

Analysis of the relationship between anxiety symptoms and temporomandibular disorder in undergraduate dental students

Análise da relação entre os sintomas de ansiedade e as desordens temporomandibulares em alunos de um curso de graduação em odontologia

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ABSTRACT

Objective: To evaluate, through the application of validated questionnaires, whether the level of anxiety symptoms was associated with the occurrence of painful Temporomandibular Disorders (TMDs) in undergraduate dental students. **Material and Methods:** To check the occurrence of symptoms of anxiety disorders the GAD-7 (Generalized Anxiety Disorder – 7) questionnaire was applied and to diagnose TMDs the DC/TMD (Diagnostic Criteria for TMDs) was administered to 60 patients. Participants were divided into two groups: control (Co), composed of students without TMD diagnosis (n=30), and experimental group (Exp), composed of students with a TMD diagnosis (n=30). The acquired data underwent descriptive analysis and statistical treatment using chi-square or Fisher's exact tests. **Results:** The results showed a significant relationship between moderate and severe anxiety levels with the occurrence of TMDs ($p < 0.001$), not being related to a specific type of these disorders (muscular and/or joint) ($p = 0.071$). Regarding sex, it was observed that it does not influence the occurrence of TMDs ($p = 0.778$). However, sex was related to anxiety levels ($p < 0.001$), with males in our study being associated with moderate and severe levels of anxiety symptoms. **Conclusion:** It was concluded that anxiety is associated with the occurrence of painful TMDs in dental students, with moderate and severe levels of anxiety symptoms being more prevalent in individuals with TMD.

KEYWORDS

Anxiety; Dentistry students; Orofacial pain; Stress; Temporomandibular Joint Dysfunction Syndrome.

RESUMO

Objetivo: Avaliar, por meio da aplicação de questionários validados, se o nível de sintomas de ansiedade está associado à ocorrência de Desordens Temporomandibulares (DTMs) dolorosas em estudantes de odontologia de graduação. **Material e Métodos:** Para verificar a ocorrência de sintomas de transtornos de ansiedade, foi aplicado o questionário GAD-7 (Generalized Anxiety Disorder - 7), e para diagnosticar as DTMs, utilizou-se o DC/TMD (Diagnostic Criteria for Temporomandibular Disorders) em 60 pacientes. Os participantes foram divididos em dois grupos: controle (Co), composto por estudantes sem diagnóstico de DTM (n=30), e grupo experimental (Exp), composto por estudantes com diagnóstico de DTM (n=30). Os dados adquiridos foram submetidos a análise descritiva e tratamento estatístico utilizando os testes qui-quadrado ou exato de Fisher. **Resultados:** Os resultados mostraram uma relação significativa entre níveis moderados e graves de ansiedade com a ocorrência de DTMs ($p < 0,001$), não estando relacionados a um tipo específico dessas desordens (muscular e/ou articular) ($p = 0,071$). Em relação ao sexo, observou-se que não influencia a ocorrência de DTMs ($p = 0,778$). No entanto, o sexo foi relacionado aos níveis de ansiedade ($p < 0,001$), com os homens em nosso estudo sendo associados a níveis moderados e graves de sintomas de ansiedade. **Conclusão:** Concluiu-se

que a ansiedade está associada à ocorrência de DTMs dolorosas em estudantes de odontologia, com níveis moderados e graves de sintomas de ansiedade sendo mais prevalentes em indivíduos com DTM.

PALAVRAS-CHAVE

Ansiedade; Dor orofacial; Estudantes de Odontologia; Estresse; Síndrome da Disfunção da Articulação Temporomandibular.

INTRODUCTION

Temporomandibular disorders (TMDs) are understood as a group of conditions affecting the temporomandibular joint (TMJ), masticatory muscles, and related structures. They are recognized as the most prevalent cause of chronic orofacial pain [1], considered as multifactorial, with the involvement of a series of local and systemic factors that, interacting with each other. Among these, the psychological factor has been investigated in a series of studies [1-3]. Psychological and social factors converge to form a perception of health, which directly influences the behavior and emotional response to pain [4].

The clinical association between pain and emotions, particularly negative ones such as depression and anxiety, is well-established in areas like medicine and psychology. More recently, this relationship has garnered attention in the realm of orofacial pain [1]. Recent research indicates that individuals experiencing orofacial pain exhibit higher levels of stress, depression, anxiety, and nonspecific physical symptoms compared to healthy controls [1,5,6].

