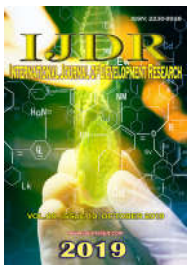
ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 09, Issue, 10, pp. 30585-30589, October, 2019



RESEARCH ARTICLE OPEN ACCESS

ASSOCIATION BETWEEN TEMPOROMANDIBULAR DISORDER AND LOW BACK PAIN IN UNDERGRADUATE STUDENTS FROM BRAZIL

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ARTICLE INFO

Article History:
Received 08th July, 2019
Received in revised form
27th August, 2019
Accepted 13th September, 2019
Published online 23rd October, 2019

Key Words:

Temporomandibular joint syndrome.
Low back pain. University students.

ABSTRACT

Objective: To verify the prevalence and association between temporomandibular disorder and low back pain in undergraduate students from Brazil. **Methods:**Analyptical cross-sectional study with a quantitative approach, carried out on 600 undergraduate students from the University Center of Sciences and Technology of Maranhão, in the city of Caxias. The Fonseca Anamnestic Index was used to assess the prevalence of temporomandibular disorderand the Brazil's Economic Classification Criterion to characterize the economic class of the students. **Results:**The demographic profile of the participants showed that 63.8% were female, 66.8% were aged ≤23 years and 85.2% belonged to economic classes B and C. The prevalence of temporomandibular disorder was 62.3% and the prevalence of low back pain was 46.5%, of which 73.8% were associated with TMD ($p<0.0001$). The presence of low back pain was a risk factor twice higher for the development of temporomandibular disorder ($p<0.0001$). **Conclusion:** It was possible to verify the significant prevalence of temporomandibular disorder and low back pain among undergraduate students, with a statistically significant association. However, it is not possible to perceive a cause-effect relationship between the pathologies based only on the use of anamnestic indexes.

Citation: ***Kelly Pereira Rodrigues dos Santos, Emigdio Nogueira Coutinho, Eduardo Henrique Barros Ferreira, Raydelane Grailea Silva Pinto and Mariana de Oliveira Sanchez.*** **2019.** "Association between temporomandibular disorder and low back pain in undergraduate students from Brazil", *International Journal of Development Research*, 09, (10), 30585-30589.

INTRODUCTION

Temporomandibular disorder (TMD) is a set of craniofacial disorders involving the masticatory muscles, temporomandibular joints (TMJ) and related structures (Nogueira *et al*., 2018). TMD has a variety of symptoms including joint pain and in its surrounding area, muscle fatigue, jaw cracking, mouth opening limitation, hearing disorders, headaches, and psychological disorders (Pinto *et al*., 2017). The multifactorial etiology of TMD is still widely discussed among health professionals, asit is understood to be an association of factors that predispose the risk of TMD, which interfere with the cure or contribute to the progression of the disorder. These factors are diverse, such as macrotrauma, parafunctional habits, ligament laxity, excessive mouth opening, emotional stress, poor posture, bruxism, systemic diseases and malocclusion (Jerjes *et al*., 2008). TMD-associated pain is the third most prevalent chronic pain condition in the world, after headache and low back pain. However, the prevalence of TMD and the factors involved in the transition from the acute phase to the chronic phase of the disorder remain unclear (Gui and Rizzatti-Barbosa, 2015). About 30 to 70% of the population is estimated to have at least one TMD sign and 10% to have significant symptoms requiring treatment (Mello *et al*., 2014; Parente and Cerdeira, 2013). Occurs predominantly in females at a ratio of five to each male (Parente and Cerdeira, 2013). The number of students in universities has been increasing in recent years, also leading to an increased incidence of TMD in this population group. Several studies around the world have

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addressed TMD in college students, revealing high prevalence of this dysfunction in this population group (Minghelli *et al*., 2014; Wahid *et al*., 2014; Habib *et al*., 2015; Lemos *et al*., 2016; Sousa *et al*., 2016; Al Moaleem *et al*., 2017; Pinto *et al*., 2017). Recent clinical studies have shown that individuals with TMD often have pain in other parts of the body besides the orofacial region, such as upper and lower limbs, cervical, dorsal and lumbar region, representing a risk factor for the development of the disorder. In addition, this comorbidity can make pain control difficult for these individuals and contributes to the persistence of myofascial pain of the masticatory muscles (Sanders *et al*., 2013; Correia *et al*., 2014; Correia *et al*., 2015). Therefore, this study aimed to verify the prevalence and association between TMD and low back pain in undergraduate students from Brazil.

