

# PSYCHOLOGICAL FACTORS RELATED TO TEMPOROMANDIBULAR DISORDERS: AN EVALUATION OF STUDENTS PREPARING FOR COLLEGE ENTRANCE EXAMINATIONS

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## ABSTRACT

The aim of this study was to research how stress and anxiety affected the development of temporomandibular disorders (TMD) in 55 high school graduates at two different times: six months before and one the week before their college entrance examinations. The American Academy of Orofacial Pain (AAOP) Questionnaire, Lipp's Stress for Adults Inventory (ISSL) and the Beck Anxiety Inventory (BAI) were used to evaluate TMD, stress and anxiety, respectively. The data were submitted to Pearson's and Spearman's correlation tests. At first the results showed higher positive correlation between anxiety and TMD than between stress and TMD. Out of the total participants, 36% had TMD, and of these, only 12.7% had no psychological disorder.

One week before the tests there were high positive correlations between TMD and the psychological factors studied, and 50.9% of the students had TMD, of which only 9% had no psychological disorder. The most prevalent signs of TMD symptomatology were joint sounds and headache, followed by neck pain. It was concluded that students preparing to take college entrance examinations are a potential risk group for developing TMD due to psychological factors generating anxiety and stress. Anxiety becomes more significant as the semester progresses, and both anxiety and stress increase as the examination dates approach.

*Key words:* Temporomandibular Joint Disorders; emotional aspects; anxiety.

## FACTORES PSICOLÓGICOS RELACIONADOS A LOS DESÓRDENES TEMPOROMANDIBULARES: EVALUACIÓN DE ESTUDIANTES PRE-UNIVERSARIOS

### RESUMEN

Este estudio tuvo como objetivo investigar la participación del estrés y la ansiedad en el desarrollo de los desórdenes temporomandibulares (DTM) en 55 alumnos en etapa pre-universitaria en dos momentos distintos: seis meses y una semana antes de las pruebas de admisión universitaria. Fueron utilizados el Cuestionario de la American Academy of Orofacial Pain (AAOP), el Inventario de Stress para Adultos de LIPP (ISSL) y el BAI (Beck Anxiety Inventory), para la evaluación de la DTM, estrés y ansiedad, respectivamente. Los datos fueron sometidos a correlaciones de Pearson y Spearman. Los resultados mostraron en un primer momento correlaciones positivas mayores entre la ansiedad y la DTM cuando fueron comparadas al estrés. Del total, 36% fueron portadores de DTM y de éstos sólo el 12,7% no presentaron alteraciones psíquicas. Una semana antes de las

pruebas se observaron mayores correlaciones positivas entre la DTM y los factores psíquicos estudiados, notando que el 50,9% de los estudiantes fueron portadores de DTM y de éstos sólo el 9% no presentaron desórdenes psicológicos. En cuanto a la sintomatología de DTM, el signo de mayor prevalencia fue el ruido articular y el síntoma fue la cefalea, seguida de dolores cervicales. Se concluye que los estudiantes durante la etapa de examen de ingreso universitario, se presentan como un grupo de riesgo potencial para el desarrollo de las DTM debidas a los factores psicológicos generadores de ansiedad y estrés. La ansiedad se presenta de forma más significativa con el correr del tiempo y ambos aumentaron con la proximidad de las pruebas.

*Palabras clave:* Trastornos de la Articulación Temporomandibular; aspectos emocionales; ansiedad.

### INTRODUCTION

Temporomandibular disorder (TMD) is a global term that includes alterations of the temporomandibular joint (TMJ) and associated structures<sup>1</sup>, including face and neck muscles<sup>1,2</sup>. TMD affects a large part of the population<sup>1</sup>, and people usually lack information on its significance and treatment<sup>3,4</sup>.

The literature describes greatly varying prevalence of symptoms (6-93%) and clinical signs (0-93%), probably as a result of the diverging clinical criteria used in the studies<sup>4</sup>. There is facial discomfort, pain in the temporomandibular joint, tenderness to facial and joint palpation, uncoordinated jaw movements and joint sounds<sup>5</sup>. Epidemiologically, males are

affected by pain in the temporal region, followed by joint sounds, while females show predominance of joint sounds followed by pain in the temporal region<sup>6</sup>. The prevalence of TMD in children is low, increasing among teenagers and young adults, declining again after the forties, and rare in older adults<sup>7</sup>.