Regardless of its origin, whether muscular or articular, pain is the primary factor linking TMD to the presence of anxiety symptoms [1]. Anxiety is characterized as a mood disorder involving excessive worry about various activities or events. Symptoms typically include agitation, nervousness, easy fatigue, difficulty concentrating, irritability, muscle tension, and disrupted sleep, all of which can significantly impact social functioning [7]. Consequently, persistent and uncontrolled pain establishes a vicious cycle of anxiety and more pain [2].

Longitudinal studies [4,8] indicate that disability due to pain, stress, depression, and/or anxiety constitutes significant risk factors contributing to the chronicity of TMDs. Social factors further exacerbate this chronic pain condition [4,8]. However, there are still few studies focused on specific populations exposed to high levels of learning tasks, facing personal and professional uncertainties, such as

graduate students. Therefore, this study aims to investigate whether the presence of anxiety symptoms among undergraduate students enrolled in the Dentistry program at the Federal University of Juiz de Fora, Campus Governador Valadares (UFJF-GV), is associated with the occurrence of painful TMDs.

MATERIAL AND METHODS

In preparation for this study, prior to implementing the methodology, the project underwent ethical review by the Human Research Ethics Committee of the Federal University of Juiz de Fora (UFJF). The approval code for this study is: 6.116.687.

Selection of participants

The students of the Dentistry course at UFJF-GV were invited via e-mail to participate in the research. Those who agreed to take part in it, signed a document equivalent to a written informed consent and, subsequently, answered the questionnaire and underwent a clinical examination. The number of total participants was 60.

The GAD-7 questionnaire (Generalized Anxiety Disorder – 7) [9], included in the axis II of the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) [10], was used to verify the anxiety symptom levels in this study. This internationally validated tool has an official Portuguese version. The questionnaire explored general and oral health aspects, pain intensity experienced (at the time of completion, in the last 6 months, and during the worst episode), and the impact of pain on daily activities. It also addressed interest in daily activities, negative emotional experiences, and occurrences of anxiety, agitation, and nervousness over the past two weeks. Participants rated symptom frequency using the options: “never,” “sometimes,” “more than half the days,” and “nearly every day,” corresponding to values of 0, 1, 2, and 3, respectively. Cumulative scores categorized anxiety symptom levels as low (>5), moderate (5-15), or high (>15), based on the combined values selected by participants.

Additionally, the axis I of the DC/TMD [10] was employed to conduct the physical diagnosis of painful TMDs. This was done to determine whether participants had any form of TMD, be it muscular, articular, or a combination of both. Based on this assessment, individuals were allocated into one of two research groups: Control (Co), composed by students without a TMD diagnosis, and Experimental (Exp), which included students diagnosed with TMD according to the DC/TMD.

Participants in this study were recruited via email. The researchers requested the Board of the Dentistry Department of UFJF-GV to disseminate an invitation to all regularly students to participate. Interested students responded by emailing one of the researchers, whose contact information was provided in the invitation. The questionnaire application was made in person at a convenient time for each participant in one of the dental clinics of the university, ensuring an adequate sample size. Participants were required to sign a written informed consent document prior to completing the questionnaire. Upon completion, the questionnaires were retained by the researchers, who upheld the ethical standards of participant anonymity and data confidentiality. The application of the questionnaires and the examination was conducted by a single calibrated examiner.

Participants eligible for this research were students enrolled in the graduate dentistry program at UFJF-GV, who were at least 18 years of age at the commencement of the study. Students currently undergoing treatment for temporomandibular disorders (TMDs) and/or anxiety disorders were excluded to prevent

confounding factors that could impact the interpretation of the study's results.

Participants were informed that they could discontinue their participation at any time, even after completing the questionnaire, should they wish to do so. This discontinuation would not require justification and would not result in any personal repercussions. However, during the study, no participants chose to discontinue their participation

Analysis of the results

The data collected were recorded in Excel spreadsheets (Excel, Office 16, Redmond, Washington, USA) and subjected to descriptive statistical analysis. The chi-square and Fisher's exact tests were performed using GraphPad Prism is 10.2.1 software (Dotmatics, Enfield, London, EN3 6XH, United Kingdom) to determine whether there is an association between the level of anxiety symptoms and the occurrence of painful temporomandibular disorders (TMD) in dental students

RESULTS

The sample consisted of 60 students of the Dentistry program at UFJF-GV, with 18 (30%) identifying as male and 42 (70%) as female. 30 participants were diagnosed with some painful TMD. These cases were further classified into three categories: muscular, articular, or combined muscular/articular (Table I).