MATERIALS AND METHODS

Study design: This is an analyptical cross-sectional study with a quantitative approach.

Place of study: The study was carried out at the University Center of Sciences and Technology of Maranhão, in the city of Caxias, from February 2015 to December 2016. Caxias is located in the countryside of the Maranhão state, in the Northeast region of Brazil. The city is the fifth largest one in the state, with a population of 164,224 inhabitants and an area of 5,196,769 km^2, considerated the fifth biggest city and one of the greatest economic centers of the State, due to its great performance in the sector of industry and na important political, cultural, and populational center of the state (IBGE, 2018).

Subjects: Participants were selected by a probabilistic sampling process, in which the population elements were sorted and the sample elements were chosen at random. Sample size calculation was performed using Epi Info's Statcalc program (version 6.04) using the formula: $n = \partial^2.p.q.N/e^2.(N-1) + \partial^2.p.q$, where N is the population, n is the sample to be calculated, ∂ is the 95% confidence level (∂ = 1.96), eis the sampling error and p.q is the percentage by which the phenomenon occurs. Considering a population of enrolled university students (2392), a prevalence of TMD of 62.5%, according to a study by Bezerra *et al*. (2012), a maximum error of 5% for a significance level of 95% and a correction factor for the drawing outcome of 1.5. The sample was increased by 25%, assuming non-response rate and to control confounding factors, resulting in a final sample of approximately 600 undergraduates. The authors guaranteed the secrecy of the participants, the confidentially of the collected data and anonymity as well as freedom to refuse to participate of the research, without prejucice of their treatment. The interview was conducted only after the clarification and agreement of the participants, and after signing the Informed Consent Form, following the precepts of the Resolution nº 446 of December 12, 2012 of the National Health Council of Brazil. The study was approved by the Research Ethics Committee of the Federal University of Maranhão under opinion number 1,121,984.

Inclusion and exclusion criteria: This study included students enrolled in one of the courses of the University Center of Sciences and Technology of Maranhão, of both sexes and aged between 18 and 45 years. Individuals with neurological disorders; osteomusculate diseases, such as fibromyalgia, arthritis, whose symptoms could be confused with TMD; individuals who were undergoing orthodontic treatment or who had had recent surgery in the orofacial region; pregnant women and those who reported continuous use of anti-inflammatory drugs in the 6 months prior to the survey were excluded.

Data collection: To describe the prevalence of TMD among the students, the Fonseca Anamnesic Index (FAI) (Fonseca *et al*., 1994) was used. It is a questionnaire consisting of 10 questions with the possibility of three answers: "Yes", which is equivalent to 10 points; "Sometimes", equivalent to 5 points; and "No", whose score is zero. The questions verify the presence of pain in the TMJ, pain in the neck, pain when chewing, headache, difficulties of mandibular movement, articular noises, parafunctional habits (teeth grinding/ clenching), perception of malocclusion, and emotional stress. By summing the scores, the Index can classify participants into symptom severity categories such as no TMD (0 to 15 points), mild TMD (20 to 40 points), moderate TMD (45 to 65 points), and severe TMD (70 at 100 points). The FAI is one of the few instruments developed in Portuguese to assess TMD severity. Being a simple questionnaire, it favors its use in population epidemiological studies in public health, presenting high accuracy, since it was previously tested in patients with TMD and showed a correlation of 95% with the Helkimo clinical index (Minghelli *et al*., 2014; Berni *et al*., 2015).

To identify prevalence of low back pain the subjects answered the question: "Have you had low back pain or discomfort during the last 12 months?''. To characterize the economic class of the students, the Brazil's Economic Classification Criterion was used. This index evaluates the consumption power of different economic classes based on some indicators such as the education level of the head of household, the number of televisions, radios, refrigerators, bathrooms and cars in the household, among others. On this scale, all items are summed and ranked according to the final score. The head of household's education level is from 0 to 8 points, the other points are obtained by the amount of durable consumer goods and not by income. The sum of the 23 indicators allows the classification of the population into 07 classes: A1 (42-46 points), A2 (35-41 points), B1 (29-34 points), B2 (23-28 points), C1 (18- 22 points), C2 (14-17 points), D (8-13 points) and E (0-7 points) (ABEP, 2015).

