

Being a woman influences the development of temporomandibular disorder: cross-sectional study

Ser mulher influencia no desenvolvimento de disfunção temporomandibular: estudo transversal

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ABSTRACT

BACKGROUND AND OBJECTIVES: Although women seem to be more susceptible to pain, there are few studies comparing the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) diagnoses between women and men. Thus, this study aimed to verify the influence of gender on Temporomandibular Disorders (TMD) and their comorbidities in a Brazilian sample.

METHODS: Patients were assessed using the RDC/TMD. Diagnoses were obtained for Axis I (myofascial pain, disc displacement, and other joint conditions) and Axis II (depressive symptoms, chronic pain, somatization, and limitation of mandibular function). Logistic regression models were used to verify whether there is a difference in the prevalence and odds of developing TMD between women and men.

RESULTS: The sample included 310 patients. Women had more myofascial pain and were more likely to develop it (73.04%;

OR: 1.91; IC 95%: 1.08 - 3.39), as well as more joint disorders (54.78%; OR: 2.07; IC 95%: 1.08 - 3.99), in comparison to men. Furthermore, women composed the majority of the sample, more often sought treatment, and had more severe levels of depressive symptoms, somatization of pain, limitation of mandibular function, and myofascial pain.

CONCLUSION: Women have more TMD and are more likely to develop it, and also show more severe levels of depressive symptoms, pain somatization, limited mandibular function, and myofascial pain.

Keywords: Facial pain, Gender characteristics, Temporomandibular joint disorders.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Embora as mulheres pareçam ser mais suscetíveis à dor, há poucos estudos comparando os diagnósticos obtidos por meio do *Research Diagnostic Criteria for Temporomandibular Disorders* (RDC/TMD) entre mulheres e homens. Assim, este estudo teve como objetivo verificar a influência do sexo nas disfunções temporomandibulares (DTM) e suas comorbidades em uma amostra brasileira.

MÉTODOS: Os pacientes foram avaliados por meio do RDC/TMD. Os diagnósticos foram obtidos para o eixo I (dor miofascial, deslocamento de disco e outras condições articulares) e eixo II (sintomas de depressão, dor crônica, somatização e limitação da função mandibular). Modelos de regressão logística foram utilizados para verificar se existe diferença na prevalência e nas chances de desenvolver DTM entre mulheres e homens.

RESULTADOS: A amostra incluiu 310 pacientes. As mulheres apresentaram mais dor miofascial e foram mais propensas a desenvolvê-la (73,04%; OR: 1,91; IC 95%: 1,08 - 3,39), bem como mais distúrbios articulares (54,78%; OR: 2,07; IC 95%: 1,08 - 3,99), em comparação aos homens. Ademais, as mulheres compuseram a maioria da amostra, procuraram tratamento com maior frequência e apresentaram níveis mais graves de sintomas de depressão, somatização da dor, limitação da função mandibular e dor miofascial.

CONCLUSÃO: As mulheres apresentam mais DTM e são mais propensas a desenvolvê-la, bem como apresentam níveis mais graves de sintomas de depressão, somatização da dor, limitação da função mandibular e dor miofascial.

Descritores: Características sexuais, Dor facial, Transtornos da articulação temporomandibular.

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HIGHLIGHTS

- There is a relevant difference regarding prevalence and greater chances of developing TMD between men and women.
- Women have more TMD are more likely to be affected by it, when compared to men.
- Women present more severe levels of depression, somatization of pain, limitation of mandibular function, and myofascial pain.

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INTRODUCTION

Sexual dimorphism can be defined as the differences inherent to each sex regarding organic predispositions. It is what distinguishes one biological sex from the other. The primary sexual characteristics are ovaries, testicles, and related hormones. Secondary sexual characteristics, however, are not directly related to reproduction¹. The manifestation of pain is one example of the disparity between women and men. Women are known to be more susceptible to psychosocial distress, such as depression and emotional stress, which has a role in the onset of chronic orofacial pain².

Temporomandibular Disorder (TMD) is defined as an association of clinical conditions involving the masticatory muscles, the temporomandibular joints (TMJs), and associated structures³, pain being the most frequent symptom⁴. Women report more pain and seek more treatment for TMD^{5,6}. Acute and chronic episodes of this disease are 1.5 to 2 times more prevalent in women than in men during adolescence and the reproductive years⁷. However, older women after childbearing age seem to be more affected by TMJ degeneration⁸. Some authors suggest that the higher prevalence of TMD in women may be associated with biological, genetic, and psychosocial factors⁵.

