.77 | 7.93 | | |
| Death wish (8→32) | Presence | 16 | 16.06 | 6.13 | 2.862 | 0.006* |
| | Absence | 44 | 12.02 | 4.29 | | |
| Distrust in the performance (17→68) | Presence | 16 | 48.88 | 9,93 | 3.773 | < 0.001* |
| | Absence | 44 | 39.18 | 8.37 | | |
| Sleep disturbance (6→24) | Presence | 16 | 14.88 | 4.13 | 2.336 | 0.025* |
| | Absence | 44 | 12.18 | 3.88 | | |
| Psychosomatic disorder (10→40) | Presence | 16 | 27.44 | 5.49 | 3.792 | < 0.001* |
| | Absence | 44 | 21.14 | 5.76 | | |
| General health (60→240) | Presence | 16 | 158.50 | 34.17 | 3.726 | 0.003* |
| | Absence | 44 | 127.68 | 25.99 | | |

†Student t test. *Statistically significant difference (p < 0.05).

**Table 4.** Absolute frequency (n), mean and standard deviation (SD) for the five dimensions of the World Health Organization Quality of Life (WHOQOL-brief), according to the presence or absence of painful disorders (PD).

| WHOQOL-brief | PD | n | Mean | SD | t† | p |
|---|---|---|---|---|---|---|
| Physical | Presence | 16 | 11.64 | 2.49 | -3.461 | 0.001* |
| | Absence | 44 | 14.08 | 2.38 | | |
| Psychologic | Presence | 16 | 12.04 | 2.33 | -3.141 | 0.003* |
| | Absence | 44 | 13.98 | 2.04 | | |
| Social | Presence | 16 | 14.17 | 2.33 | -0.696 | 0.489 |
| | Absence | 44 | 14.73 | 2.89 | | |
| Environment | Presence | 16 | 12.38 | 2.20 | -1.613 | 0.112 |
| | Absence | 44 | 13.43 | 2.26 | | |
| General | Presence | 16 | 12.50 | 2.68 | -2.513 | 0.015* |
| | Absence | 44 | 14.36 | 2.49 | | |

†Student t test. *Statistically significant difference (p < 0.05).

**Table 5.** Absolute frequency (n), mean and standard deviation (SD) for the two dimensions of the State-Trait Anxiety Inventory (STAI), according to the presence or absence of painful disorders (PD).

| STAI | PD | n | Mean | SD | t† | p |
|---|---|---|---|---|---|---|
| State anxiety (20→80) | Presence | 16 | 49.06 | 5.42 | 2.081 | 0.042* |
| | Absence | 44 | 45.70 | 5.56 | | |
| Trait anxiety (20→80) | Presence | 16 | 49.63 | 5.21 | 1.276 | 0.207 |
| | Absence | 44 | 47.48 | 5.95 | | |

†Student t test. *Statistically significant difference (p < 0.05).

## Discussion

The TMD diagnostic tool used in this study was the DC/TMD, which constitutes an adaptation of the RDC/TMD (Schiffman et al.; 2014; Schiffman & Ohrbach, 2016). This tool was developed to improve the clinical applicability of the instrument and update the definitions of TMD subtypes (Steenks & Wijer 2009; List & Greene, 2010). Any diagnostic system has its pros and cons, but the success of any test must be based on accuracy and reproducibility. The DC/TMD is a reliable system for the diagnosis of painful and articular TMJ disorders (Schiffman et al., 2014; Schiffman & Ohrbach, 2016) and its validity has been established in several studies in the literature (Alkhudhairy et al., 2018,Lovgren et al., 2018; Lung et al., 2018).

Epidemiological research has shown great variability in the prevalence of TMD in the general population, ranging from 22.6% (Karthik et al., 2017) to 92.1% (Wahid et al., 2014). Most of these divergences occur because some studies assess the prevalence of TMD signs and symptoms through questionnaires (Fonseca and Helkimo Index) and cases are not really diagnosed as dysfunctions by clinical examination (RDC/TMD and DC/TMD) (Lung et al., 2018). Given the need to correct TMD diagnosis and thus assessing the effect of various etiological factors on the initiation or progression of dysfunction, the present study used DC/TMD due to the high validity and reliability.

