ORIGINAL ARTICLE

Association between temporomandibular signs and symptoms and depression in undergraduate students: descriptive study

Associação entre sinais e sintomas de disfunção temporomandibular com depressão em universitários: estudo descritivo

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ABSTRACT

BACKGROUND AND OBJECTIVES: Temporomandibular joint dysfunction is a chronic condition that affects a large part of the college population, deserving greater importance in public health due to the negative consequences in students' performance and in the quality of life of these individuals. The objective of this study is to check the association and correlation of temporomandibular dysfunction symptoms and signs with depression in students from the School of Science and Technology of Maranhão.
METHODS: Epidemiological, descriptive and cross-sectional study with the quantitative approach with 199 undergraduate students. For data collection, we used Fonseca's Anamnestic Index and the Research Diagnostic Criteria for Temporomandibular Disorders, Axis II. Data were analyzed using Pearson's Chi-square test, Fisher's Exact test, and Spearman's Correlation, considering a statistical significance of 5%.
RESULTS: 37.7% students showed signs and symptoms of mild temporomandibular dysfunction, 19.6% moderate and 9% severe. Temporomandibular dysfunction was more frequent in female students (70.2%) between the ages of 19 to 24 years (70.2%). When assessing the level of depression symptoms, it was found that 25.1% students had moderate depression and 17.1% severe. There was no statistically significant association (p<0.001) and weak positive correlation (r=0.38; p<0.001) between the presence of temporomandibular dysfunction signs and symptoms and depression.
CONCLUSION: The results of this study suggest that there is a relationship between temporomandibular dysfunction and depression in undergraduate students, with higher prevalence in women, however, more specific diagnostic methods are necessary to confirm this relationship and the need for treatment.

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RESUMO

JUSTIFICATIVA E OBJETIVOS: A disfunção temporomandibular é uma condição crônica que afeta grande parte da população universitária, merecendo maior importância na saúde pública, devido as consequências negativas que pode proporcionar no rendimento acadêmico e na qualidade de vida desses indivíduos. Esta pesquisa teve como objetivo verificar a associação e correlação entre os sinais e sintomas de disfunção temporomandibular com depressão em universitários da Faculdade de Ciências e Tecnologia do Maranhão.
MÉTODOS: Estudo epidemiológico, descritivo e transversal de abordagem quantitativa com 199 estudantes universitários. Para a coleta de dados, foram aplicados o Índice Anamnésico de Fonseca e o *Research Diagnostic Criteria for Temporomandibular Disorders* eixo II. Os dados foram analisados por meio dos testes Qui-quadrado de Pearson, Exato de Fisher e correlação de Spearman, considerando uma significância estatística de 5%.
RESULTADOS: 37,7% dos acadêmicos apresentavam sinais e sintomas de disfunção temporomandibular leve, 19,6% moderada e 9% grave. A disfunção temporomandibular foi mais frequente em acadêmicos do sexo feminino (70,2%) e na faixa etária dos 19 aos 24 anos (70,2%). Ao avaliar os graus de sintomas de depressão, verificou-se que 25,1% dos acadêmicos apresentavam depressão moderada e 17,1% grave. Houve associação estatisticamente significativa (p<0,001) e correlação positiva fraca (r=0,38; p<0,001) entre a presença de sinais e sintomas de disfunção temporomandibular com depressão.
CONCLUSÃO: Os resultados desta pesquisa sugerem que existe uma relação entre disfunção temporomandibular e depressão em universitários, com maior prevalência em mulheres, entretanto necessita-se de métodos diagnósticos mais específicos para comprovar essa relação e necessidade de tratamento.
Descritores: Depressão, Estudantes de Ciências da Saúde, Índice de gravidade de doença, Sinais e sintomas, Síndrome da articulação temporomandibular.

INTRODUCTION

Temporomandibular dysfunction (TMD) is a term that encompasses a set of chronic painful conditions, and dysfunction in the orofacial region involving the muscles of mastication, the

temporomandibular joints (TMJ) and related structures[1]. TMJ presents a range of symptoms that include pain in the joint and surrounding area, muscular fatigue, mandibular joint crackling, mouth opening limitation, optic disorders, headaches and psychological disorders[2,3].

More than 50% of the Brazilian population has at least one or more signals of TMD, which does not necessarily mean that these people need treatment. It is estimated that only 3.6 to 7% of the individuals seeking care need some intervention [4]. The prevalence of TMD is around 40 and 60% in the general population[5]. Among college students, this prevalence varies from 15 to 92%, depending on the origin of the students and the diagnostic method used, representing a common health problem in this population group[6-9].