Animal studies have sought to demonstrate why women are more susceptible to TMD. One study with female baboons showed strong uptake of female hormone, estradiol, on the condyles surface, suggesting that this hormone has a role in the etiopathogenesis of TMD⁹. Other authors also suggest that this hormone might promote degenerative changes in the TMJ by means of an inflammatory cascade, specifically by activating reagents in the acute phase that alter the morphology and physiology of the joint function¹⁰. Psychoneuroimmunology also explains the hypothesis that the nociceptive processing mechanisms of TMD occur differently between women and men. Its molecular mechanism consists in an event linked to gender that causes a person to react with “defective immune responses” and changes in inflammatory cascades. The generated biological changes cause a sexual disparity with serious health consequences¹¹.

On the other hand, a recent study suggested that the appearance of myofascial pain seems to be more related to psychosocial aspects rather than hormonal variations¹². Furthermore, psychological and psychosocial determinants might have an association with physical health. A clinical study that evaluated psychological profiles suggested that female patients with TMD had significantly higher anxiety, stress, and muscle tension levels than the male cohort with similar symptoms¹³. Despite some indications that women are more susceptible to TMD, there is a lack of clinical studies in Brazilian samples. Also, few studies have evaluated the impact of gender in other psychosocial components of the RDC/TMD and which outcomes are known to modify and modulate pain. Thus, this study aimed to investigate the influence of gender on the prevalence of TMD, the chances of developing it, and its comorbidities, in a sample of individuals from southern Brazil. The conceptual hypothesis was that women would be more affected by TMD and would present worse psychosocial aspects.

METHODS

This retrospective, cross-sectional study was approved by the Research Ethics Committee of the Federal University of Santa Maria (protocol number 47289415.0.0000.5346) and followed the STROBE (STRENGTHENING the Reporting of OBSERVATIONAL studies in Epidemiology) guidelines. All participants signed a Free Informed Consent Term (FICT).

The sample was composed of all patients diagnosed with TMD from 2015 to 2019, at the Occlusion Clinic of the Federal University of Santa Maria (UFSM), which constituted a convenience sample. UFSM provides the benchmark for dental appointments in the region of Santa Maria, a city located in the south of Brazil with a population of 271,735 inhabitants, according to the 2022 Brazilian census. The sample included patients between 18 and 60 years of age, and excluded individuals with a history of facial and/or jaw trauma, and those with neuropathic pain such as trigeminal neuralgia.

All patients were evaluated using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)¹⁴. The RDC/TMD is a worldwide validated instrument and is divided into two axes¹⁵. Axis I encompasses three groups of TMD diagnoses: myofascial pain, disc displacement, and other joint conditions. The patient may present more than one diagnosis in Axis I, and this diagnosis may be different for each of the TMJs. On the other hand, Axis II assesses psychosocial conditions and functional impairment such as chronic pain, measured using the Graded Chronic Pain Score (GCPS)¹⁶; limitation of mandibular function, evaluated through question 19; and depression and non-specific physical symptoms, assessed using the Symptom Checklist 90-R (SCL-90-R)¹⁷. Somatization is evaluated based on the presence of non-specific physical symptoms. Both Axes complement each other and aim to offer a complete diagnosis of the patient, considering physical and psychosocial aspects. Trained examiners performed all clinical examinations. Complementary tests, such as panoramic radiography, computed tomography, or magnetic resonance imaging, were requested when necessary to complement clinical diagnosis.

Statistical analyses

Data were analyzed using the STATA 14 (StataCorp. 2014. Stata Statistical Software: Release 14.0. College Station, TX: StataCorp LP). Binomial or Multinomial logistic regression models were used in order to assess the association between gender and binary and polytomous outcomes, respectively. The results were presented with Odds Ratio (OR) and its respective 95% confidence interval (CI). The adjusted models included predictor variables with a p-value ≤ 0.20 in the unadjusted analysis. A significance level of 0.05 was considered in the adjusted model.

RESULTS

From 354 individuals initially assessed, 44 did not meet the eligibility criteria: 23 had a history of trauma, 17 medical records were incomplete, three subjects were diagnosed with trigeminal neuralgia, and one patient was duplicated. Thus, 310 medical

Table 1. Descriptive characteristics of the sample.

