

# Association between symptoms of temporomandibular disorders and gender, morphological occlusion, and psychological factors in a group of university students

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## ABSTRACT

**Aim:** The purpose of this study was to find out the prevalence of temporomandibular disorder (TMD) in a sample of university students and its relationship to gender, occlusion, and psychological factors.

**Materials and Methods:** The sample comprised 196 subjects, aged 18-25 years. The TMD degree was evaluated using an anamnestic questionnaire. Morphologic occlusion was evaluated according to Angle classification (classes I, II, and III). The Hospital Anxiety and Depression Scale (HADS), a 14-item self-administered rating scale developed specifically to identify anxiety and depression in nonpsychiatric medical outpatients, was used to assess the levels of anxiety (HADSa) and depression (HADSd).

**Statistical Analysis:** The incidence of TMD level, malocclusion, anxiety, and depression in both genders was calculated as percentages. Association between TMD degree and occlusion, HADSa, and HADSd was tested using the Chi-square test.

**Results:** According to our results, 50% of the subjects had TMD, but it was of moderate or severe degree in only 9.18% of them. No statistically significant association could be found between TMD and gender or occlusion. TMD was found to have statistically significant association with HADSa but not with HADSd.

**Conclusion:** A high prevalence of TMD was found in this student population; however, most of the cases could be classified as mild. Of the variables studied, only HADSa had a statistically significant association with TMD.

**Key words:** Anxiety, depression, gender, occlusion, temporomandibular disorder

Received : 29-11-06  
Review completed : 20-04-07  
Accepted : 26-07-07

DOI: 10.4103/0970-9290.52901

Temporomandibular disorder (TMD) is a term used to describe a number of related disorders involving the temporomandibular joints (TMJ), masticatory muscles, and occlusion and having some symptoms in common, such as pain, restricted movement, muscle tenderness, and intermittent joint sounds.<sup>[1]</sup> Approximately 60-70% of the general population will have at least one of the signs of TMD at some stage in their lives; however, only about 5% actually seek treatment.<sup>[2]</sup>

TMD is the most common cause of orofacial pain of non-dental origin.<sup>[3]</sup> Its etiology is multifactorial and still poorly understood.<sup>[1]</sup> A variety of possible etiological factors have been studied, such as occlusion,<sup>[4-8]</sup> depression, stress, and anxiety.<sup>[9-14]</sup> The importance of psychological factors in the etiology of TMD has usually been emphasized;<sup>[15,16]</sup> they are believed to predispose the individual to chronicity.<sup>[17]</sup>

Although TMD may occur at any age, patients most commonly present in early adulthood.<sup>[18]</sup> The role of gender in TMD has also been extensively discussed in the literature. TMD is considered to be 1.5-2 times more prevalent in women than in men and 80% of patients treated for this disorder are women.<sup>[19]</sup> The gender difference was most prominent in the 20-40 years age-group and was lowest in children, adolescents, and the elderly.<sup>[20]</sup>

The purpose of this study was to find out the prevalence of TMD in a sample of university students and its association with gender, morphologic occlusion, and selected psychological factors.

## MATERIALS AND METHODS

### Subjects

A sample of 196 young adults (101 girls and 95 boys), with age ranging from 18 to 25 years, was randomly selected from among the student population of Tiradentes University,

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Aracaju-SE, Brazil. The Ethics Committee of Tiradentes University approved the conduct of this research.

### Anamnestic questionnaire

The presence and severity of TMD was determined using a self-administered anamnestic questionnaire composed of 10 questions regarding common TMD symptoms. The number and frequency of positive responses were used to categorize the subjects into different groups according to severity of symptoms. The symptoms were transposed into a severity classification according to the number and frequency of positive responses. This questionnaire is a modified version of Helkimo's anamnestic index and has been previously used by Fonseca *et al.*<sup>[21]</sup> and Conti *et al.*<sup>[22]</sup> it has demonstrated a high efficiency in obtaining a diagnosis and is easy to apply. The scoring system was as follows: A score of '0' indicated the absence of symptoms; a score of '1' was given for a report of an occasional occurrence, a score of '2' was given for each response indicating the presence of dysfunction, and a score of '3' indicated severe pain or bilateral symptoms. (According Conti *et al.*, the score of '3' could only be given for questions 4, 6, and 7 of the anamnestic questionnaire; the questions are given below.)<sup>[22]</sup> The sum of the scores was used to group the subjects into four categories as follows: Score 0-3: TMD free; score 4-8: Mild TMD; score 9-14: Moderate TMD; and score 15-23: Severe TMD.