The application of the GAD-7 revealed that 27 participants exhibited no symptoms of anxiety. Additionally, 7 participants displayed mild anxiety symptoms, 18 demonstrated moderate anxiety symptoms, and 8 presented with severe anxiety symptoms (see Table II).

Following the statistical analysis of the data, the chi-square test revealed a significant association between anxiety levels and the occurrence of

Table I - Prevalence of TMDs in the studied population

Co	Exp		
	Muscular	Articular	Muscular/ Articular
30	13	6	11

Table II - Levels of anxiety symptoms among the study participants

NO ANXIETY SYMPTOMS		ANXIETY SYMPTOMS		
		Mild	Moderate	Severe
Co	20	7	3	0
Exp	7	0	15	8
<i>p- valor</i>		< 0.001		

TMD ($p < 0.001$). Moderate and severe anxiety symptoms were associated with a higher frequency of TMD, whereas most participants without TMD showed no symptoms of anxiety

However, no correlation was observed between anxiety symptoms and the diagnosis of a specific type of TMD over others (muscular, articular, or muscular/articular) ($p = 0.071$).

Regarding sex, Fischer's test indicated that it does not influence the occurrence of TMDs ($p = 0.778$). However, an association with the level of anxiety symptoms was observed ($p < 0.001$; chi-square). In this study, most women exhibited either no or low levels of anxiety symptoms, whereas men were more frequently associated with moderate to severe anxiety symptoms (Table III).

DISCUSSION

TMDs are characterized as a diverse group of clinical conditions that adversely impact individuals' emotional health. Psychosocial factors are among the risk factors that can perpetuate or even intensify pain symptoms. Consequently, symptoms of anxiety, whether transient or chronic psychological disorders, have been extensively examined in the context of TMDs. This is because psychological changes often coexist with pain in the temporomandibular region, creating an interplay between physical and emotional symptoms [11,12]. In light of this, the present study aimed to assess the relationship between anxiety symptoms and TMDs among undergraduate dental students at UFJF-GV.

In this study, a significant association was found between painful TMD and moderate to severe anxiety symptoms. This indicates a notable relationship between higher levels of anxiety and the presence of TMD, consistent with the findings of Ton et al. [13]. According to the literature, anxiety symptoms in the student population can reach a prevalence of up

to 90% [14]. These symptoms may arise from various stressors, including heavy workloads, the pressure to achieve academic success, uncertain future prospects, living away from family and adapting to a new environment. Additionally, students face social, emotional, physical, and familial challenges [15,16]. These high levels of anxiety are known to increase the activity of the masticatory muscles, which can subsequently lead to TMD, whether muscular or joint-related [17].

Although an intercontinental survey conducted in 17 countries with 85,052 adults shows a higher prevalence of TMD in women (62%) compared to men (38%) [17] and another study indicates similar results for student populations (65% for women and 35% for men) [18], the results of this study reveal no significant influence of sex on the presence of TMD, contrary to previous findings where prevalence was higher among women. We hypothesize that this lack of sex-based influence may be related to the study group, which consists of students with a similar age range and in the same academic context, even though they are at different stages of their courses, factors that may contribute to a more homogeneous sample. However, current literature suggests that the high prevalence of TMDs in women, with onset patterns after puberty and lower prevalence rates postmenopause, indicates that female reproductive hormones, such as fluctuations in estrogen levels, play a crucial etiological and physiological role in altering pain thresholds and the development of these conditions [19].

The current results indicate that men in this sample experienced moderate to severe anxiety symptoms more frequently than women, which might explain why they were diagnosed with TMD more often than their female counterparts. However, these findings are inconsistent with previous studies, which have reported a higher prevalence of these symptoms among women [20-22]. The higher prevalence of severe anxiety

Table III - Relationship of TMD and levels of anxiety symptoms with sex of the study volunteers

SEX	TMD		ANXIETY SYMPTOMS			
	Absent	Present	Absent	Mild	Moderate	Severe
Women	22	20	26	7	8	1
Men	8	10	1	0	10	7
<i>p-value</i>	0.778		<0.001			

symptoms in men in the present study may be related to different coping mechanisms between genders, as suggested by Sójka et al. [23]. Women might be more proactive in confronting challenges and therefore invest more effort in problem-solving or managing stress, potentially reducing their anxiety symptoms [22].