Variables	n (%)
Degree of chronic pain	
Without	43 (14.88)
Low disability	186 (64.36)
High disability	60 (20.76)
Degree of depressive symptoms	
Normal	145 (47.54)
Moderate	80 (26.23)
Severe	80 (26.23)
Degree of non-specific physical symptoms	
Normal	138 (45.54)
Moderate	71 (23.43)
Severe	94 (31.02)
Limitation of mandibular function	
≤ 0.16 (1 st tercile)	84 (28.00)
0.16 – 0.58 (2 nd tercile)	151 (50.33)
> 0.58 (3 rd tercile)	65 (21.67)
Myofascial pain	
None	99 (32.35)
Present	207 (67.65)
Disc displacement	
None	203 (66.56)
Present	102 (33.44)
Articular conditions	
None	152 (49.67)
Present	154 (50.33)
Gender	
Male	79 (25.48)
Female	231 (74.52)
Race	
White	257 (83.99)
Non-white	49 (16.01)
Employment	
Yes	156 (51.15)
No	149 (48.85)
Marital Status	
Single	160 (52.29)
Married/Stable Union	116 (37.91)
Divorced/Widower	30 (9.80)
Monthly Income	
Up to 3 minimum wages	131 (51.78)
3 minimum wages or more	122 (48.22)
Schooling	
≤ 8 years	45 (14.75)
> 8 years	260 (85.25)
Age	
≤ 34 years	178 (57.42)
> 34 years	132 (42.58)
Total	310 (100.00)

Values smaller than 310 are due to missing data.

records were included in this study. The majority of patients were female (74.52%), less than 34 years of age (57.42%), single (52.29%), and had completed elementary school (85.25%). Most of them (48.85%) were not working when examined and 51.78% had a monthly family income up to three Brazilian minimum wages (Table 1).

When assessing the diagnosis of axes I and II according to gender, it is observed that women were more affected and had higher severity of the diagnoses (Table 2). In Axis II, women with High Disability chronic pain represented 25.23% of the female group, while in the male group only 7.04% were affected. Moreover, more than 50% of the females had some degree of depressive symptoms or of non-specific physical symptoms. Axis I shows that women had more myofascial pain (73.04%) and joint impairment (54.78%).

Table 3 shows the unadjusted and adjusted analyzes between the outcomes and gender, with men being the reference group. Women were more likely to be affected for the vast majority of conditions studied. Considering the Axis II conditions, the adjusted analysis showed that females are more likely to develop high di-

Table 2. Distribution of the degree of chronic pain, degree of depressive symptoms, degree of non-specific physical symptoms, limitation of mandibular function, myofascial pain, disc displacement, and joint conditions according to gender.

Variables	Male n (%)	Female n (%)
Degree of chronic pain		
Without	19 (26.76)	24 (11.01)
Low disability	47 (66.20)	139 (63.76)
High disability	5 (7.04)	55 (25.23)
Degree of depressive symptoms		
Normal	44 (57.89)	101 (44.10)
Moderate	14 (18.42)	66 (28.82)
Severe	18 (23.68)	62 (27.07)
Degree of non-specific physical symptoms		
Normal	46 (61.33)	92 (40.35)
Moderate	12 (16.00)	59 (25.88)
Severe	17 (22.67)	77 (33.77)
Limitation of mandibular function		
≤ 0.16 (1 st tercile)	37 (50.68)	47 (20.70)
0.16 – 0.58 (2 nd tercile)	30 (41.10)	121 (53.30)
> 0.58 (3 rd tercile)	6 (8.22)	59 (25.99)
Myofascial pain		
None	37 (48.68)	62 (26.96)
Present	39 (51.32)	168 (73.04)
Disc displacement		
None	59 (78.67)	144 (62.61)
Present	16 (21.33)	86 (37.39)
Articular conditions		
None	48 (63.16)	104 (45.22)
Present	28 (36.84)	126 (54.78)

Values smaller than 310 are due to missing data.

Table 3. Unadjusted and adjusted analyses between genders and outcomes (degree of chronic pain, degree of depressive symptoms, degree of non-specific physical symptoms, limitation of mandibular function, myofascial pain, disc displacement, and joint conditions) determined using Binomial Logistic Regression or Multinomial Logistic Regression models.