DTM can occur in all age groups, but its incidence is higher between 20 and 45 years of age. Between the ages of 15 and 30, the most frequent causes are from muscle origin and after the age of 40, joint origin. They affect more women than men, in a ratio of five women to every man (5:1)[10].

Many studies mention depression as one of the main factors associated with the presence of TMD, generating investigations and innumerable inquiries regarding the influence of psychological factors, mainly depression, for the onset and/or worsening of TMD. ̄

Depression, disability, and changes in behavior are critical aspects of the profile of patients with TMD. However, its importance is neglected for the classification of these factors as adjuvant factors for a detailed knowledge of this condition, or to guide the clinical treatment and the evaluation of physical and psycho-social results in a long run[11].

In the population where there is a clinical manifestation of TMD, there is a significant psycho-social involvement and decrease in the quality of life[12]. The perpetuation of TMD is due to mechanical and muscle tension, metabolic problems, and especially behavioral, social and emotional variants that lead to the spasm of the masticatory muscles caused by excessive contraction or muscle fatigue due to parafunctional habits[13,14].

In this context, the objective of this study was to check the association and correlation of TMD symptoms and signs with depression in students from the School of Science and Technology of Maranhão - FACEMA.

METHODS

The study observed the ethical aspects that were involved in studies of this nature, supported by Resolution 466/2012 of the National Health Council, that establishes the standard for health studies. The subject`s agreement to participate in the study was obtained by signing a Free and Informed Consent (FICT).

This is an epidemiologic, descriptive and cross-section study with a quantitative approach, carried through at FACEMA, in the city of Caxias, Maranhão. The size of the sample was calculated according to the formula: $n = N.z^2.p.(1-p)/e^2.(N-1)+z^2.p.(1-p)$, where **n** is the calculated sample, **N** is the population, **z** the confidence level of 95% (1.96), **p** the frequency the event occurs and **e** the sampling error (0.05). The population of the study

was college students enrolled in the academic year of 2015 at FACEMA (2392). A prevalence of TMD in college students of 19%, according to the study of Khan, Khan and Hussain[15], sampling error of 5% and confidence level of 95%, resulting in a final sample of approximately 215 students.

Data collection occurred between the months of February and August of 2015, during class intervals and performed by two physiotherapists and two students of the Physiotherapy course. The evaluators were previously trained by the Research Coordinator on the use of the Fonseca's Anamnestic Index (IAF) questionnaire and Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), objectives of the research and data collection. The evaluators received a list of students registered at FACEMA and copies of the IAF questionnaire, the RDC/TMD, and the FICT.

The evaluators were trained together for two days, and after this, they were divided into pairs. The teacher gave permission to approach the students in the classroom to explain the objectives/background of the study, as well as to confirm the students' interest in participating in the study. The students who agreed to participate in the research were invited to go to a reserved room during the breaks to sign the FICT and answer the questionnaires.

The inclusion criteria adopted were: students enrolled in one of FACEMA courses, with age between 18 and 45 years, of both genders. Students who were undergoing orthodontic treatment, pregnant women and those who reported the use of anti-inflammatory drugs in the last six months were excluded.

To collect the data about students' TMD signs and symptoms we used the IAF since it is a Brazilian instrument, developed in Portuguese, that assesses the severity of TMD signs and symptoms. It has 10 questions with the possibility of three answers: "Yes," which is equivalent to 10 points; "sometimes," equivalent to 5 points; and "no," which score is zero. Questions check the presence of pain in the TMJ, neck, when chewing, headache, a difficulty of mandibular movements, joint noises, parafunctional habits (clenching and grinding the teeth), a perception of malocclusion and sense of emotional stress. According to the sum of points, the index can sort participants into categories of severity of symptoms, without TMD (0 to15 points), mild TMD (20 to 40 points), moderate TMD (45 to 65 points) and severe TMD (70 to 100 points)[16].

