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CLINICAL PROFILE OF UNDERGRADUATE STUDENTS WITH SEVERE TEMPOROMANDIBULAR DISORDER: A CASE STUDY

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ABSTRACT

Objectives: To describe the clinical characteristics of undergraduate students with severe TMD.
Methods: Study case, descriptive, with a convenience sample of 30 students of the Faculty of Sciences and Technology of Maranhão, classified as severe temporomandibular disorder through the Fonseca's Anamnesic Index; after the clinical examination (Axis I) of the Research Diagnostic Criteria for Temporomandibular Disorderswas used. Data were analyzed using the Shapiro-Wilk test and the Spearman correlation test considering a significance when $p<0,05$.
Results: 60% of the students presented pain on both sides of the face, 50% presented uncorrected right lateral deviation, the average of incisal overbite was ±1,6mm, the average of midline deviation was ±1,4mm, 50% of the students presented click on the right side during mouth opening. Positive correlation and statistically significant ($p<0,05$) was observed for the presence of pain on palpation of the masticatory muscles and adjacent structures. Also strong positive correlation between the perception of difficulty to open the mouth and the mouth opening ($r=0,76$; $p<0,001$).
Conclusion: The results of this study show that undergraduate students with severe TMD have significant limitation of the range of the mandibular motion, accompanied by pain in the masticatory muscles and adjacent structures.

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INTRODUCTION

In 1934, the dentist James Bray Costen described for the first time the temporomandibular disorder, which reported that occlusal alterations, especially vertical protrusive occlusion and loss of molar teeth, cause characteristic symptoms such as hearing loss, tinnitus, vertigo, headache and trismus (PovedaRoda *et al.,* 2007). The term temporomandibular disorder, or just TMD, refers not only to problems related to the temporomandibular joints (TMJ), but also includes all alterations in the masticatory system, with clinical and painful manifestations involving the masticatory muscles, temporomandibular joints (TMJ) and adjacent structures (Plesh *et al.,* 2011; Concórdia *et al.,* 2014; Lemos *et al.,* 2015). Factors such as trauma in the jaw or TMJ, malocclusion, dental losses, alterations in masticatory muscles, microtraumas caused by continuous parafunctional habits, rheumatic conditions, psychological disorders and postural abnormalities may be related to the development of TMD (Biasotto-Gozalez *et al.,* 2008; Jerjes *et al.,* 2008; Saddu *et al.,* 2015; Habib *et al.,* 2015). Epidemiological studies show that TMD has a prevalence between 20 and 60% in the general population and those with TMD, 25% need treatment, however, its incidence in the population has been increasing considerably, mainly in women, with a ratio of 5: 1 in relation to men, and in greater number the middle-aged women, predominantly between 21

and 40 years old. Between 15 and 30 years, the most frequent causes are those of muscular origin and, from the age of 40, of joint origin (Maluf *et al.,* 2008; Kinote *et al.,* 2011; Parente and Cerdeira, 2013; Mor*et al.,* 2015; Rodrigues *et al.,* 2015; Habib *et al.,* 2015). Often the undergraduate students have been reported withthis condition, however, they are without diagnosis due to lack of knowledge of this dysfunction. Among thes subjects it is estimated that 41.3% to 68.6% have some sign or symptom of TMD (Carrara*et al.,* 2010). However, most of studieswith the academic public are, from the epidemiological perspective, carried out through indexes, not presenting clinical parameters that can show the clinical behavior of this dysfunction among undergraduate students, especially severe temporomandibulardisorder, which can be highly disabling and interfere in the process of learning of these students (Machado *et al.,* 2010). Since the number of students in universities has increased significantly in recent years, the incidence of temporomandibular disorder in this population group also increases. In this perspective, this study has a positive scientific and social impact, aiming to provide relevant and truthful information to undergraduate students and health professionals, so that an effective multidisciplinary intervention and preventive measures can be developed. Based on the above, the objective of this study was to describe the clinical characteristics of undergraduate students with severe temporomandibular disorder.