Statistical analysis: Data were organized and tabulated using Microsoft Excel version 2010 for Windows and statistical analyzes were performed using IBM SPSS version 18.0 software for Windows (IBM Corp., Armonk, United States). In the univariate analysis, descriptive statistics procedures were applied as measures of central tendency (absolute and relative frequencies) related to sociodemographic characteristics, low back pain and TMD diagnosis. Subsequently, a bivariate analysis was performed to identify associations between sex, age, economic class and low back pain (independent variables) and TMD (dependent variable). All variables were tested for normality using Student's t-test. For categorical variables, Pearson's chi-square test (x^2) was used. For multivariate analysis (logistic regression), crude and adjusted odds ratios (OR) and their respective confidence intervals of 95% (95% CI) were estimated. Independent variables that reached $p < 0.05$ in the bivariate analysis were selected for the multivariate model. For all analyzes under study, a significance level of 95% was considered.

RESULTS

Of the 600 students, 63.8% (383) were female and 60.7% (364) of them were under 23 years old. Regarding economic class, 85.2% (511) belonged to classes B and C. The prevalence of low back pain was 46.5% (279), as shown in the table 1. The prevalence of TMD among the students was 62.3% (374). It was found a predominance of TMD in females, with a prevalence of 67.9% (260), as well as among under 23 years old students, whose prevalence was 66.8% (243). Regarding economic class, 62% (317) of the students who belonged to classes B and C presented TMD.Of the sociodemographic characteristics, sex ($p < 0.0001$) and age ($p = 0.005$) were significantly associated with TMD. Regarding low back pain, 73.8% (206) of those who reported this symptom also had TMD, thus having a statistically significant association between low back pain and TMD ($p < 0.0001$) (Table 2). When comparing the risks of developing TMD, students who reported low back pain were 2.40 times more likely (OR: 1.70-3.42) to develop TMD than those who did not report low back pain.

Table 1. Demographic characteristics, economy class, and low back pain among undergraduate students participating in the study. Caxias, Brazil, 2017

Variables	N	%
Sex		
Male	217	36.2
Female	383	63.8
Age		
<23 years	364	60.7
≥23 years	236	39.3
Economic class		
A1/A2	22	3.7
B1/B2	220	36.7
C1/C2	291	48.5
D/E	67	11.2
Low back pain		
Yes	279	46.5
No	321	53.5
Total	600	100.0

Source: Research data, 2019. N: Number of subjects. A1 and A2: upper class; B1 and B2: upper middle class; C1 and C2: middle class; D and E: lower class (based on Brazil's Economy Classification Criteria).

Table 2. Association between temporomandibular disorder and demographic characteristics, economy class and low back pain among undergraduate students participating in the study. Caxias, Brazil, 2017.

Variables	Without TMD		With TMD		Total		*P**
	N	%	N	%	N	%	
Sex							<0.0001
Male	103	47.5	114	52.5	217	100.0	
Female	123	32.1	260	67.9	383	100.0	
Age						100.0	0.005
<23 years	121	33.2	243	66.8	364	100.0	
≥23 years	105	44.5	131	55.5	236	100.0	
Economic class						100.0	0.721
A1/A2	10	45.5	12	54.5	22	100.0	
B1/B2	82	37.3	138	62.7	220	100.0	
C1/C2	112	38.5	179	61.5	291	100.0	
D/E	22	32.8	45	67.2	67	100.0	
Low back pain						100.0	<0.0001
Yes	73	26.2	206	73.8	279	100.0	
No	153	47.7	168	52.3	321	100.0	
Total	226	37.7	374	62.3	600	100.0	

Source: Research data, 2019. TMD: Temporomandibular disorder; A1 and A2: upper class; B1 and B2: upper middle class; C1 and C2:middle class; D and E: lower class (based on Brazil's Economy Classification Criteria). *p < 0.001, **p < 0.0001 (Pearson's Chi-square test).

Table 3.Multinomial logistic regression model for the influence of demographic characteristics and low back pain in the diagnosis of temporomandibular disorder in undergraduate students participating in the study. Caxias, Brazil, 2017

Variables	WithTMD	*P**
	OR (CI95%)	
Sex		0.007*
Male	1.0	
Female	0.62 (0.43-0.88)	
Age		0.007*
<23 years	0.62 (0.43-0.87)	
≥23 years	1.0	
Low back pain		<0.0001**
Yes	2.40 (1.70-3.42)	
No	1.0	

Source: Research data, 2019. CI 95%: confidence interval of 95%, OR: odds ratio. Data compared to the category: without TMD (temporomandibular disorder). *p < 0.05, **p < 0.001 (Wald test).