The ten questions in the questionnaire were as follows:

1. Do you have difficulty in opening your mouth?
2. Do you have difficulty in moving or using your jaw?
3. Do you have tenderness or muscular pain when chewing?
4. Do you have frequent headaches?
5. Do you have neck aches or shoulder pain?
6. Do you have pain in or about the ears?
7. Are you aware of noises in the jaw joints?
8. Do you consider your bite 'normal'?
9. Do you use only one side of your mouth when chewing?
10. Do you have morning facial pain?

### Occlusal examination

Morphologic occlusion was evaluated according to Angle classification (molar classes I, II, and III).

### Hospital anxiety and depression scale

The level of anxiety and depression was self-rated using the Hospital Anxiety and Depression Scale (HADS). HADS consists of seven items for depression (HADSd) and seven items for anxiety (HADSa). The scale was first used in a study by Zigmond and Snaith,<sup>[23]</sup> and a Portuguese version has since been validated by Botega *et al.*<sup>[24]</sup> The main characteristic of HADS is that items covering somatic symptoms of anxiety and depression have been eliminated. By defining cutoff values,

the HADS subscales give an indication of the severity of the mental disorder: 0-7 = normal; 8-10 = mild; 11-14 = moderate; and 15-21 = severe disorder.<sup>[23]</sup> HADS has been extensively tested and has well-established psychometric properties.<sup>[25]</sup>

### Statistical analysis

Data were computerized and the SAS package (version 8.2; SAS Institute) was used for analysis. The percentages of subjects with TMD (of different grades of severity), malocclusion, anxiety, and depression in both genders were calculated. Association between TMD degree and occlusion, HADSa, and HADSd was tested using the Chi-square test. The significance level was set at  $P < 0.05$ .

## RESULTS

The results obtained from the anamnesis index showed that the percentage of women (57.42%) with some degree of TMD was higher than men (42.11%), but this difference was not statistically significant ( $P = 0.226$ ).

Only 9.18% of the total sample presented moderate to severe levels of TMD [Table 1]. The majority of the subjects who had moderate or severe levels of TMD exhibited class I occlusion [Table 2]. Moreover, independently of molar class, 49.74% of the total sample had no TMD symptoms according to the questionnaire. No significant association between malocclusion and TMD levels was found ( $P = 0.112$ ).

The association between TMD levels and anxiety or depression is shown in [Tables 3 and 4], respectively. The majority of the participants had no evidence of either anxiety (65.81%) or depression (95.39%) symptoms according to HADS. TMD level was shown to be significantly related to HADSa ( $P = 0.0001$ ) but not to HADSd ( $P = 0.0935$ ).

**Table 1: Distribution of the university students according to gender and TMD degree (n = 196)**

TMD degree	Men		Women		Total	
	n	(%)	n	(%)	n	(%)
Free of TMD	55	57.89	43	42.57	98	50
Mild	33	34.74	47	46.53	80	40.82
Moderate	6	6.32	8	7.92	14	7.14
Severe	1	1.05	3	2.98	4	2.04

Chi square value = 5.026;  $P = 0.226$

**Table 2: Distribution of the university students according to molar class angle classification and TMD degree (n = 193)**

Molar class	TMD degree							
	Free of TMD		Mild		Moderate		Severe	
	n	(%)	n	(%)	n	(%)	n	(%)
I	57	29.53	37	19.16	11	5.70	1	0.52
II	13	6.74	21	10.88	2	1.04	1	0.52
III	26	13.47	21	10.88	1	0.52	2	1.04
Total	96	49.74	79	40.92	14	7.26	4	2.08