MATERIALS AND METHODS

This is a study case, descriptive carried out from February to August 2015 at the Faculty of Sciences and Technology of Maranhão - FACEMA, in the city of Caxias - MA. Thirty undergraduate students classified as severe TMD participated of this study. The inclusion criteria were students of the Faculty of Sciences and Technology of Maranhão, aged between 18 and 45 years. Students in orthodontic treatment, who reported acute periodontal disease (acute problems), students taking anti-inflammatories (except paracetamol), anxiolytics, anticonvulsants and/or opioid analgesics, and those with some type of systemic disease or psychological disorders that could cause difficulties in the clinical examination were excluded. To describe the severity of TMD among students, the Fonseca Anamnestic Index (FAI) was used, because it is a Brazilian instrument developed in the Portuguese language that evaluates the severity of TMD, presenting high accuracy. It consists of 10 questions with the possibility of three answers: "yes", which equals 10 points; "Sometimes", equivalent to 5 points; and "no", whose score is zero. The questions verified the presence of pain in the temporomandibular joint and in the neck, chewing, headache, movement difficulties, noises, parafunctional habits (tightening and grinding of teeth), perception of malocclusion and feelings of emotional stress. Through the sum of the points, the Index can classify participants into categories of symptom severity, such as No DTM (0 to 15 points), Mild DTM (20 to 40 points), Moderate DTM (45 to 65 points) and Severe DTM (70 to 100 points).

Those one classified by the FAI as having severe TMD were subsequently evaluated using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). It is a method of clinical diagnosis, already validated and used in research that has two axes, a physical and a psychosocial partner. Axis I counts provide clinical diagnosis, while Axis II counts provide an evaluation of temporomandibular function, psychological status, and the level of psychological disability related to TMD (Schiffman *et al.,* 2014). Physical examination included evaluation of mandibular movements, palpation of temporomandibular joint (TMJ) and masticatory muscles, as well as palpation for noise and clicking in TMJ. The data was organized and tabulated in Microsoft Excel version 2016 for Windows and statistical analysis was done using Stata® software version 14.0 for Windows. In the statistical analysis, a descriptive analysis of all variables was performed. Numerical variables were represented by mean and standard deviation (mean±SD) or medians and quartiles, while the categorical variables were by absolute frequency (N) and relative frequency (%). To verify the normality of the data, the Shapiro Wilk test was used and the correlation of the variables was used to evaluate the correlation of the Spearman correlation test, being considered weak correlation (0.26-0.49), moderate correlation (0.50- 0.69), strong correlation (0.70-0.89) and very strong correlation (0.9 -1) (MUNRO, 2001). A significance of 5% ($p < 0.05$) was considered for all the study analyzes. The research respected the ethical aspects that involve the studies of this nature backed in the resolution 466/2012 of the National Health Council, which establishes the health research norms. This research was approved by the Research Ethics Committee of the University Hospital of the Federal University of Maranhão/HU/UFMA, through CAAE: 42793015.5.0000.5086. The agreement of the subjects of the research to participate in the interview depended on their free choice and was obtained through the signing of a Free and Informed Consent Term.

RESULTS

The sample consisted of 30 students classified as severe TMD, aged between 20 and 38 years, with a median age of 22.5 (Q1 21; Q3 26) years being 7 males (23.3%) and 23 (76.7%) females, distributed among the undergraduate courses of the Faculty of Sciences and Technology of Maranhão - FACEMA. The application of Fonseca's Anamnestic Index resulted in 60% of the students reporting difficulties in opening their mouth, 50% had difficulty to move their jaws to the sides, 73.3% reported fatigue or muscle pain when chewing, 93.3% feel headaches and 83.3% feel pain in the neck or torticollis. When asked about joint noises, 90% reported noises during mastication, opening or closing of the mouth, and 70% reported having TMJ pain or earaches. More than half (66.7%) said they had parafunctional, as well as 63.3% said their teeth did not articulate well. Of those interviewed, 56.7% considered themselves nervous people, according to the data in Table 1. About the presence of pain in the face, 18 (60%) students presented pain on both sides, while only 01 (3.3%) did not report any type of pain. Regarding the mouth opening pattern, it was verified that 15 (50%) students had uncorrected right lateral deviation pattern. In the evaluation of the presence of articular noises during mouth opening, 15 (50%) students had a click on the right side, but they did not have noises on the left side, as shown in Table 2. Regarding the extension of mouth movements and excursions, the mean and standard deviation values are shown in Table 3. In the palpation of the temporal, masseter and submandibular muscles, a moderate and statistically significant positive correlation was observed between the right and left middle temporal muscle ($r=0.65$; $p<0.001$). We also observed a weak positive correlation between the right and left anterior temporal muscle ($r=0.44$; $p=0.02$).