As for the emotional state, students were evaluated within the RDC/TMD axis II of the Symptom Checklist - Revised (SCL-90-R) - question 20 (In last the four weeks, how much you have been overwhelming or worried?), a scale that has 20 items related to the evaluation of the signs and symptoms of depression that includes the 13 items of the scale of depression SCL-90-R and 7additional items designed to evaluate the vegetative symptoms of depression. The 7 additional items were included in the depression instrument axis II due to the validity of its content as part of the construction of the Diagnostic and Statistical Manual of Mental Disorders (DSM) of depression[17]. The scale of depression of the RDC/TMD provides five answer options with scores from zero to 4: "not at all", which score is zero, "a little" which is equivalent to 1 point, "moderately", which equals 2 points,

"much", which is equivalent to 3 points and "extremely", which is equivalent to 4 points. The sum of the points ranks individuals according to the degree of signs and symptoms of depression as normal (result<0.535), moderate depression (result>0.535 and <1.105) and severe depression (result >1.105)[18].

This study was approved by the Committee on Ethics in Research of the University Hospital of the Federal University of Maranhão/HU/UFMA, under number CAAE: 42793015.5.0000.5086.

Statistical analysis

The data was organized using Microsoft Excel version 2016 for Window and for the statistical analysis it was used the Stata software[*] version 12.0 for Windows.

The univariate analysis was carried through the description of all the studied variables. The Shapiro Wilk test was used to check data normality. Numerical variables were represented by mean and standard deviation (mean±SD), or medians and quartiles, and the categorical by absolute and relative frequencies, respectively. The comparison between male and female in the presence of the signs and symptoms of TMD and depression was made using the Mann-Whitney test.

In the bivariate analysis of the data, we used Pearson's Chi-square test and Fisher's Exact test to check associations among inde-pendent variables (gender, age group, and depression), with the dependent variable (TMD).

The correlation between variables was evaluated using Spearman›s rank correlation, considering weak correlation (0.26-0.49), moderate correlation (0.50-0.69), a strong correlation (0.70-0.89) and very strong correlation (0.9-1[19,22]. The significance considered for all analysis in the study was 5%.

RESULTS

Of the 300 distributed questionnaires, 221 were answered (response rate: 79.6%). Of these, 22 were excluded because the items related to depression were not completed. Among the 199 students included, 75.9% (151) were female and 24.1% (48) male. The age of the participants varied from 19 to 42 years, with an average of 24.2±4.6 years and median of 23 years (Q1 21; Q3 26), in which 69.4% (138) of students were between 19 and 24 years, 20.1% (40) between 25 and 30 years, 7% (11) between 31 and 36 years and only 3.5% (7) between 37 and 42 years (Table 1).

The prevalence of TMD signs and symptoms in its different levels was 66.3%, totaling 132 individuals with the presence of the symptoms of the dysfunction. Among those who presented TMD, 37.7% had a mild degree, 19.6% moderate and 9% severe. TMD symptoms were more frequent in females, with a prevalence of 70.2% (106), as well as the mild (39.7%), moderate (21.2%) and severe (9.3%) degrees, but there was no statistically significant difference compared to males (p=0.078). In relation to age, the presence of TMD signs and symptoms was higher in students in the age group of 19 to 24 years (70.2%), as well as the mild degree (44.3%). The moderate degree was more frequent in students in the age group of 31 to 36 years (35.7%), being absent among students in the age group of 37 to 42 years, and the severe degree had a higher frequency among those above 31 years old (28.6%) (Table 2).

The prevalence of symptoms of depression among students was 42.2%, of which 57.8% has been classified as normal, 25.1% with moderate depression, and 17.1% severe. Considering gender, the signs and symptoms of depression had a higher prevalence in

Table 1. Distribution of students regarding age and gender. Caxias-MA, 2016

Variables	f	%
Gender		
Female	151	75.9
Male	48	24.1
Age group (years)		
19 to 24	138	69.4
25 to 30	40	20.1
31 to 36	14	7.0
37 to 42	7	3.5
Total	199	100.0

f = absolute frequency; % = relative frequency.

Table 2. Distribution of students according to the degree of the signs and symptoms of the temporomandibular dysfunction. Caxias-MA, 2016

Variables	Temporomandibular dysfunction										p value*
	Without TMD		Mild		Moderate		Severe		Total		
	f	%	f	%	f	%	f	%	f	%	
Gender											0.255
Female	45	29.8	60	39.7	32	21.2	14	9.3	151	100.0	
Male	22	45.8	15	31.3	7	14.6	4	8.3	48	100.0	
Age group (years)											0.461
19 to 24	41	29.7	61	44.2	26	18.8	10	7.2	138	100.0	
25 to 30	17	42.5	10	25.0	8	20.0	5	12.5	40	100.0	
31 to 36	5	35.7	2	14.3	5	35.7	2	14.3	14	100.0	
37 to 42	4	57.1	2	28.6	0	0.0	1	14.3	7	100.0	
Total group	67	33.7	75	37.7	39	19.6	18	9.0	199	100.0	