TMD etiology is clearly multifactorial and not based on a few isolated factors. Factors have thus been divided into three groups: anatomical (including occlusion and joint disorders), neuromuscular and psychological. If two or three of these factors are present, there is increased risk of developing TMD<sup>8</sup>.

In a review about TMD, Poveda-Roda et al.<sup>4</sup> considered the following potential risk factors: a) age: older adults may have a greater number of clinical and radiological signs, but fewer symptoms than adults, and even fewer than 12- to 18-year-olds, who represent 7% of TMD cases; b) sex: females are markedly more affected due to hormonal and emotional factors; c) occlusal factors: it is reported that there is no clear relationship, although there are known correlations with disharmonies between Centric Relation (CR) and Maximum Habitual Intercuspatation (MHI) and unilateral crossbite, among others; d) local or systemic joint hypermobility; e) parafunctional habits and bruxism. In addition, these authors study the relationships between stress and myofascial pain, noting that genetic factors and disorders related to orthodontic treatment were not proven to be potential risk factors for TMD<sup>9</sup>. It was also observed that maximum manifestations of pain and discomfort coincide with moments of everyday tension, agitation and stress<sup>10,11</sup>, which generate muscular hyperactivity, the principal cause of the onset of TMD<sup>12</sup>.

Penna and Gil<sup>13</sup> reported that emotional tension and continuous stress can often be expressed by the individual through bodily discomfort such as muscular tension and pain, and that this tension may show through parafunctional habits, teeth clenching, etc. Psychological disturbance may thus lead to an increase in bodily tension, triggering or worsening painful TMD-related symptomatology. This would explain the presence of TMD signs and symptoms in people who are continually subject to tension, anxiety and stress.

In 2006, Penna and Gil<sup>13</sup> used the craniomandibular index (CMI) to show the influence of psycho-

somatic factors on signs and symptoms of craniomandibular dysfunction, specifically observing the generalized anxiety disorder, which was shown to have a great influence on the TMD etiology and even pain potentiation, which usually took place with an increase in muscle tension.

Maia, Vasconcelos and Silva<sup>12</sup> studied the influence of stress on the development of TMD in 215 subjects. Prevalence of TMD symptomatology was almost 60%, of which 81% reported being under emotional stress, which is thus shown to influence the onset of TMD.

Martins et al.<sup>14</sup> studied the association between stress and TMD according to economic class in 354 subjects, finding a significant correlation between stress and TMD; however economic class was not found to affect the occurrence of TMD. Kanehira et al.<sup>15</sup> studied the relationship between TMD symptomatology and stress by studying the presence of stress in 3225 subjects together with muscle tiredness, joint sounds, pain, teeth clenching during the day and bruxism at night. A significant correlation was found between stress and joint sounds, muscle tiredness, pain and the parafunction. It was thus recognized that stress has a great influence on the development of TMD, and can exacerbate its signs and symptoms. Manfredi et al.<sup>16</sup> evaluated TMD sufferers and found that 90.9% of them had some degree of stress.

According to the World Health Organization (WHO), stress is a global epidemic caused by the demands and pressures of society, work, school, family and other factors such as physiological or psychological difficulties, responsibilities and duties, and may be worsened by factors such as individual adaptation vulnerability<sup>17</sup>. This emotional tension is often assumed and expressed by the subject through bodily discomfort such as muscle pain, and shown by the presence of parafunctional habits and teeth clenching<sup>14</sup>. Studies show that the participation of emotional factors in TMD development are related to alterations of the sympathetic nervous system (SNS)<sup>18,19</sup>. Correlations between stress and TMD involve organic and brain alterations (hypothalamus, pituitary, adrenergic, serotonergic and opioid), alterations in the transmission systems and perception of pain cyclically and continuously, so that the presence of inadequate responses (e.g. facial pain) may act as stressors, feeding a continuous pain-stress cycle<sup>19</sup>.