Table 1. Numerical distribution and percentage of responses to Fonseca's Anamnestic Index. (N=30)

Questions	Responses							
	No		Sometimes		Yes		Total	
	N	%	N	%	N	%	N	%
Do you have difficulty opening your mouth wide?	03	10,0	09	30,0	18	60,0	30	100,0
Do you have difficulty moving your jaw to the sides?	03	10,0	12	40,0	15	50,0	30	100,0
Are you tired/achy when you chew?	01	3,3	07	23,3	22	73,3	30	100,0
Do you often have headaches?	01	3,3	01	3,3	28	93,3	30	100,0
Do you feel pain in the neck or torticollis?	01	3,3	04	13,3	25	83,3	30	100,0
Do you have pain in the ear or in the temporomandibular joints?	03	10,0	06	20,0	21	70,0	30	100,0
Have you ever noticed if you have TMJ noises when you chew or when you open your mouth?	01	3,3	02	6,7	27	90,0	30	100,0
Have you ever noticed if you have a habit like squeezing or grinding your teeth?	04	3,3	06	20	20	66,7	30	100,0
Do you feel that your teeth do not articulate well?	3	10	8	26,7	19	63,3	30	100
Do you consider yourself a tense (nervous) person?	6	20	7	23,3	17	56,7	30	100

Legend: TMJ: temporomandibular joint.

Table 2. Numerical distribution and percentage of the evaluation of the presence of face pain, pattern of mouth opening and presence of articular noises in the temporomandibular joint. (N=30)

Variables	N	%
Face pain		
None	01	3,3
Rightside	04	13,3
Leftside	07	23,4
Both	18	60,0
Openingmouthpattern		
Right lateral deviation (uncorrected)	15	50,0
Correctedright lateral deviation (*S*)	04	13,3
Left lateral deviation (uncorrected)	06	20,0
Correctedleft lateral deviation (*S*)	05	16,7
Joint noises (Rightside)		
None	13	43,3
Click	15	50,0
Coarsecrackling	-	-
Sharp crackling	02	6,7
Joint noises (Leftside)		
None	15	50,0
Click	11	36,7
Coarsecrackling	01	3,33
Sharp crackling	03	10,0
Total	30	100,0

Table 3. Values related to the evaluation of vertical movement extension, excursions, vertical incisal trespass and middle line deviation. (N=30)

Variables	Mean	SD
Range of the vertical motion		
Opening without aid	±31,9	±8,3
Maximum opening without aid	±39,8	±8,7
Maximum opening with aid	±44,2	±9,0
Excursions		
Right lateral excursion	±8,4	±3,2
Left lateral excursion	±7,2	±3,4
Protusion	±3,8	±2,3
Vertical incisal trespass	±1,6	±1,3
Middle line deviation	±1,4	±1,2

Legend: Obs: observations; SD: standard deviation

Table 4. Presence of muscle and joint pain during palpation (N=30)