In this study, it was found that female students (OR: 0.62; 0.43-0.88) and those aged<23 years old (OR: 0.62; 0.43-0.87) had a low risk to develop TMD (Table 3).

DISCUSSION

The prevalence of TMD found in this study is similar to that observed by other studies that used the FAI to identify TMD signs and symptoms among the university population (Pinto *et al*., 2017; Bezerra *et al*., 2012; Goyatá *et al*., 2010). However, other studies with undergraduate students using the same index found discrepancies in prevalence, ranging from 42 to 92% (Minghelli *et al*., 2014; Wahid *et al*., 2015; Habib *et al*., 2015; Lemos *et al*., 2015; Sousa *et al*., 2016; Al Moaleem *et al*., 2017). These differences can be explained by different data collection methodologies, gender distribution or differences in the sample, where cultural, economic and dietary habits are considered (Al Moaleem *et al*., 2017). According to Sousa *et al*. (2016), because it is easy to apply and interpret, the use of indexes, especially when validated and widely disseminated in the literature, are effective to identify possible TMD signs and symptoms for early diagnosis of this disorder. They affirm that, regarding risk groups, young undergraduate students represent the object of studies, mainly due to the level of demand for academic performance as one of the fundamental factors for future professional perspectives. In addition, several Brazilian and international studies have used the FAI to classify patients according to TMD signs and symptoms (Minghelli *et al*., 2014; Habib *et al*., 2015; Lemos *et al*., 2015; Al Moaleem *et al*., 2017; Berni *et al*., 2015; Dantas *et al*., 2015). Research data from Bortoleto *et al*. (2013) show that 40 to 60% of individuals in the general population have some type of TMD. This may be a conservative estimate, as many patients have no complaints of any TMD-associated symptoms. The possible explanation for this fact is the presence of subclinical signs that are not reported as symptoms. Gender is considered a predisposing factor in the occurrence of TMD. The data obtained through the application of the IAF in this study showed that women were more affected (63.8%) compared to men (36.2%), corroborating the results of other studies (Parente and Cerdeira, 2013; Minghelli *et al*., 2014; Pinto *et al*., 2017; Correia *et al*., 2015; Goyatá *et al*., 2010; Dantas *et al*., 2015; Medeiros *et al*., 2011; Ferreira *et al*., 2016). However, two studiesfound a higher prevalence of TMD among men (Mello *et al*., 2014; Bezerra *et al*., 2012).

The literature shows that women are the ones who seek TMD treatment the most, as in population studies, which report a higher prevalence of TMD signs and symptoms in women (Medeiros *et al*., 2011). For Lemos *et al*. (2015), the reasons why women are more affected than men remain controversial and some factors have been suggested, such as a greater female perception of painful stimuli, a higher prevalence of psychological disorders, physiological differences, such as women hormonal variations, structural differences in muscle and connective tissue or simply a greater concern for health, leading to a greater search for prevention and treatment. Some authors attribute this higher prevalence of TMD in women to greater ligament laxity, causing a greater difficulty in stabilizing the TMJ or, in some cases, the hormonal conditions that worry in greater moments of tension, sometimes generating an increase in parafunctional habits (Parente and Cerdeira, 2013; Berni *et al*., 2015). According to Minghelli *et al*. (2014), the greater laxity of these tissues, which is related to estrogen level, may explain why these tissues are less able to withstand functional pressure, leading to TMD. For Wahid *et al*.7, this higher prevalence in women is associated with higher mental stress.