* Fisher's Exact test; f = absolute frequency; % = relative frequency.

women (45%), as well as the moderate degree (25.8%) and the severe (19.2%). However, no significant statistical difference was observed in relation to males (p=0.259). The signs and symptoms of depression were more frequent among students in the age group of 31 to 36 years (57.2%), and its absence was higher among students in the age group of 37 to 42 years (71.4%). Both the moderate degree (28.6%) and the severe degree (28.6%) were more frequent in students with ages between 31 and 36 years (Table 3). The TMD signs and symptoms most reported by the college students were: headaches (60.8%), tinnitus (40.2%), crackle when

chewing (37.7%), malocclusion (34.2%) and noise in the TMJ (31.2%), as shown in table 4.

Of the 132 students who presented TMD symptoms, 72 had depression symptoms, representing a prevalence of 54.5% of students with signs and symptoms of both diseases. There was a statistically significant association between the presence of TMD signs and symptoms and depression (p<0.001) (Table 5). Also, there was a weak positive and statistically significant correlation between the variables (r=0.38; p<0.001) (Figure 1).

Table 3. Distribution of students according to the degree of the signs and symptoms of depression. Caxias-MA, 2016

Variables	Depression								p value
	Normal		Moderate		Severe		Total		
	f	%	f	%	f	%	f	%	
Gender									0.143*
Female	83	55.0	39	25.8	29	19.2	151	100.0	
Male	32	66.7	11	22.9	5	10.4	48	100.0	
Age group (years)									0.741**
19 to 24	75	54.3	39	28.3	24	17.4	138	100.0	
25 to 30	25	62.5	9	22.5	6	15.0	40	100.0	
31 to 36	6	42,8	4	28.6	4	28.6	14	100.0	
37 to 42	5	71.4	1	14.3	1	14.3	7	100.0	
Total group	115	57.8	50	25.1	34	17.1	199	100.0	

*Pearson's Chi-square, **Fisher Exact; f = absolute frequency; % = relative frequency.

Table 4. Percentage of more frequent signs and symptoms of temporomandibular dysfunction among students. Caxias-MA, 2016

Signs and symptoms	No		Yes		Total	
	f	%	f	%	f	%
Facial pain	146	73.4	53	26.6	199	100.0
Jaw locking	160	80.4	39	19.6	199	100.0
Crackle when chewing	124	62.3	75	37.7	199	100.0
Noise in the TMJ	137	68.8	62	31.2	199	100.0
Bruxism	165	82.9	34	17.1	199	100.0
Tinnitus	119	59.8	80	40.2	199	100.0
Malocclusion	131	65.8	68	34.2	199	100.0
Headache	78	39.2	121	60.8	199	100.0

TMJ = temporomandibular joint; f = absolute frequency; % = relative frequency.

Table 5. Association of signs and symptoms of temporomandibular dysfunction and depression among students. Caxias-MA, 2016

Depression	Temporomandibular dysfunction									
	Without TMD		Mild		Moderate		Severe		Total		p value
	f	%	f	%	f	%	f	%	f	%	
Normal	53	79.1	42	56.0	13	33.3	7	38.9	115	57.8	<0.001*
Moderate	11	16.4	20	26.7	15	38.5	4	22.2	50	25.1	
Severe	3	4.5	13	17.3	11	28.2	7	38.9	34	17.1	
Total	67	33.7	75	37.7	39	19.6	18	9,0	199	100.0	

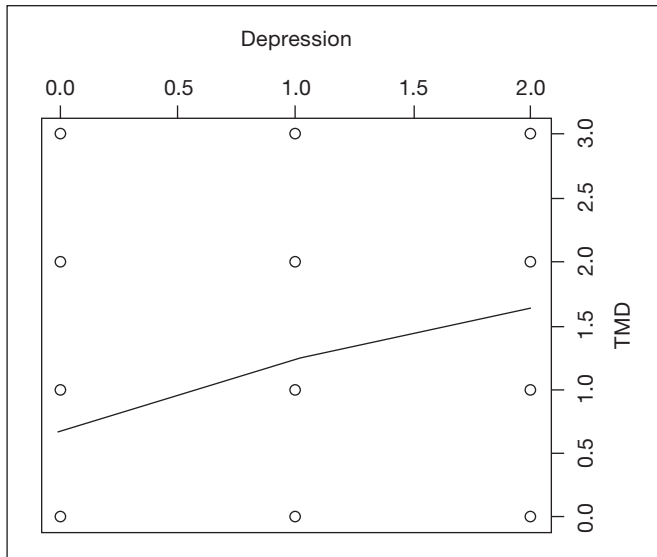* Fisher's Exact; f = absolute frequency; % = relative frequency.