Chi square value = 10.325;  $P = 0.112$

**Table 3: Distribution of the university students according to association between TMD degree and anxiety level (HADSa) (n = 196)**

TMD degree	Anxiety level							
	Free of anxiety		Mild		Moderate		Severe	
	n	(%)	n	(%)	n	(%)	n	(%)
TMD free	74	37.75	21	10.71	3	1.53	0	0
Mild	47	23.98	16	8.16	16	8.16	1	0.52
Moderate	5	2.55	9	4.59	0	0	0	0
Severe	3	1.53	1	0.52	0	0	0	0
Total	129	65.81	47	23.98	19	9.69	1	0.52

Chi square value = 30.674; *P* = 0.0001**Table 4: Distribution of the university students according to association between TMD degree and depression level (HADSd) (n = 196)**

TMD degree	Depression level							
	Free of depression		Mild		Moderate		Severe	
	n	(%)	n	(%)	n	(%)	n	(%)
TMD free	96	48.97	3	1.54	0	0	0	0
Mild	74	37.75	5	2.55	0	0	0	0
Moderate	13	6.63	1	0.52	0	0	0	0
Severe	4	2.04	0	0	0	0	0	0
Total	187	95.39	9	4.61	0	0	0	0

Chi square value = 1.496; *P* = 0.935

## DISCUSSION

In this study, we evaluated the incidence of TMD in university students and its association with gender, occlusion, and psychological factors. The anamnesis index used to measure TMD degree provided a substantial amount of information in a short period of time and was sensitive and useful for identifying the TMD degree in the studied population. The index proved to be a simple tool that could be easily understood by the volunteers, thus reducing the influence, if any, of the investigator on the individuals and their answers.<sup>[26]</sup> The clinically determined prevalence of TMD (which gives the point prevalence) might be lower than that determined by using the questionnaire (which estimates the period prevalence);<sup>[27]</sup> for the purposes of this study we have considered only the period prevalence of TMD. Several studies support the validity of the questionnaire for epidemiological studies on TMD symptoms.<sup>[28-30]</sup>

In this study, 50% of the subjects had some degree of TMD. This value is a bit lower than that reported by Garcia *et al.*<sup>[31]</sup> (61%) and Conti *et al.*<sup>[26]</sup> (68%), both of whom used the same questionnaire to evaluate TMD in university students. Nassif *et al.*<sup>[32]</sup> found that although the prevalence of TMD in young adults was high, the severity of the condition in this age-group was low. Our study corroborates this, as we found that only 9.18% of the subjects presented moderate or severe degree of TMD and, consequently, needed care and treatment. These data lead us to suggest that TMD evaluation

must be discerningly performed in order to identify those who actually could benefit from some intervention.

Table 1 shows that the percentage of women (57.43%) with TMD is higher than that of men (42.11%); however, this difference was not statistically significant. Other studies have also shown higher prevalence of TMD signs and symptoms in females,<sup>[19,33,34]</sup> with the disorder reported as being 3-6 times more common in women than in men.<sup>[35,36]</sup> Our findings are similar to that reported by Widmalm *et al.*<sup>[37]</sup> and Sonmez *et al.*<sup>[38]</sup>

Several studies have demonstrated that the severity of TMD symptoms varies with the age. The least symptoms are reported by children, adolescents, and the elderly.<sup>[39]</sup> In women the symptoms generally increase after puberty, to peak at the reproductive age-group (between 20-40 years).<sup>[20]</sup>

In this study, we found no statistically significant association between morphologic occlusion and TMD degree. Our results agree with that of several studies that have also failed to find strong evidence to support of the theory that occlusion plays a role in the etiology of TMD, particularly as the sole cause or the dominant factor.<sup>[8,40-43]</sup> Gesch *et al.*<sup>[44]</sup> reported a weak association between malocclusion and the functional and clinical parameters of occlusion as well as subjective TMD. Moreover, no particular morphologic or functional occlusal factor became apparent. Gesch *et al.* also reported that the occlusal factors that were found were partly protective for TMD, i.e., subjects with these occlusal parameters (i.e., angle class II malocclusion, deep bite, and anterior crossbite) showed fewer signs and symptoms of TMD.