Anxiety can also interfere in TMD conditions. It corresponds to a pattern of unconditioned response characterized by the presence of physiological reactions involving flight behavior in reaction to imminent danger<sup>20</sup>. Anxiety disorders affect the whole population and different economic classes, predominantly women and young people over 18 years of age. It may be associated to genetic or environmental factors or life experiences<sup>21</sup>. Its influence on TMD was evaluated, and the results showed considerable influence of generalized anxiety disorder on TMD etiology, potentiating pain primarily due to an increase in muscle tension<sup>13</sup>. Psychological disturbance would thus lead to an increase in body tension, triggering or worsening the painful symptomatology associated to TMD. This would explain the presence of TMD signs and symptoms in individuals constantly exposed to tension, anxiety and stress<sup>13</sup>.

Adolescent students are considered to be a group at risk of developing psychological alterations and have thus been the object of many TMD studies. These psychological alterations often lead to a reduction in learning<sup>22</sup>. Bonjardim et al.<sup>23</sup> evaluated the presence of clinical signs of TMD and its relationship to sex, anxiety, depression and bite force in 217 students (aged 12 to 18 years) attending the public schooling system. The authors noted that the most prevalent subjective symptoms were joint sounds (26.72%) and headache (21.65%) and that TMD symptomatology can be influenced significantly by the presence of anxiety and depression.

In 2007, Marchiori et al.<sup>24</sup> studied the prevalence of TMD signs and symptoms in 304 individuals aged 9 to 15 years and their anxiety levels. They found that most of the sample (64.5%) had TMD signs and symptoms and high levels of anxiety as a state, i.e. "how I feel" (96.7%) and anxiety as a feature "how I usually feel" (63.5%), showing that students are subject to anxiety and its consequences.

In a study of adolescents with TMD and the influence of dental and psycho-social factors, List, Wahlund and Larsson<sup>25</sup> analyzed 63 patients of both sexes aged 12 to 18 years, and compared them to 64 patients without TMD. They found no difference in occlusal factors, although regarding psycho-social factors, patients with TMD had higher levels of stress, somatic ailments and aggressive behavior than the control group. It was concluded that psycho-social factors have a greater influence on adolescent TMD than occlusal factors do.

Rosenblatt et al.<sup>26</sup> studied the prevalence of joint sounds and myofascial pain in adolescents aged 16 and 17 years, finding a significant prevalence of myofascial pain and joint sounds, which should be considered as a priority for public healthcare. The authors suggest that studies should be performed to determine the factors associated to these disturbances, such as stress, depression and iatrogenesis caused by treatments, among others.

In a study on adolescents in Saudi Arabia, Feteih<sup>27</sup> analyzed the presence of TMD signs and symptoms and parafunctional habits in 358 adolescents aged 12 to 16 years. The results show that the most prevalent sign was joint sounds, and the most prevalent symptom was headache. Among the most common parafunctional habits were lip, cheek and nail biting.

### **Students preparing for college admission examinations as susceptible to TMD**

A student preparing for a college examination is entering a world of challenges. Adolescence is in itself a period of turbulence<sup>28</sup> during which young people undergo identity-building changes and situations. This is all the more true for those who wish to pursue an academic degree and face an entrance examination which they perceive as an obstacle. The student takes on a commitment with the aim of succeeding as a professional in the future, and knows that he/she is about to take a decision that will reflect upon the rest of his/her life<sup>28</sup>. Choosing a college and preparing for the admission examination is a source of great psychological disturbance during this stage.

Many factors can trigger stress during the admission period<sup>28</sup> and interfere with the student's mental health, increasing tension, reducing memory and speed of reaction, causing irritability and increased errors, which could lead to the onset of psychopathological manifestations.

In a study evaluating stress among 295 young people from different schools using Lipp's Stress Symptoms Inventory for Adults (ISSI), Calais, Andrade and Lipp<sup>29</sup> found higher values in students preparing for their college entrance examination than in students at high school or in their first years of college.

Among the main causes of anxiety are fear of failure and fear of disappointing the family<sup>29</sup>, in addition to having to choose a profession during adolescence, which requires knowledge of the dif-

ferent areas of professional activity, job market, income, routines, etc. Moreover, when family opinion does not match the student's choice, anxiety may increase<sup>30</sup>.

Rocha et al.<sup>31</sup> studied a sample of 791 students to evaluate depressive symptoms at the end of the third year of high school and pre-university education. They found twice as much depressive symptomatology in females, with a significant increase in depression according to academic progress. Psychological evaluation of students was suggested. These students who are subject to the continuous stress, anxiety and tension of the admission period may be potentially at risk for the onset of TMD.