The prevalence of TMD among dental students observed in this study was 43.33%, including painful (26.67%) and articular (20.00%) disorders. These results within the prevalence range were observed among students in studies using clinical diagnostic methods, including DC/TMD or RDC/TMD (30% – 54%)

(Wieckiewicz et al., 2014; Alkhudhairy et al., 2018; Azevedo et al., 2018; Lovgren et al., 2018). In contrast to these findings, study by Lung et al. (2018) found a prevalence of 77.2%.

No statistically significant differences were observed according to gender in this study. Nevertheless, there was a higher frequency of female participants with painful disorder (21.7%; n = 13). Several studies have shown a higher prevalence of TMD signs and symptoms in female patients (Wieckiewicz et al., 2014; Zwiri & Al-Omiri 2016; Gurgel et al., 2016; Karthik et al., 2017; Alkhudhairy et al., 2018; Lung et al., 2018; Rokaya et al., 2018; Shaefer, Khawaja, & Bavia, 2018). Such findings have been attributed to elevated estrogen levels and estrogen polymorphic receptors in the joint (Chisnoiu et al., 2015; Lung et al., 2018). Researchers believe thatwomen have more difficulty coping with daily stressors, leading to more functional disorders (Karthik et al., 2017; Shaefer et al., 2018). Another theory states that a higher prevalence of TMD in women is due to the female genetic makeup (Jerjes et al., 2007, Shaefer et al., 2018). In addition, significantly higher levels of pain ($p = 0.004$) and palpation muscle sensitivity ($p = 0.001$) in women with TMD have been reported (Schmid-Schwap, Bristela, Kundi, & Piehslinger, 2013).

The association between TMD and psychosocial aspects has been widely studied in an attempt to elucidate the effect of these factors as initiators or perpetuators of the dysfunction. GHQ is an important diagnostic tool for quantifying general health, and the analysis of results is performed through the interpretation of six characteristics: psychological stress, death wish, distrust of their own performance, sleep disturbances, psychosomatic disorders and general health (Pasquali et al., 1994). Results of this study rejected the first null hypothesis by demonstrating that all general health parameters can stimulate the development of TMD signs and symptoms.

Psychosocial factors perform significant role in the development of TMD and the chronic stress specifically correlates strongly with the etiology of TMD (Wieckiewicz et al., 2014; Karthik et al., 2017; Ahuja et al., 2018; Alkhudhairy et al., 2018; Ohrbach & Michelotti, 2018). Stress is also a risk factor for parafunctional habits, because when the individual is subjected to emotional overload, tooth clenching begins, which in turn causes circulatory changes in the chewing muscles or compression in pain receptors and aggravates the condition of TMD (Karthik et al., 2017; Alkhudhairy et al., 2018). It is believed that dental students could be more susceptible to psycho-emotional disorders and therefore at greater risk of developing TMD due to the intense workload of study (Karthik et al., 2017; Ahuja et al., 2018; Lovgren et al., 2018; Lung et al., 2018). One study examined stress levels of dental students compared with dentists and found they experienced increased anxiety and stress levels (Farrelly, Sun, & Mack, 2013). Similarly, Polychronopoulou and Divaris (2009) found that academic performance pressure and workload were sources of stress among dental students.

Previous studies in the literature have associated psychological factors with the severity of TMD (Resende et al., 2013; Oliveira, Almeida, Lelis, Tavares, & Fernandes Neto, 2015). The TMD usually causes morbidity, psychological changes, difficulty in performing daily activities and problems in general health (Resende et al., 2013; Alkhudhairy et al., 2018). Sleep disorders were also associated with the presence of painful disorders ($p = 0.025$), so studies in the literature also established this relationship (Kurtoglu et al., 2016; Rener-Sitar, John, Pusalavidyasagar, Bandyopadhyay, & Schiffman, 2016; Berger et al., 2017; Yeler et al., 2017). Insomnia is the most common sleep disorder in TMD patients, and the greater the intensity of insomnia results in more signs and symptoms of TMD (Quartana, Wickwire, Klick, Grace, & Smith, 2010). In addition, (Sener & Guler 2012) using a more specific index (Pittsburgh Sleep Quality Index – PSQI) showed that the most affected components were subjective sleep quality, sleep latency and the usual efficiency of sleep.