Painlocation	Intensidade da dor										
	Onlypression (withoutpain)		Mildpain		Moderatepain		Severepain		Total		*P*
	N	%	N	%	N	%	N	%	N	%	
Posterior temporal (R)	21	70,0	07	23,3	02	6,7	-	-	30	100,0	0,722
Posterior temporal (L)	22	73,4	06	20,0	01	3,3	01	3,3	30	100,0	
Middle temporal(R)	15	50,0	07	23,3	05	16,7	03	10,0	30	100,0	<0,001*
Middle temporal (L)	15	50,0	09	30,0	05	16,7	01	3,3	30	100,0	
Anterior temporal (R)	10	33,3	10	33,3	04	13,4	06	20,0	30	100,0	0,02**
Anterior temporal (L)	6	20,0	14	46,6	05	16,7	05	16,7	30	100,0	
Superior masseter (R)	12	40,0	07	23,3	07	23,3	04	13,4	30	100,0	<0,001*
Superior masseter (L)	09	30,0	04	13,3	11	36,7	06	20,0	30	100,0	
Middle masseter (R)	08	26,7	07	23,3	09	30,0	06	20,0	30	100,0	<0,001*
Middle masseter (L)	05	16,7	04	13,3	10	33,3	11	36,7	30	100,0	
Inferior masseter (R)	07	23,3	09	30,0	06	20,0	08	26,7	30	100,0	<0,001*
Inferior masseter (L)	09	30,0	06	20,0	06	20,0	09	30,0	30	100,0	
Submandibular (R)	09	30,0	04	13,3	09	30,0	08	26,7	30	100,0	<0,001*
Submandibular (L)	05	16,7	07	23,3	12	40,0	06	20,0	30	100,0	
Lateral pole (R)	05	16,7	08	26,7	10	33,3	07	23,3	30	100,0	<0,001*
Lateral pole (L)	02	6,7	10	33,3	09	30,0	09	30,0	30	100,0	
Posterior ligament(R)	09	30,0	10	33,3	08	26,7	03	10,0	30	100,0	<0,001*
Posterior ligament(L)	10	33,3	01	3,3	13	43,4	06	20,0	30	100,0	

Legend: R: right; L: left. **P*<0,01; ***P*<0,05 (Spearman correlation test).

Table 5. Correlation of the frequency of responses to Fonseca's Anamnestic Index (FAI) with signs of clinical evaluation of the Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TDM). (N=30).

Questions						
FAI			RDC/TMD			
Clinicalsigns	Yes		Clinicalsigns	Present		*P*
	N	%		N	%	
Do you have difficulty opening your mouth wide?	18	60,0	Openingmouth<40mmm	24	80,0	<0,001*
Are you tired/achy when you chew?	22	73,3	Pain on palpation of the masticatory musculature	25	83,3	<0,001*
Do you often have headaches?	28	93,3	Pain on palpation of the temporal muscle	22	73,3	0,006**
Do you have pain in the ear or in the temporomandibular joints?	21	70,0	Pai non palpationofthetemporomandibular joint (lateral pole and posterior ligament)	28	93,3	0,080
Have you ever noticed if you have TMJ noises when you chew or when you open your mouth?	27	90,0	Auscultationof joint noises	24	80,0	0,022**

In relation to the masseter muscle, a strong and statistically significant positive correlation was observed between the right and left superior region(r=0.75; p<0.001). In the middle region of the masseter there was a moderate positive correlation (r=0.54; p<0.001) between the right and left sides, as well as a moderate positive correlation between the right and left lower region (r=0.63; p<0.001). In the submandibular region there was a moderate positive correlation between the right and left sides (r=0.68, p<0.001). It was found that there was a moderate positive correlation between the right and left lateral poles (r=0.54; p<0.001). There was also a moderate positive correlation between the right and left posterior ligaments (r=0.54; p<0.001). Table 4 shows the values referring to the evaluation of the presence of muscle and joint pain on palpation. Table 5 shows the correlation between the reports of TMD signs and symptoms through FAI and the clinical evaluation of RDC/TDM showing a strong positive correlation between the difficulty to open the mouth and the range ofthe mouth opening (r=0.76; p<0.001) and a weak positive correlation between muscle fatigue and pain on chewing and palpation of the masticatory muscles (r=0.26; p<0.001). For the other reports, there was no correlation.