We found a statistically significant association between TMD degree and HADSa [Table 3] but not between TMD degree and HADSd [Table 4]. These outcomes are in agreement with Bonjardim *et al.*<sup>[14]</sup> Mazzetto<sup>[45]</sup> asserted that anxiety plays an important role in TMD, acting as a predisposing or aggravating factor. Furthermore, anxiety may be an important factor in the perception of pain, with anxious subjects paying more attention to pain and thereby amplifying the perceived intensity. This possibility has been confirmed by other studies,<sup>[46,47]</sup> which indicate that anxiety is related to increased pain reports in clinical settings.

There is currently considerable evidence that psychological factors are important in TMD, which is the most common cause of chronic facial pain. TMD are often associated with somatic and psychological complaints, including fatigue, sleep disturbances, anxiety, and depression.<sup>[13,14]</sup> Thus, considering that stress is associated with psychological disturbances such as anxiety and depression,<sup>[48]</sup> we can say that there appears to be a relationship between stress and degree of TMD in our study.

In conclusion, we found a high prevalence of TMD symptoms in our sample, even though the majority of the cases

were classified as being of mild degree. Although a larger percentage of women than men had some symptoms of TMD, the difference was not statistically significant. Morphologic malocclusion (molar class, Angle's classification) was not associated with the presence of TMD symptoms. On the other hand, anxiety (but not depression) was associated with TMD symptoms. The outcomes suggest the importance of recognizing the merits of psychological screening of young adults with a confirmed diagnosis of TMD.

## ACKNOWLEDGMENTS

We would like to thank CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brazil) for the financial support provided through an institutional studentship.