Therefore, the results of this study should be interpreted with caution due to several limitations. Firstly, the small sample size limits the ability to quantify the extent to which anxiety symptoms are associated with TMD occurrence. Specifically, the study does not provide statistical evidence on how variations in anxiety levels affect the likelihood of a TMD diagnosis. Secondly, the study was conducted exclusively among university students enrolled in the Dentistry program at UFJF-GV, encompassing students from both the introductory and advanced stages of the dental program. It remains uncertain whether these findings can be generalized to other fields or populations. Further research is needed to validate these results. Ultimately, a larger and more representative sample of university students is essential for drawing more definitive conclusions.

CONCLUSION

The results of this study indicated that anxiety was associated with the occurrence of painful temporomandibular disorders (TMDs) in Dentistry graduate students at UFJF-GV. Furthermore, medium to high levels of anxiety symptoms were more prevalent among individuals with TMD compared to those in the control group without TMD.

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Author's Contributions

LLMC: Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing – Original Draft Preparation, Writing – Review & Editing, Visualization and Project Administration.

IC: Writing – Original Draft Preparation and Writing Review & Editing. AATC: Methodology and Writing Review & Editing. RLAC: Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources and Supervision. JSM: Conceptualization, Methodology, Software, Validation, Formal Analysis, Investigation, Resources, Data Curation, Writing – Original Draft Preparation, Writing – Review & Editing, Project Administration Funding Acquisition and Supervision.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects' oversight committee guidelines and policies of Human Ethics and Research Committee of the Federal University of Juiz de Fora. The approval code for this study is: 6.116.687.

REFERENCES

1. Manfredini D, Landi N, Romagnoli M, Bosco M. Mood disorders in subjects with bruxing behavior. *J Dent*. 2005;33(6):485-90. <http://doi.org/10.1016/j.jdent.2004.11.010>. PMID:15935268.
2. Vickers ER, Boocock H. Chronic orofacial pain is associated with psychological morbidity and negative personality changes: A comparison to the general population. *Aust Dent J*. 2005;50(1):21-30. <http://doi.org/10.1111/j.1834-7819.2005.tb00081.x>. PMID:15881302.
3. Manfredini D, Ahlberg J, Winocur E, Guarda-Nardini L, Lobbezoo F. A critical review on the importance of psychological factors in temporomandibular disorders. *Minerva Stomatol*. 2003;52(6):321-30, 327-30. PMID:12874536.
4. Galli U, Ettlin DA, Palla S, Ehlert U, Gaab J. Do illness perceptions predict pain-related disability and mood in chronic orofacial pain patients? A 6-month follow-up study. *Eur J Pain*. 2010;14(5):327-30. <http://doi.org/10.1016/j.ejpain.2009.08.011>. PMID:19875320.
5. Gatchel RJ, Garofalo JP, Ellis E 3rd, Holt C. Major psychological disorders in acute and chronic TMD: an initial examination. *J Am Dent Assoc*. 1996;127(9):1365-74. <http://doi.org/10.14219/jada.archive.1996.0450>. PMID:8854613.
6. Oliveira SSI, Oliveira JI, Frigerio MLMA, Laganá DC. Quality of life assessment in patients with temporomandibular disorder with stabilization splint and home therapeutic exercises: a randomized clinical trial. *Braz Dent Sci*. 2023;26(1):e3669. <http://doi.org/10.4322/bds.2023.e3669>.