DISCUSSION

Severe temporomandibulardisorder represents the most chronic degree for the patient with this disorder, affecting not only the normal functions of this joint, but also the quality of life and social interaction. For this reason, researchers have been looking for less elaborate evaluation processes, more applicable and that cover the main clinical findings, allowing their use in epidemiological or population studies, as well as a unique tool in the calibration of research involving sample collections. In this study, the Fonseca Anamnestic Index and the clinical examination of the RDC/TMD were used, as they are accurate, simple, reliable and highly reproducible instruments for the diagnosis of TMD. Severe TMD, despite having a lower prevalence among undergraduate students and the general population, is a serious condition that affects the individuals' quality of life, requiring more attention and a deeper and more specific investigation of the determining factors and functional limitations, in order to elaborate appropriate and effective measures of intervention. Pain is one of the most reported symptoms in individuals diagnosed with severe TMD(Jerjes *et al.,* 2008; Machado *et al.,* 2010; Habib *et al.,* 2015; Mor*et al.,* 2015; Rodrigues *et al.,* 2015), being this symptom found in 60% of the students evaluated in this study, who reported feeling it on both sides of the face. All the students had some type of deviation during the oral opening, the most common pattern being uncorrected right lateral deviation, being the uncorrected right lateral deviation the most found, with a prevalence of 50%. Macedo and Bianchini (2014) verified myofunctionalorofacial characteristics in 85 young adults aged 19 to 39 years with complaints of orofacial pain in the city of Niterói - RJ and observed that 25% of them had uncorrected right lateral deviation during mouth opening, the most prevalent among the types of deviations evaluated by the researchers. According to Figueiredo *et al*. (2009), mandibular deviation during mouth opening may be due to pathological changes, joint inflammation, muscular hyperactivity and lack of occlusal guides. Regarding the range of the mouthmotion it was observed that the students had movement limitation, even for maximum opening with aid (44.2mm), because according to Hamazaki *et al*. (2002), the indexes of normality for maximum mouth opening vary between 45mm and 60mm. Other studies in Croatia (Celic*et al.,* 2004), Greece (Kitsoulis *et al.,* 2011), Santa Maria - RS (Pasinato *et al.,* 2011) and Natal - RN (Andrade *et al.,* 2016) observed similar values in individuals with severe TMD, with averages of 47.9mm, 44.4mm, 45.9mm and 42.6mm, respectively. On the other hand, Gomes *et al*. (2014), when evaluated 92 undergraduate students with TMD in the city of São Paulo through the IAF, found maximum mouth opening with a mean of 51.40mm among participants classified as severe TMD. Macedo and Bianchini (2014) also found a maximum passive mouth opening range of 54.6mm. Alves *et al*. (2010) report that pain can be determinant in the reduction of range of the mouth opening and the closing velocity of mandibular movements during speech, as well as the internal disorders of the TMJ or the disorders in the masticatory musculature, that interfere and restrict the mandibular function, and generate limitation of the movements of the jaw, thus hindering the activities of daily life, as the acts of speaking and feeding.

For theexcursion and mouth protrusionmovements, a significant movement limitation was also observed, with mean values of 8.4mm for right lateral excursion, 7.2mm for left lateral excursion and 3.8mm for mouth protusion, corroborating the study by Gomes *et al*. (2014), who found values of 8.09mm for right excursion, 8,55mm for left excursion and 3,50mm for protrusion. Pasinato *et al*. (2011), in a clinical and experimental study carried out in the city of Santa Maria - RS, evaluated 34 women aged 18-35 years, diagnosed with TMD by RDC/TMD, and verified values of range of the mouth higher than the present study (8.89mm for right lateral excursion, 8.58mm for left lateral excursion and 4.81mm for protrusion). The mandibular movement variables for the laterality range presented lower values in the studies of Celic*et al*. (2004) and Macedo and Bianchini (2014), however, curiously, the protrusion measurements were superior compared to the present study (4.87mm and 5.9mm,