## REFERENCES

- Dimitroulis G. Temporomandibular disorders: A clinical update. *BMJ* 1998;317:190-4.
- Macfarlane TV, Gray RJ, Kincey J, Worthington HV. Factors associated with the temporomandibular disorder, pain dysfunction syndrome (PDS): Manchester case-control study. *Oral Dis* 2001;7:321-30.
- Irving J, Wood GD, Hackett AF. Does Does temporomandibular disorder pain dysfunction syndrome affect dietary intake? *Dent Update* 1999;26:405-7.
- Egermark-Eriksson I, Ingervall B, Carlsson GE. The dependence of mandibular dysfunction in children on functional and morphologic malocclusion. *Am J Orthod* 1983;83:187-94.
- Lieberman MA, Gazit E, Fuchs C, Lilos P. Mandibular dysfunction in 10-18 year old school children as related to morphological malocclusion. *J Oral Rehabil* 1985;12:209-14.
- Riolo ML, Brandt D, TenHave TR. Associations between occlusal characteristics and signs and symptoms of TMJ dysfunction in children and young adults. *Am J Orthod Dentofacial Orthop* 1987;92:467-77.
- Henrikson T, Ekberg EC, Nilner M. Symptoms and signs of temporomandibular disorders in girls with normal occlusion and Class II malocclusion. *Acta Odontol Scand* 1997;55:229-35.
- De Boever JA, Carlsson GE, Klineberg IJ. Need for occlusal therapy and prosthodontic treatment in the management of temporomandibular disorders: Part I, Occlusal interferences and occlusal adjustment. *J Oral Rehabil* 2000;27:367-79.
- Wexler GB, Steed PA. Psychological factors and temporomandibular outcomes. *Cranio* 1998;16:72-7.
- Yap AU, Tan KB, Hoe JK, Yap RH, Jaffar J. On-line computerized diagnosis of pain-related disability and psychological status of TMD patients: A pilot study. *J Oral Rehabil* 2001;28:78-87.
- Kino K, Sugisaki M, Ishikawa T, Shibuya T, Amagasa T, Miyaoka H. Preliminary psychologic survey of orofacial outpatients: Part 1, Predictors of anxiety or depression. *J Orofac Pain* 2001;15:235-44.
- Sipila K, Veijola J, Jokelainen J, Jarvelin MR, Oikarinen KS, Raustia AM, *et al.* Association between symptoms of temporomandibular disorders and depression: An epidemiological study of the Northern Finland 1966 Birth Cohort. *Cranio* 2001;19:183-7.
- Yap AU, Dworkin SF, Chua EK, List T, Tan KB, Tan HH. Prevalence of temporomandibular disorder subtypes, psychologic distress, and psychosocial dysfunction in Asian patients. *J Orofac Pain* 2003;17:21-8.
- Bonjardim LR, Gavião MB, Pereira LJ, Castelo PM. Anxiety and depression in adolescents and their relationship with signs and symptoms of temporomandibular disorders. *Int J Prosthodont* 2005;18:347-52.
- Kight M, Gatchel RJ, Wesley L. Temporomandibular disorders: Evidence for significant overlap with psychopathology. *Health Psychol* 1999;18:177-82.
- Rollman GB, Gillespie JM. The role of psychosocial factors in temporomandibular disorders. *Curr Rev Pain* 2000;4:71-81.
- Gatchel RJ, Garofalo JP, Ellis E, Holt C. Major psychological disorders in acute and chronic TMD: An initial examination. *J Am Dent Assoc* 1996;127:1365-70.
- Dworkin SF, Huggins KH, LeResche LR, Von Korff M, Howard J, Truelove E, *et al.* Epidemiology of signs and symptoms in temporomandibular disorders: I, Clinical signs in cases and controls. *J Am Dent Assoc* 1990;120:273-81.
- LeResche L. Epidemiology of temporomandibular disorders: Implications for the investigation of etiologic factors. *Crit Rev Oral Biol Med* 1997;8:291-305.
- Meisler JG. Chronic pain conditions in women. *J Womens Health* 1999;8:313-20.
- Fonseca DM. Diagnóstico pela anamnese da disfunção craniomandibular. *Rev Gaúcha Odont* 1994;42:23-8.
- Conti PC, Ferreira PM, Pegoraro LF, Conti JV, Salvador MC. A cross-sectional study of prevalence and etiology of signs and symptoms of temporomandibular disorders in high school and university students. *J Orofac Pain* 1996;10:254-62.
- Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67:361-70.
- Botega NJ, Bio MR, Zomignani MA, Garcia C Jr, Pereira WA. Mood disorders among medical in-patients: A validation study of the hospital anxiety and depression scale HAD. *Rev Saude Publica* 1995;29:355-63.
- Mykletun A, Stordal E, Dahl AA. Hospital Anxiety and Depression (HAD) scale: Factor structure, item analyses and internal consistency in a large population. *Br J Psychiatry* 2001;179:540-4.
- Conti A, Freitas M, Conti P, Henriques J, Janson G. Relationship between signs and symptoms of temporomandibular disorders and orthodontic treatment: A cross-sectional study. *Angle Orthod* 2003;73:411-7.
- Miyake R, Ohkubo R, Takehara J, Morita M. Oral parafunctions and association with symptoms of temporomandibular disorders in Japanese university students. *J Oral Rehabil* 2004;31:518-23.
- Nilner M. Relationships between oral parafunctions and functional disturbances and diseases of the stomatognathic system among children aged 7-14 years. *Acta Odontol Scand* 1983;41:167-72.
- Matsuka Y, Itoh S, Minakuchi H, Kuboki T, Yamashita A. Validity of questionnaire for epidemiological studies on symptoms of temporomandibular disorders. *J Jpn Soc TMJ* 1997;9:80-91.
- Gavish A, Halachmi M, Winocur E, Gazit E. Oral habits and their association with signs and symptoms of temporomandibular disorders in adolescent girls. *J Oral Rehabil* 2000;27:22-32.
- Garcia AL, Lacerda NJ, Pereira SLS. Grau de Disfunção da ATM e dos movimentos mandibulares em adultos jovens. *Rev APCD* 1997;51:46.
- Nassif NJ, Al-Salleeh F, Al-Admawi M. The prevalence and treatment needs of symptoms and signs of temporomandibular disorders among Young adult males. *J Oral Rehabil* 2003;30:944-50.
- Barone A, Sbordone L, Ramaglia L. Craniomandibular disorders and orthodontic treatment need in children. *J Oral Rehabil* 1997;24:2-7.
- Kapila S, Xie Y. Targeted induction of collagenase and stromelysin by relaxin in unprimed and beta-estradiol-primed diarthrodial joint fibrocartilaginous cells but not in synoviocytes. *Lab Invest* 1998;78:925-38.
- Biondi M, Picardi A. Temporomandibular joint pain-dysfunction syndrome and bruxism: Etiopathogenesis and treatment from a psychosomatic integrative viewpoint. *Psychother Psychosom* 1993;59:84-98.
- McNeill C. History and evolution of TMD concepts. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:51-60.
- Widmalm SE, Westesson PL, Kim IK, Pereira FJ Jr, Lundh H, Tasaki MM. Temporomandibular joint pathosis related to sex, age, and dentition in autopsy material. *Oral Surg Oral Med Oral Pathol* 1994;78:416-25.
- Sonmez H, Sari S, Oksak Oray G, Camdeviren H. Prevalence of temporomandibular dysfunction in Turkish children with mixed and permanent dentition. *J Oral Rehabil* 2001;28:280-5.
- Kuttila M, Niemi PM, Kuttila S, Alanen P, Le Bell Y. TMD treatment need in relation to age, gender, stress, and diagnostic subgroup. *J Orofac Pain* 1998;12:67-74.
- Liu JK, Tsai, MY. Relationship between morphologic malocclusion and temporomandibular disorders in orthodontic patients prior to treatment. *Funct Orthod* 1997;14:13-6.