According to Rodrigues and Pelisoli<sup>32</sup>, the universe of adolescents who are preparing for college admission exams does not receive the necessary attention in the scientific literature of Brazil, as shown by the small number of studies performed up to that time. In 2008 a study was performed with the aim of checking the prevalence of anxiety indicators during the admission process. It evaluated 1046 students, average age 18 years. The results showed that 23.5% of them had a moderate to serious level of anxiety. Females were significantly more affected by symptoms. The authors concluded that further studies should be performed on these students in order to direct attention to them, as psychological or even psychiatric treatment is often needed.

The aim of this study is to analyze the participation of stress and anxiety in the development of temporomandibular disorders (TMD) in students during the college admission process throughout the time in which they are preparing for examinations, in order to determine the degree in which admission can act upon the etiology/risk factor of psychological disorders and consequently on temporomandibular disorder.

## MATERIALS AND METHODS

The study was approved by the Research Ethics Committee at the School of Dentistry at the Juiz de Fora Federal University, according to protocol # 436/2007.

This was a longitudinal study, a design often used in health research when the sample is to be followed over a period of time. The sample consisted of 55 volunteer students during their admission period in the city of Juiz de Fora, aged 18 to 25 years, of both sexes, attending the daytime shift, and selected con-

sidering their accessibility (location, willingness to participate, etc.).

Inclusion criteria were: good overall health, graduated from high school and going through pre-university stage (public or private), providing free, duly answered and signed informed consent to the terms, comprehensive participation and seriousness in answering the questionnaires.

Whether or not TMD symptomatology was present was evaluated by means of a questionnaire on orofacial pain and temporomandibular disorders recommended by the American Academy of Facial Pain. According to Manfredi et al.<sup>16</sup>, this questionnaire was useful and viable for pre-evaluation of TMD, mainly for evaluating myogenic disturbances such as muscle hyperactivity. The questionnaire is made up of 10 directed questions with yes/no answers about the most frequent signs and symptoms of orofacial pain and TMD. TMD is considered to be present when there are four or more "yes" answers

Lipp's Inventory of Stress Symptoms for Adults (ISSL)<sup>33</sup> was used to analyze concomitant presence of emotional stress in the students. The inventory identifies stress in populations as from 15 years of age, evaluating the presence of stress, type of somatic or psychological symptoms and state.

In addition to stress, the presence of anxiety was evaluated using the *Beck Anxiety Inventory* (BAI)<sup>34</sup> form created in 1993 by Beck at the Center for Cognitive Therapy (CCT) of the University of Pennsylvania, in Philadelphia, USA, and validated in Brazil by Cunha in 2001<sup>35</sup>. It contains 21 items referring to descriptions of anxiety symptoms, evaluated by the subject with reference to himself/herself (self-reporting) revealing increasingly serious levels of each symptom. According to Cunha<sup>35</sup>, the BAI has been used in psychiatric and non-psychiatric groups, including students, and has been found to be adequate for the population in general. Regarding the validation, the BAI includes items that are representative of anxiety, avoiding any symptoms shared with conditions of depression. When the BAI was developed, its items were intended to be representative of diagnostic criteria of the DSM III *American Psychiatric Association, (1987)*, for diagnosing anxiety disorders, especially panic and generalized anxiety disorders. Its reliability and validity are highly satisfactory considering the original sample data reported in the Manual. Both were used under the supervision of a psychologist.

The questionnaires were used in two stages:

Stage 1: during the first semester of the 2008 school year (June);

Stage 2: one week before the 2008 admission examinations (December).

The questionnaires were answered in the students' respective pre-admission course classrooms while the researchers were present. After the questionnaires were collected, the data were analyzed and submitted to statistical analysis. Descriptive analysis and Pearson and Spearman's correlations were performed for both stages of the study. Data were analyzed quantitatively and qualitatively according to questionnaire content.

## RESULTS

The results showed that of the 55 students analyzed in June, 58.2% had stress, of which 81.25% were in the resistance stage and 18.75% in the quasi-exhaustion stage (Fig. 1), while 41.8% suffered anxiety, which was mild in 86.95% and moderate in 13.05% (Fig. 2).