7. Craske MG, Stein MB. Anxiety. *Lancet*. 2016;388(10063):3048-59. [http://doi.org/10.1016/S0140-6736\(16\)30381-6](http://doi.org/10.1016/S0140-6736(16)30381-6). PMID:27349358.
8. Marazziti D, Dell'Osso L, Catena Dell'Osso M, Maj M. Headache, panic disorder and depression: comorbidity or a spectrum? *Neuropsychobiology*. 1995;31(3):125-9. <http://doi.org/10.1159/000119182>. PMID:7609860.
9. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166(10):1092-7. <http://doi.org/10.1001/archinte.166.10.1092>. PMID:16717171.
10. Schiffman E, Ohrbach R, Truelove EL, Look JO, Anderson GC, Goulet JP, et al. Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) for Clinical and Research Applications: Recommendations of the International RDC/TMD Consortium Network* and Orofacial Pain Special Interest Group†. *J Oral Facial Pain Headache*. 2014;28(1):6-27. <http://doi.org/10.11607/jop.1151>. PMID:24482784.
11. Bingeors C, Isacson D. Epidemiology, comorbidity and impact on health-related quality of life of self-reported headache and musculoskeletal pain - a gender perspective. *Value Health*. 2003;6(6):773-4. [http://doi.org/10.1016/S1098-3015\(10\)61970-5](http://doi.org/10.1016/S1098-3015(10)61970-5).
12. Kuroiwa DN, Santos LF, Gonçalves DA, Rodrigues LA, Dantas LM. Temporomandibular disorders and orofacial pain: study of quality of life measured by the Medical Outcomes Study 36 - Item Short Form Health Survey. *Rev Dor*. 2011;2:93-8. <http://doi.org/10.1590/S1806-00132011000200003>.
13. Ton LAB, Mota IG, de Paula JS, Martins APVB. Prevalence of temporomandibular disorder and its association with stress and anxiety among university students. *Braz Dent Sci*. 2020;23(1):1-9. <http://doi.org/10.14295/bds.2020.v23i1.1810>.
14. Eswi AS, Radi S, Youssri H. Perceived stress/stressors among Saudi nursing bachelor students. *Middle East J Sci Res*. 2013;14:193-202.
15. Yap AU, Chua EK, Dworkin SF. Prevalence of temporomandibular disorder subtypes, psychological distress, and psychosocial dysfunction in Asian patients. *J Orofac Pain*. 2003;17(1):21-8. PMID:12756927.
16. Silva FF, Barroso MSF, Guimarães AS, Valadas LAR, Rodrigues LLFR. Relationship between myofascial pain and facial types: an observational study. *Braz Dent Sci*. 2023;26(1):e3725. <http://doi.org/10.4322/bds.2023.e3725>.
17. Rugh JD, Solberg WK. Electromyographic studies of bruxist behavior before and during treatment. *J Calif Dent Assoc*. 1975;3(9):56-9. PMID:1073399.
18. Tsang A, Von Korff M, Lee S, Alonso J, Karam E, Angermeyer MC, et al. Common chronic pain conditions in developed and developing countries: gender and age differences and comorbidity with depression and anxiety disorders. *J Pain*. 2008;9(10):883-91. <http://doi.org/10.1016/j.jpain.2008.05.005>. PMID:18602869.
19. Quinelato V, de Souza CM, Koerich L, Souza JF, Siqueira JT. Association between polymorphisms in the genes of estrogen receptors and the presence of temporomandibular disorders and chronic arthralgia. *J Oral Maxillofac Surg*. 2018;76(2):314.e1-9. <http://doi.org/10.1016/j.joms.2017.10.023>. PMID:29175417.
20. Shaefer JR, Holland N, Secrest A, Hall T, Overstreet D. Pain and temporomandibular disorders. *Dent Clin North Am*. 2013;57(2):233-62. <http://doi.org/10.1016/j.cden.2013.02.005>. PMID:23570804.
21. Bueno CH, Pereira DD, Pattussi MP, Grossi PK, Grossi ML. Gender differences in temporomandibular disorders in adult populational studies: A systematic review and meta-analysis. *J Oral Rehabil*. 2018;45(9):720-9. <http://doi.org/10.1111/joor.12661>. PMID:29851110.
22. Johansson A, Unell L, Carlsson GE, Söderfeldt B, Halling A. Gender difference in symptoms related to temporomandibular disorders in a population of 50-year-old subjects. *J Orofac Pain*. 2003;17(1):29-35. PMID:12756928.
23. Sójka A, Stelcer B, Roy M, Mazur Z, Pryliński M. Is there a relationship between psychological factors and TMD? *Brain Behav*. 2019;9(9):e01360. <http://doi.org/10.1002/brb3.1360>. PMID:31339236.

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