Figure 1. Correlation between signs and symptoms of temporomandibular dysfunction and depression

DISCUSSION

TMD represents a chronic picture for those with this disorder that affects the TMJ motor functions as well as the speech, breathing, swallowing, the quality of life and the social interaction of the individual. That is why it is necessary to have less elaborate evaluation processes, greater applicability covering the main clinical results, enabling its use both in epidemiological or populational studies, as well as a unique instrument to calibrate studies involving samples collections[20]. In this study, we used the IAF and RDC/TMD questionnaires axis II since they are accurate, simple, reliable assessment tools with high reproducibility for the diagnosis of TMD.

Since it is a simple questionnaire, IAF favors its use in epidemiological and populational studies, presenting high accuracy since it has been previously tested in patients with TMD and demonstrated a correlation of 95% with the Helkimo clinical index[14]. We decided to use this index in this study because it is a tool of quick and easy application, and because the subjects were not looking for TMD treatment; therefore, the original intention was just to track the signs and symptoms of this disorder in college students. In addition, several Brazilian and international studies have been using the IAF to classify patients as to TMD signs and symptoms[3,4,7-9,14,15,20-27].

We noticed that most of the students participating in this study were female, showing that currently, the number of women attending universities is bigger than men. This is due to the increasing role women are playing in society and the labor market, creating a greater demand for their qualification which can be obtained through higher education.

According to the results, we noticed that the number of students with TMD signs and symptoms is substantial (66.3%), consistent with the results found in the studies of Goyatá et al.[4], that present a prevalence of TMD signs and symptoms in 63.9% of the evaluated students. Bezerra et al.[21] found a prev-

alence of 62.5%, Barbosa and Swerts[22], a prevalence of 66% of TMD signs and symptoms in Dentistry students, and Dantas[23], a prevalence of 64.4%. Lower results of TMD signs and symptoms were found in several studies conducted in other countries, with prevalence varying from 15 to 57.7%[6,9,14,15,24-26]. Other authors found a higher prevalence among the students evaluated in their respective studies, varying from 74.9 to 92.3%[7,8,10,12,27,28].

These differences in relation to the present study can be attributed to the use of different TMD diagnostic methods, gender distribution and differences in the sample, where the origin and cultural, economic and food habits are considered. Some authors have evaluated students of Eastern and European origin, and others evaluated only male students since it is scientifically proven that the prevalence of TMD is higher in women.

College students are potential candidates for the onset of TMJ alterations, leading to disorders that affect this joint, since during their studying period they develop parafunctional habits, such as to support the jaw on the hand, bruxism, clenching, chewing gum, biting the lips, onychophagia and to biting objects[20,22,28,29], due to discharge of the nervous tensions on the masticatory muscles and, consequently muscle hyperactivity that in turn can be triggered by emotional alterations such as depression and stress[11,14], requiring more elaborate and specific investigation in order to scientifically determine the influence that depression exerts in the onset and/or worsening of TMD. Due to this overload on the masticatory muscles triggered by the adoption of harmful parafunctional habits, this group is more prone to have TMD of muscular origin than articular origin.

Parafunctional habits trigger isometric muscle contraction, inhibition of normal blood flow to muscle tissue, increase of carbon dioxide and metabolic waste in muscle tissue, culminating in fatigue, spasms, and pain. As a result, the parafunctional habits are more likely to cause changes in the muscular system and the TMJ, since the structures of the masticatory system stand a certain amount of force generated by the hyperactivity, and, after this level, tissue collapse may occur[20].

In relation to the degrees of severity, mild TMD was the most frequent (37.7%), followed by moderate (19.6%) and severe (9%), which corroborates previous studies carried out with university students that found a higher frequency of the mild degree of TMD signs and symptoms[4,9,10,14,21,24-26,28]. In this study, although it was observed a higher prevalence of TMD signs and symptoms among university students between ages of 21 to 24 years, the degree of impairment that can be a possible indication for treatment (moderate and severe degrees), were more frequent among students over 31 years old, proving that TMD worsens with age, which has been already described in the literature[10,28].