In June, TMD had a higher correlation to anxiety (0.35) than to stress (0.18). Of the 55 students, 36.4% showed that they were potential carriers of the disorder - 65% of them were anxious and 70% were stressed.

The week before the admission examination (December), 65.45% of the students were stressed, of which 72.2% were in resistance phase and 27.7% in quasi-exhaustion phase (Fig. 3), while 43.63% suffered some degree of anxiety, which was mild in 50%, moderate in 45.8% and serious in 4.16% (Fig. 4).

The week before the examinations, 50.9% of the students were potential TMD carriers, of whom 100% had stress, all with some degree of anxiety. There was a higher correlation between anxiety and TMD (0.44) than between stress and TMD (0.39). There was also a significant increase in anxiety and stress levels, which was determining in the group of TMD carriers.

Average predominance of temporomandibular disorder was 40% among students heading for their college admission examinations at both times.

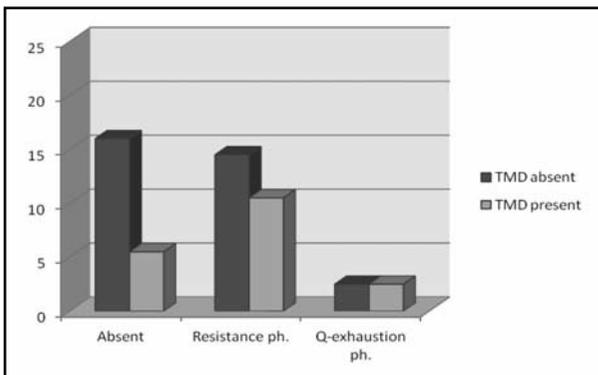


Fig. 1: Stress and temporomandibular disorder in June.

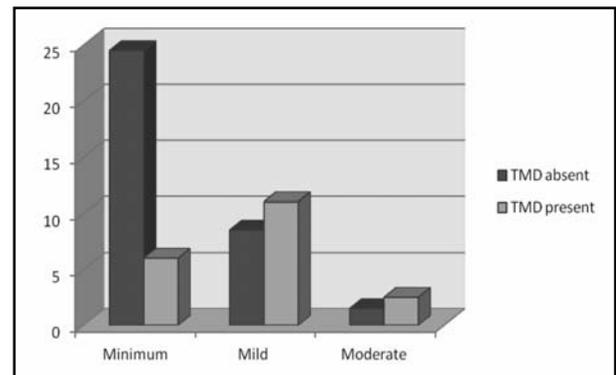


Fig. 2: Anxiety and temporomandibular disorder in June.

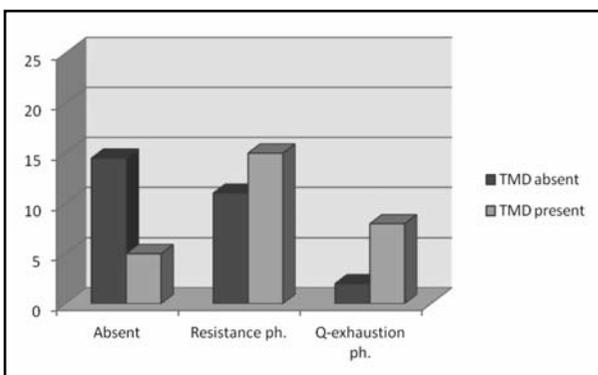


Fig. 3: Stress and temporomandibular disorder in December.

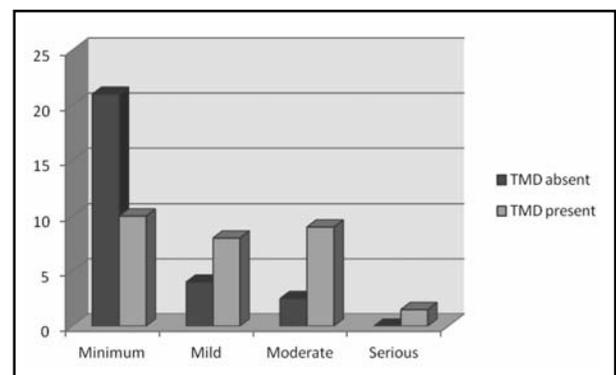


Fig. 4: Anxiety and temporomandibular disorder in December.