Quality of life assessment should be based on an individual's perception of their health, including general aspects of life and well-being (Fleck et al., 1999; Christensen, 2001). The diagnostic tool used to assess quality of life was the WHOQOL-brief and the results showed a significant association between some dimensions (physical, psychological and general) and the presence of painful disorders, partially rejecting the second null hypothesis of the study. These results corroborate to other studies in the literature, where the quality of life decreases as the severity of TMD increases (Oliveira et al., 2015; Rocha et al., 2017). Thus, quality of life is directly related to the physical, psychological and social perception of the environment in which the person lives (Oliveira et al., 2015).

Nevertheless, some authors assessed quality of life by the Oral Health Impact Profile (OHIP) and found that myofascial pain had a greater impact on quality of life than joint TMD (Reissmann, John, Schierz, & Wassell, 2007). The chronic headaches or long-term TMD share similar neuronal pathways as well as central sensitization pathways and influence the functional and psychosocial quality of life of the patients (Alkhudhairy et al., 2018). Different findings were described by Resende et al. (2013) who reported an

association between reduced displacement and social domain, and Rener-Sitar et al. (2016) who found a high association between TMD and decrease of the OHRQoL index.

Regarding anxiety, the third null hypothesis of the study was partially rejected as the results of the present study suggest that the presence of painful disorders in dental students is mainly determined by their anxiety state (STAI-S; $p < 0.05$) and not their trait (STAI-T; $p > 0.05$). Significant associations between anxiety and TMD were also observed in other studies (Oliveira et al., 2015; Bertoli et al., 2018). Anxiety is based on emotional response and manifests to varying degrees, so it seems plausible that the psycho-emotional trait is endemic in dental students (Rocha et al., 2017). On the other hand, a previous study found no significant association between anxiety (trait or state) and TMD and suggest that this could be explained based on the structure of STAI, because despite its validation as a reliable questionnaire to assess anxiety, some authors have questioned its validity, as it also identifies depression (Azevedo et al., 2018). Therefore, it is important to highlight that the use of divergent instruments may result in different anxiety levels.

Another factor of dental relevance concerns postural habits and, although it was not the target of this study, its relationship with TMD has been established (Moraes & Antunes, 2012; Souza et al., 2014; Chaves et al., 2017; Espinosa de Santillana et al., 2018). It is suggested that an anterior head position requires hyperactivity of the posterior neck and shoulder muscles to prevent the head from falling forward. This compensatory muscle function can cause fatigue, discomfort, and trigger point activation (Fuentes Fernandez et al., 2016). Souza et al. (2014) observed that postural changes were more pronounced in subjects with TMD, suggesting that TMD may have influence on the postural system. Similarly, dental students and dentists are more susceptible to occupational diseases due to work posture, and ergonomics often go unnoticed in their daily lives.

In this context, the biopsychosocial model emphasizes the multifactorial nature of TMD and considers the role of cognitive, social and biological factors in the etiology of TMD. Researchers and clinicians agree on the importance of assessing and managing physical and psychological factors in patients with dysfunction (Rocha et al., 2017). Results of this study (association of general health, quality of life and indicators of anxiety with TMD) reinforce the need for a multidisciplinary approach to TMD treatment. Therefore, it is important to recognize and treat emotional distress and physical symptoms, with an emphasis on multidisciplinary character and more humane care.

## Conclusion

Prevalence of TMD in dental students was 43.33%. Painful muscle disorder was the most frequent TMD subtype. Presence of painful disorders has been associated with several psychosocial aspects, including general health (stress, death wish, distrust in the performance, sleep disturbances and psychosomatic disorders), quality of life (physical, psychological and general) and anxiety (Stai-S).

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