41. Kitai N, Takada K, Yasuda Y, Verdonck A, Carels C. Pain and other cardinal TMJ dysfunction symptoms: A longitudinal survey of Japanese female adolescents. *J Oral Rehabil* 1997;24:741-8.
42. Watanabe EK, Yatani H, Kuboki T, Matsuka Y, Terada S, Orsini MG *et al.* The relationship between signs and symptoms of temporomandibular disorders and bilateral occlusal contact patterns during lateral excursions. *J Oral Rehabil* 1998;25:409-15.
43. Pullinger AG, Seligman DA. Quantification and validation of predictive values of occlusal variables in temporomandibular disorders using a multifactorial analysis. *J Prosthet Dent* 2000;83:66-75.
44. Gesch D, Bernhardt O, Kirbschus A. Association of malocclusion and functional occlusion with temporomandibular disorders (TMD) in adults: A systematic review of population-based studies. *Quintessence Int* 2004;35:211-21.
45. Mazzetto MO. Alterações psicossociais em sujeitos com desordens crânio craniomandibulares. *J Bras. Oclusão, ATM & Dor Orofacial* 2001;1:223-43.
46. Marbach JJ, Lennon MC, Dohrenwend BP. Candidate risk factors for temporomandibular pain and dysfunction syndrome: Psychosocial, health behavior, physical illness and injury. *Pain* 1998;34:139-51.
47. Wahlund K, List T, Ohrbach R. The relationship between somatic and emotional stimuli: A comparison between adolescents with temporomandibular disorders (TMD) and a control group. *Eur J Pain* 2005;9:219-27.
48. Gameiro GH, da Silva Andrade A, Nouer DF, Ferraz de Arruda Veiga MC. How may stressful experiences contribute to the development of temporomandibular disorders? *Clin Oral Investig* 2006;10:261-8.

**How to cite this article:** Bonjardim LR, Lopes-Filho RJ, Amado G, Albuquerque Jr RLC, Gonçalves SRJ. Association between symptoms of temporomandibular disorders and gender, morphological occlusion, and psychological factors in a group of university students. *Indian J Dent Res* 2009;20:190-4.

**Source of Support:** CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) Brazil. **Conflict of Interest:** None declared.