Most students with TMD were younger than 23 years old (66.8%), contrary to the studies by Minghelli *et al*. (2014) and Wahid *et al*. (2014), who found a higher prevalence of TMD among undergraduate students over 20 years old. According to Mello *et al*. (2014), the severity of TMD symptoms varies with age and suggests an association between teething change for children, changes in puberty for adolescents and the reproduction period for adults. Today, stress makes a major contribution to TMD, affecting all age groups. One of the factors analyzed in relation to TMD was economic class, due to its association with morbidity and mortality. In this research it was possible to observe that more than half of individuals belonging to classes D and E had TMD symptoms, but there was no statistically significant association with TMD, and a possible explanation may be due to the homogeneity of the studied population, which belongs almost entirely to lower economic classes, in agreement with Mello *et al* (2014). In addition, different problems, such as concern for the family's livelihood for the poor; violence and business for the rich can lead to stress, which is a possible variable for TMD, making it difficult to associate socioeconomic class and TMD. Low back pain has been linked to TMJ problems, which not only fit in the cranioencephalic follow-up but can also trigger painful processes throughout the spine. The results showed that 73.8% of the students had low back pain associated with TMD. Correia *et al*. (2014) carried out a study of 180 individuals with chronic pain and found that 4.44% of them had low back pain associated with TMD. Correia *et al*. (2015) evaluated 328 records of patients diagnosed with TMD and verified the presence of low back pain in 35% of them. These results confirm that the presence of low back pain may influence the onset and / or worsening of TMD signs and symptoms. A study carried out on 96 Swedish patients with back pain showed a significant relationship between long-term pain localized in the low back region and the presence of musculoskeletal disorders in the TMJ. The authors suggest that these reflex connections could be involved in the spread of muscle stiffness and pain as well as motor control disturbances. Non-specific effects of central pain processing and sensitization may contribute to the co-morbidity between back pain and jaw-face pain (Wiesinger *et al*., 2007).

Ferreira *et al*. (2016), when evaluating subjects with migraine and TMD and without TMD, demonstrated that, through the method of evaluation of cervical and lumbar spine angles, it is possible to suggest that in patients with migraine without TMD, changes in body posture are more specifically restricted to the cranial segment, while in patients with migraine and TMD compensatory changes in other levels of the spine may be present. The authors also emphasize the importance of postural reeducation in patients with TMJ disorders, thus concluding that there is an intimate relationship between TMD and changes in body posture, which may explain the onset of low back pain in patients with TMD. In the study, students with low back pain had a 20% risk of developing TMD. The limitations of this research are related to the use of only one instrument to classify the students regarding the presence of any TMD clinical signs/symptoms, that only allows to identify the degree of TMD, but it does not provide clinical diagnosis of classification with regard to types of TMD of muscular, joint and mixed origin. Another limiting factor of this study is

the subjectivity of the data collected through the use of this questionnaire, which may lead to self-report bias, making it difficult to verify the data. However, the sample was significant and it was possible to observe a prevalence of students with TMD associated with the self-report of low back pain.

Conclusion

It is not possible to state that TMD causes low back pain or that low back pain leads to TMD, but the results of this study showed a significant association between individuals who presented the disorder and referred low back pain. In this sense, it is recommended to conduct research to analyze the pathophysiology of pain in low back pain with TMD to show whether or not there is an association between these variables and, therefore, measures to control and/or treat this dysfunction. It is also suggested that cohort studies be conducted on the habits of individuals with low back pain that may contribute to the development of orofacial pain in this specific group. The authors declare no conflict of interest.

REFERENCES

Al Moaleem MM, Okshah AS, Al-Shahrani AA, Alshadidi AA, Shaabi FI, Mobark AH *et al*. 2017. Prevalence and severity of temporomandibular disorders among undergraduate medical students in association with khat chewing. J. Contemp. Dent. Pract. 18(1):23–28.

Associação Brasileira de Empresas de Pesquisa - ABEP. 2015. Critério de Classificação Econômica Brasil. ABEP, São Paulo, Brasil, pp 1-6.

Berni KCDS, Dibai-Filho AV, Rodrigues-Bigaton D. 2015. Accuracy of the Fonseca anamnestic index in the identification of myogenous temporomandibular disorder in female community cases. J. Bodyw. Mov. Ther. 19(3):404-409.

Bezerra BP, Ribeiro AI, Farias AB, Farias, AB, Fontes LD, Nascimento SR *et al*. 2012. Prevalência da disfunção temporomandibular e de diferentes níveis de ansiedade em estudantes universitários. Rev. Dor. 13(3):235–242.

Bortolleto PPB, Moreira APSM, Madureira PRD. 2013. Análise dos hábitos parafuncionais e associação com disfunção das articulações temporomandibulares. Rev. Assoc. Paul. Cir. Dent. 67(3):216–221.

Correia LMF, Guimarães AS, Teixeira ML, Rodrigues LL. 2015. Evaluation of body painful areas in patients with muscular temporomandibular disorder: a retrospective study. Rev Dor.16(4):249-253.

Correia LMF, Hummig W, Adamowicz T, Almeida DBD. 2014. Importance of evaluating the presence of temporomandibular disorders in chronic pain patients. Rev. Dor. 15(1):6-8.