Regarding signs, in June there was predominance of joint sounds (80%), and the symptom having greatest prevalence was headache (50%). The number of carriers increased as the examination date approached. Joint sounds were found in 90% and headache and pain in teeth and neck in 52% (Fig. 5). Psychological factors appeared as potential risk factors when this symptomatology worsened.

## DISCUSSION

The onset of TMD has been attributed to occlusal and joint alterations, and neuromuscular and psychological factors, with the presence of two or three of these factors increasing the risk of developing TMD<sup>8</sup>. The results show that at both times in the study, psychological factors, stress and anxiety are correlated with TMD. In June, the correlation with anxiety was 0.35 and the correlation with stress was 0.18. Of the 36.4% of TMD carriers, 65% were anxious and 70% were stressed. In December, the correlation between anxiety and TMD increased to 0.44 and the correlation between stress and TMD increased to 0.39. Moreover of the 50.9% of TMD carriers, all had stress and some degree of anxiety, in agreement with the study by Manfredi et al.<sup>16</sup> describing some degree of stress with some degree of anxiety. It reported some degree of stress in 90.9% of TMD carriers. Poveda-Roda et al.<sup>4</sup> named emotional factors and age as potential risk factors for TMD. The study by Maia, Vasconcelos and Silva<sup>12</sup> showed that of the 60% of TMD carriers, 81% reported being under emotional stress, which are remarkably high values, as in our study (Figs. 2 and 4). Similar results were reported by Kanehira et al.<sup>15</sup>, who found that stress was significantly correlated to joint sounds, muscle tiredness and pain, highlighting that these emotional factors participate in TMD etiology, and may also exacerbate signs and symptoms. List, Wahlund and Larsson<sup>25</sup> studied adolescent TMD carriers and also found that they had higher levels of psychological alteration than non-carriers, adding that in adolescents, the psycho-social factor has the greatest relevance in the onset of DMT. Regarding the correlation between psychological factors such as anxiety<sup>13</sup> and myofascial pain, the peak of pain and discomfort manifestation matches times of everyday

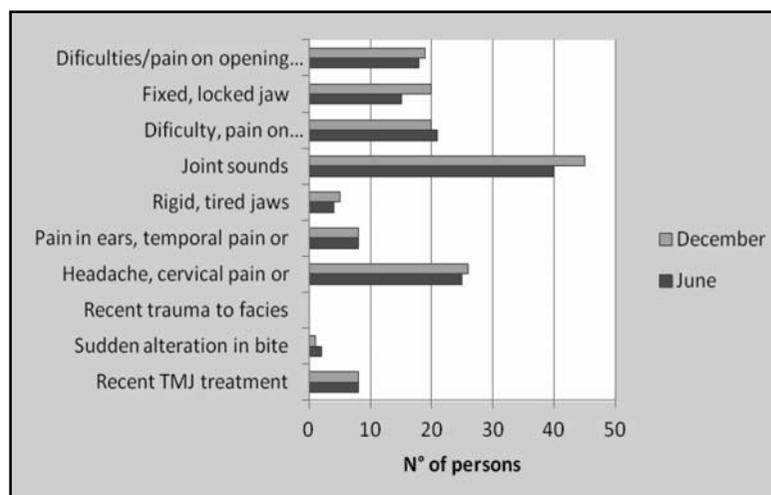


Fig. 5: Anxiety and temporomandibular disorder in June.

tension, agitation and stress<sup>10,11,13</sup>, which generate muscle hyperactivity and may be the primary cause, acting as TMD<sup>12,14</sup> potentiators<sup>13</sup>. The participation of emotional factors in the onset of TMD is related to alterations involving the sympathetic nervous system (SNS)<sup>18,19</sup>, alterations in the transmission and perception of pain cyclically and continuously, so that inadequate adaptive responses (facial pain, for example) can act as stressors, feeding a continuous pain-stress cycle<sup>19</sup>. This tension can often be somatized and expressed by the individual through bodily manifestations such as muscle pain and is shown by the presence of parafunctional habits and teeth clenching<sup>14</sup>.