Corroborating other studies[12,14,15,20-22,24,26,28], it was observed that women are more affected by the TMD symptoms than men, with a prevalence of 70.2% showing the symptoms of the dysfunction versus 55.2% of men, however, no statistically significant difference between genders was observed

(p=0,078). Other studies have found a higher prevalence of TMD in men[6,9].

According to Martins et al.[30] women tend to have retropositioned mandibular condyles when compared with men, which probably predisposes them to anterior disc displacements. For Medeiros, Batista and Forte[28], this higher prevalence in females must be because women look for treatment more frequently, meaning that they are more careful and attentive to health than men. Minghelli, Kiselova and Pereira[24] claim that women are more susceptible to TMD due to the influence of physiological characteristics, hormonal variations and the structures of the connective tissue and muscle, and since a greater laxity of these tissues is related to estrogen levels, it explains the fact that these tissues have less capacity to support functional pressure, leading to TMD. Wahid et al.[8] argue that women have more TMD due to greater mental stress.

In the distribution of the TMD degree in relation to gender, it was perceived that both in females and males, the mild degree was more frequent than the other degrees, with a prevalence of 39.7 and 31.3% respectively, being these results in accordance with other studies[18,24,26,28]. Bezerra et al.[21], Barbosa and Swerts[22] and Al Moaleem et al.[9] have also found a higher prevalence of mild TMD symptoms in both genders. However, unlike the results found in this study, and in most studies available in the literature, this prevalence was higher in men compared to women (51.7, 46.3 and 40.2%, respectively). Because it is a young population, a higher incidence of TMD is accepted since the symptoms may worsen with age, and the worsening of TMD etiological factors, such as parafunctional habits and emotional stress.

The prevalence of signs and symptoms of depression among the evaluated college students, in RDC/TMD axis II, was significant (42.2%), what it draws the attention since it is a relatively young population e supposedly with good general health. Other studies have found an equivalent prevalence of symptoms of depression[18,31,32] in 41.1, 43.9 and 41% of college students, respectively. However, most of the studies[13,14,24,33-36] found a prevalence different from this study, with values of 50, 30.5, 18.3, 34.6, 24.2, 54.2 and 51.4, respectively.

The use of the RDC/TMD, axis II, is considered a trustworthy and valid indicator to track the symptoms of depression, somatization and psychosocial dysfunction related to pain. Even not providing a psychiatric diagnosis, it gives initial scientific support to validate the clinical decision-making based on evidence, referring these patients to a psychological evaluation and interventions in the psychosocial barriers to minimize TMD[17,37]. Also, axis II has been used in several clinical and epidemiological studies to describe high levels of depression and somatization, as well as the high prevalence of pain-related disability in social activities in patients with TMD[12,18,34,35,37]. However, some authors warn that the use of axis II should be used with caution because it presents high sensitivity (87%), but lower specificity (53%) in identifying patients with depression (comparing low scores with moderate/severe depression). This can generate false positive diagnoses, where serious levels of somatization may mistake the interpretation of the clinical

examination[17,38]. In order to solve these problems, a new RDC/TMD is being elaborated to evaluate the psychological factors and their relationship with the TMD diagnosis[38].

When distributed by the degree of depression symptoms, we noticed that more than the half (57.9%) of the college students presented normal conditions. When analyzing the presence of depression symptom, it was observed that most of the affected students presented a moderate degree (25.1%), and 17.1% presented severe signs and symptoms. In previous studies, it was also proved that the degree of depression most present among the evaluated students was the moderate degree, and the majority had normal psychological conditions, for the presence of significant sign and symptoms of depression[13,31,33,36]. However, it should be noted that in this study, the presence of severe symptoms was more significant compared to the studies mentioned.

When comparing the presence of symptoms of depression in both genders, the prevalence in women is higher (45%), while in men it is 33.3%, however, despite the numerical difference, there was no significant statistical difference between genders (p=0.278). The results obtained in this study, as well as in others[14,18,24,31,36], showed that women are more susceptible to depression, showing the need to investigate the causes for this higher prevalence of symptoms in women.