respectively). In the evaluation of vertical incisal trespass, there was an average of 1.6mm among the evaluated students, lower than that found by Cruzet a. (2009), who evaluated 103 subjects in Minas Gerais through RDC/TMD, divided into two groups: case (n=51), with TMD, and control (n=52), without TMD, and verified a mean vertical incisal trespass of 2.5mm in the case group, being a serious condition for the authors, leading the jaw to a retruded position and predisposes the onset of TMD signs and symptoms. The mean value of the mean line deviation was 1.4mm during the usual maximum intercuspation, similar to the 1.3mm found in the study by He *et al*. (2010) who investigated the relationship between the centric-maximum intercuspidation (CR-MI) discrepancy and temporomandibular joint disorder in 107 pre-treated Chinese orthodontic patients. According to these same authors, when the centric relation (CR) interferences are present during the mouth closing, the inferior lateral pterygoid muscle, which remains passive when the maximal intercuspidation (MI) is in harmony, contracts non-psychologically to pull the condyle out of CR to achieve MI. The elevator muscles are, therefore, thought to be hyper activated and the balance between the elevator and the depressor muscles is broken, leading to masticatory muscle spasms and pain. Thus, if occlusal interferences are not removed, chronic hyperactivity of the muscles will lead to articular disc derangement, and forward displacement, which causes TMJ retreat and further progression will result in intracapsular disorders, osteoarthritis and even condylar resorption. For Celic*et al*. (2004), the evaluation of mandibular patterns is recommended as diagnostic criteria for all classifications of temporomandibular disorders, since these disorders are characterized by restrictions, deviations and limitations of these patterns, including range of the motion, frontal deflections, limited lateral extrusion, etc.

Concerning the presence of articular noises during mouth opening, it was verified that most of the evaluated ones (50%) presented clicks when performing the movement, mainly in the right side. Superior findings of presence of joint noises were found by Machado *et al*. (2010), with a prevalence of 70% in a study with 20 undergraduate students of Speech Therapy with average age of 22 years. These data raise the hypothesis of greater joint erosion in this population. Joint sounds are considered the most common sign of TMD, and are more frequent and more severe in older populations. Joint noises, such as clicks and crepitation, indicate temporomandibular joint disorder or joint disc displacements (Barbosa and Barbosa, 2009). In this study, we can observe a correlation between right and left temporalis muscles and right and left masseter, indicating that the myofascial processes involving the biomechanics of the temporomandibular joint may evolve to the contralateral involvement of this joint. Similar findings were found in the studies by Tosato *et al*. (2015), who investigated the association between electromyographic findings of the anterior temporalis and masseter with salivary cortisol in 49 women aged between 18-40 years and found hyperactivity and correlation with the release of cortisol in these muscles.

Some authors believe that the temporal muscle assumes the additional function of jaw elevation as a way to compensate for loss of strength of the masseter muscle, being a compensatory mechanism to minimize pain in a motor response in individuals with TMD (Tosato *et al.,* 2015;Caria*et al.,* 2009). As to palpation of the temporal, masseter, submandibular muscles, lateral poles and posterior ligaments, there was a greater presence and severity of pain on the left side of the face, unlike the pattern of mouth opening, with a higher frequency of lateral deviation right. It is assumed that this is due to the fact that an anterior exacerbated displacement of the condyle and greater stretching and consequent tension of the muscles of the left side to perform the movement of the mouth deviation to the right side, therefore there are higher pain indices in the structures located in the left side of the face, but there are no references in the literature that scientifically prove this hypothesis. When correlating some clinical variables obtained through the clinical examination of the RDC/TDM with the answers of the items of the FAI, a strong correlation was observed only in the perception of the difficulty to open the mouth. Few studies have established physical aspects and severity of TMD (Gomes *et al.,* 2014). Still citing the authors' study, they did not find a correlation between the severity of TMD and the range of the mouth motion, different from that found in this study. This work presented some limitations that may interfere in its results, such as the number of subjects and the bias during the application of the Fonseca Anamnestic Index. Therefore, it is recommended to perform more research with patients with severe temporomandibular disorder.

Conclusion

The findings of this study show that undergraduate students diagnosed with severe TMD have a significant limitation of the range of the mandibular motion, such as opening, excursion (laterality) and protrusion, accompanied by pain in the masticatory muscles and adjacent structures. There was also a greater frequency and intensity of pain in palpation of the muscles and structures of the left side of the face; in contrast, larger numbers of undergraduate students with right lateral deviation were found, which confirms a significant relationship between the two sides of the face. The positive correlation between the muscles and structures on both sides of the face proved that the as greater the pain on one side, greater the pain on the opposite side, and the relationship is directly proportional. However, there was little correlation between the clinical signs evaluated by the RDC/TMD and the Fonseca's Anmnesic Index. In this sense, more research is suggested to observe the relationship between severity classified according to Fonseca's Anamnestic Index and the clinical signs of TMD.

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