TMD symptomatology in students was marked by the predominance of joint sounds (80%) and the most prevalent symptoms were headache and neck or tooth pain (50%), which increased in prevalence as the examination date approached for 90% of joint sounds and 52% of headache, neck or tooth pain. Complaints are usually about facial pain, pain in the temporomandibular joint, tenderness to palpation, uncoordinated jaw movements, joint sounds<sup>5,6</sup> and pain in the temporal region<sup>6</sup>. Bonjardim et al.<sup>23</sup> observed that the most prevalent subjective symptoms were joint sounds (26.72%) and headache (21.65%), as was found in this study (Fig 5). The same was reported by Feteih<sup>27</sup> for adolescents in Saudi Arabia and by Rosenblatt et al.,<sup>26</sup> who found significant prevalence of myofascial pain and joint sounds in adolescents, with psychological components as potential risk factors for the worsening this symptomatology.

Stress is a global epidemic arising from the demands and pressures of society, work, school and family, in addition to other factors such as physiological and psychological difficulties, responsibilities and duties, and may be worsened by factors such as individual adaptation vulnerability<sup>17</sup>. They were markedly high in the students evaluated. Of the 55 students studied in June, 58.2% had stress, of which 81.25% were in resistance phase and 18.75% were in quasi-exhaustion phase (Fig. 1). Stress increased as the semester progressed, and in the week before the examination (December), 65.45% of the students were stressed, of which 72.2% were in the resistance phase and 27.7% in the quasi-exhaustion phase (Fig. 3). Calais, Andrade and Lipp<sup>33</sup> found 83% stress levels in students heading for their collage entrance examination, and argued the possibility that the ability to fight stress and anxiety might be an important factor for success at the admission examination. Rocha<sup>31</sup> says that stress triggering factors such as the admission examination may interfere with the student's mental health, increasing tension, reducing memory and speed of reaction, causing irritability, sleepiness, increase in errors and psychopathological manifestations such as TMD, which can be observed during and after the studies through the analysis of data in the questionnaires.

Anxiety corresponds to an unconditioned response pattern, characterized by physiological reactions connected to flight behavior and situations of danger<sup>20</sup>. The results of this study show that in June, 41.8% of the subjects were anxious, of which 86.95% of the cases were mild and 13.05% moderate (Fig. 2). By December, anxiety had increased to 43.63% of students, of which 50% of the cases were mild, 45.8% moderate and 4.16% serious (Fig 4). Rodrigues and Pelisoli<sup>32</sup> evaluated anxiety in students in the college admission phase and found that 23.5% had moderate to serious anxiety, with 43.6% of the cases having a minimum level of anxiety, 32.8% mild, 17.7% moderate and 5.8% serious. These values are considered high, like the ones found in our study, due to students in university admission stage being exposed to similar anxiety generating factors. A possible explanation for these values is the influence of anxiety generating

factors such as fear of failure and of disappointing the family<sup>29</sup>, the choice of a profession that must already be made during adolescence and which demands knowledge of various fields of professional activity, job market, income, routines, etc. When family opinion does not agree with the student's choice, it could make the condition more serious<sup>30</sup>.

The period prior to the admission examination may generate severe psychological alterations in students, as shown in this study, because the examination is viewed as an obstacle for someone wishing to attain a university academic degree, in addition to the fact that adolescence is a period of turbulence<sup>28</sup> during which the person undergoes changes and knows that he/she must take a decision that can change the course of his/her life<sup>28</sup>. All of this is a major source of psychological disturbance during this stage.

A few scientific studies have analyzed students, in particular, students undergoing the college admission phase<sup>19,23,31</sup>, but as the universe of these adolescents in Brazil does not receive the necessary attention, it is difficult to research. Further studies involving the students are needed in order to learn what their demands are and to establish measures that may improve the pathological conditions that appear due to the pressure of the admission examination.

## CONCLUSION

The conclusions of this study are:

During the college admission period, students should be observed for the onset of psychological alterations, because they undergo high stress levels throughout the year, which may increase as the examination dates approach.

The admission examination was found to be an anxiety producing factor for the students, as anxiety was significantly present throughout the year, increasing as the examination dates approached.

The students heading for their college admission examination were shown to be a group potentially at risk for developing TMD as a consequence of the factors studied, primarily when anxiety is significant in both stages. Students also showed prevalence of joint sounds and headache.

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