When classifying the degree of symptoms of depression by gender, it was observed that both women and men had a higher prevalence of the moderate degree (25.8 and 22.9%, respectively), which was also observed in the studies of Toledo, Capote and Campos[18] (17.8% for women and 16.1% for men) and Iqbal, Gupta and Venkatarao[36] (22.7% for women and 11% for men).

The higher prevalence of symptoms of depression in women can be explained by the fact that women report depressive symptoms more frequently than men and present a higher index of psychosomatic diseases[24,36]. Justo and Calil[39] explain that changes in levels of estrogen in women affect mood and cognition, working not only in the hypothalamus but also in the hippocampus and cerebellum, leaving women more vulnerable to depression. Other factors such as sexual abuse in childhood, double workday, conflicts in social and family relationships, lower educational level and motherhood may contribute to the high prevalence of depression in women.

We noticed that the symptom of depression was more present in college students with ages between 31 and 36 years (57.2%), in both the moderate and severe degrees. This can be explained by the fact that this is the most productive phase of the individual, period when the person is more exposed to stressing factors due to the demand of the professional routine. However, this affirmation requires more specific studies to provide a scientifically proven conclusion. For Jadoon et al.[31], depression can lead to negative results, including school truancy, reduced capacity to work efficiently, deterioration of relationships, exhaustion, increased suicidal tendency and existing problems, which is part of the health care.

Healthcare professionals tend to present higher indexes of mental problems, especially depression, which usually appears in graduation years and impacts the academic performance as

well as the increase in the risk of other diseases, as TMD[21]. This can probably be explained by the high level of mental pressure and demand in obtaining high academic results and, consequently, fear to fail in their professional life, since they are daily dealing with human lives.

The signs and symptoms of TMD most reported are headaches (60.8%), tinnitus (40.2%), crackle when chewing (37.7%), malocclusion (34.2%) and noise in the TMJ (31.2%). The least reported was the presence of pain or fatigue when waking up, with a prevalence of 14.1%. Headache was also the most reported symptom in some studies[15,24], with a prevalence of 20 and 31.6%, respectively. In other studies[21,29,30], the pain in the back of the head or neck was more prevalent, with 47.3, 93 and 38%, respectively. Goyatá et al.[4] and Toledo, Capote and Campos[18] identified bruxism as the sign of TMD more present among the interviewed (41.2 and 23.2%, respectively), yet Habib et al.[25] found a higher frequency of malocclusion (23.2%). The possible relationship between TMD and headache can be attributed to the fact that headaches are related to muscle activity. Therefore, activities involving the head and the neck probably play an important role in the etiology of this condition[24].

In this study, we found a significant statistical association (p<0.001) and positive correlation (r=0.38; p<0.001) between the presence of TMD signs and symptoms and the presence of depression symptoms. More than half of the students (54.5%) showed symptoms of both conditions, which leads to suggest that the psychological factors, especially depression, influence the clinical conditions of TMD, as described in the literature. These results are supported by the studies of Toledo, Capote, and Campos[18], who found that 53.3% of the interviewed college students showed signs and symptoms of TMD and depression and Nery[32], who found a prevalence of signs and symptoms of depression in 52% of individuals with signs and symptoms of TMD. Minghelli, Morgado and Caro[14] and Minghelli, Kiselova and Pereira[24] found a lower prevalence of signs and symptoms of depression in students who also had TMD symptoms, 44 and 30.7%, respectively. Another study found a higher prevalence of signs and symptoms of both diseases (64%)[35].

Orhbach et al.[17] report that psychiatric disorders as depression and generalized anxiety, as well as psychological disorders, are common in patients who look for treatment of TMD chronic pain and they can interfere with the response to the treatment. In many patients, there is a cycle where the TMD generates emotional disorders that increase the symptoms of the TMD, and the opposite is also true, that is, the emotional disorder generates TMD and this, in turn, aggravates the emotional distress. However, it is still unclear whether the emotional disorders, in chronic conditions, are the trigger of TMD, or if it is the worsening of TMD that leads to the onset of emotional disorders, especially depression[40].

The importance of the results of this study reassures that for the TMD treatment to be effective it is necessary a psychological follow-up of these patients with emotional alterations because only by treating the root cause it will be possible to have satisfactory results in the treatment of functional changes caused by TMD.

CONCLUSION

The results of this study showed a high prevalence of TMD signs and symptoms in college students, similar to other studies in the literature. Among them, women and those in the younger age group showed a higher prevalence of symptoms of this dysfunction.

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