Coutinho EM, Santos KPR, Ferreira EHB, Pinto RGS, Sanchez MO. 2018. Association between self-reported sleep bruxism and temporomandibular disorder in undergraduate students from Brazil. Cranio. 1-8.

Dantas AMX, Santos EJLDS, Vilela RM, Lucena LBSD. 2015. Perfil epidemiológico de pacientes atendidos em um Serviço de Controle da Dor Orofacial. Rev. Odontol. UNESP. 201544(6):313–319.

Ferreira CLP, Silva MAMRD, Felício CMD. 2016. Sinais e sintomas de desordem temporomandibular em mulheres e homens. CoDAS.28(1):17-21.

Fonseca DM, Bonfarte G, Valle ALD, Freitas SF. 1994. Diagnóstico pela anamnese da disfunção craniomandibular. Rev. Gauch. Odontol. 42:23–28.

Goyatá FR, Taira NV, Almeida SD, Silva DD, Taira CV. 2010. Avaliação de sinais e sintomas de disfunção temporomandibular entre os acadêmicos do curso de odontologia da universidade Severino Sombra, Vassouras – RJ. Int. J. Dent. 9(4):181-186.

Gui MS, Rizzatti-Barbosa CM. 2015. Chronicity factors of temporomandibular disorders: a critical review of the literature. Braz. Oral Res. 29(1):1-6.

Habib SR, Al Rifaiy MQ, Awan KH, Alsaif A, Alshalan A, Altokais Y. 2015. Prevalence and severity of temporomandibular disorders among university students in Riyadh. Saudi Dent. J. 27:125–130.

Instituto Brasileiro de Geografia e Estatística - IBGE. **Caxias**. Availableon: <https://goo.gl/pF55w5>. Acess on: 2018 oct20.

Jerjes W, Upile T, Abbas S, Kafas P, Vourchachis M, Rob J *et al*. 2008. Muscle disorders and dentition-related aspects in temporomandibular disorders: controversies in the most commonly used treatment modalities. Int. Arch. Med. 1(23):1-13.

Lemos GA, Silva PLP, Paulino MR, Moreira VG, Beltrão RTS, Batista AUD. 2015. Prevalência de disfunção temporomandibular e associação com fatores psicológicos em estudantes de Odontologia. Rev. Cubana Estomatol. 52(4).

Medeiros SP, Batista AU, Forte FD. 2011. Prevalência de sintomas de disfunção temporomandibular e hábitos parafuncionais em estudantes universitários.. Rev. Gaúcha Odontol.59(2):201-208.

Mello VVCD., Barbosa ACDS., Morais MPLDA., Gomes SGF., Vasconcelos MMVB., Caldas Júnior ADF. 2014. Temporomandibular disorders in a sample population of the Brazilian Northeast. Braz. Dent. J. 25(5):442-446.

Minghelli B, Morgado M, Caro T. 2014. Association of temporomandibular disorder symptoms with anxiety and depression in Portuguese college students. *J Oral Sci.* 56(2):127–133.

Parente IA, Cerdeira DQ. 2013. Disfunção temporomandibular: a avaliação fisioterapêutica em discentes de uma instituição de ensino superior do município de Sobral – Ceará. SANARE. 12(2):27-33.

Pinto RGS, Leite WMA, Sampaio LS, Sanchez MO. 2017. Associação entre sinais e sintomas de disfunção temporomandibular com depressão em universitários: estudo descritivo. Rev. Dor. 18(3):217–224.

Sanders AE, Slade GD, Bair E, Fillingim RB, Knott C, Dubner R *et al*. 2013. General health status and incidence of first-onset temporomandibular disorder: OPPERA prospective cohort study. J. Pain. 14(12 suppl).

Sousa EFD, Moreira TR, Santos LHG. 2016. Correlação do nível de ansiedade e da qualidade de vida com os sinais e sintomas da disfunção temporomandibular em universitários. ClipeOdonto. 8(1):16–21.

Wahid A, Mian FI, Razzaq A, Bokhari SAH, Kaukab T, Iftikhar A *et al*. 2014. Prevalence and severity of temporomandibular disorders (TMD) in undergraduate medical students using Fonseca's questionnaire. Pak. Oral Dent. 34(1):38–41.

Wiesinger B, Malker H, Englund E, Wänman A. 2007. Back pain in relation to musculoskeletal disorders in the jaw-face: A matched case–control study. Pain. 131(3):311–319.

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