Variables	OR ^a _{Unadjusted} (CI95%)		OR ^a _{Adjusted} (CI95%)	
	Male	Female	Male	Female
Degree of chronic pain ^b				
Low disability	1	2.34 (1.18 – 4.65)*	1	2.61 (1.12 – 6.06)*
High disability	1	8.71 (2.91 – 26.05)*	1	7.63 (2.04 – 28.52)*
Degree of depressive symptoms ^b				
Moderate	1	2.05 (1.04 – 4.04)*	1	2.56 (1.10 – 5.98)*
Severe	1	1.50 (0.80 – 2.82)	1	1.19 (0.56 – 2.55)
Degree of non-specific physical symptoms ^b				
Moderate	1	2.46 (1.20 – 5.02)*	1	2.74 (1.15 – 6.56)*
Severe	1	2.26 (1.20 – 4.27)*	1	1.74 (0.79 – 3.86)
Limitation of mandibular function ^b				
0.16 – 0.58 (2 nd tercile)	1	3.17 (1.76 – 5.71)*	1	2.90 (1.42 – 5.92)*
> 0.58 (3 rd tercile)	1	7.74 (3.01 – 19.89)*	1	16.42 (3.55 – 75.86)*
Myofascial pain ^c				
With	1	2.57 (1.50 – 4.39)*	1	1.91 (1.08 – 3.39)*
Disc displacement ^c				
With	1	2.20 (1.19 – 4.07)*	1	1.75 (0.92 – 3.32)
Articular conditions ^c				
With	1	2.08 (1.22 – 3.54)*	1	2.07 (1.08 – 3.99)*

^aOR = Odds Ratio; ^b = Multinomial logistic regression; ^c = Binomial logistic regression. *p <0.05. Reference category: Male. Values smaller than 310 are due to missing data.

sability chronic pain (OR: 7.63; 95% CI: 2.04 – 28.52), moderate depressive symptoms (OR: 2.56; 95% CI: 1.10 - 5.98), and some degree of limitation of mandibular function (OR: 16.42; 95% CI: 3.55 – 75.86). As for Axis I, the adjusted analysis showed that women are more likely to develop myofascial pain (OR: 1.91; 95% CI: 1.08 - 3.39) and joint disorders (OR: 2.07; 95% CI: 1.08 – 3.99).

DISCUSSION

Chronic pain is a public health problem and causes personal and social damage. The conceptual hypothesis was accepted, once the findings of this study showed that women have a higher prevalence and show greater chances of developing TMD, regardless of seeking more care. In addition, they suffer more with chronic pain, have more limited mandibular function, and are more affected by symptoms of depression. The female gender represented 74.52% of the sample, which corroborates the studies that found greater demand for treatment by women¹⁸⁻²⁰. Some factors can explain this trend: women are more sensitive to pain and have a higher prevalence of emotional tension, depression, anxiety, and hormonal changes, in addition to showing greater concern for health than men²¹.

Emotional factors are more prevalent in patients with chronic pain, which is associated with central sensitization, which, in turn, is related to the pathophysiology of several types of chronic pain, such as TMD²². Central sensitization is characterized by an increased and prolonged response to harmful stimuli,

known as hyperexcitability, and increased second-order nociceptive neuron receptors, causing a decreased threshold for prolonged neuronal activation and discharge. Clinically, central sensitization can be perceived as an increased and prolonged response to harmful stimuli (hyperalgesia) or pain perception after a non-painful stimulus (allodynia)²³. Women were 7.63 and 2.61 times more likely to develop high and low disability chronic pain, respectively, which is in agreement with the fact that women report chronic pain more frequently than men²⁴.

In the present study, 42.10% of men had some degree of depressive symptoms, while 55.89% of the female group presented this condition (28.82% had moderate and 27.07% had severe depressive symptoms). Also, women were 2.56 and 7.63 times more likely to develop moderate depressive symptoms and chronic pain, respectively. The association between TMD and chronic pain has a strong association with the individual's biopsychosocial status, being anxiety and depression symptoms the main factors involved^{25,26}. Somatization, which is characterized by the physical expression (usually pain) of a psychological condition²⁷, was also more prevalent in women (59.65%), who were 2.74 times more likely to develop it. This expressive number is important, once somatic symptoms are the strongest psychosocial predictor of TMD incidence, according to the OPPERA longitudinal study²⁸. Thus, it is evident that a considerable percentage of patients have depressive symptoms and somatization, and that these symptoms have the potential to exacerbate TMD²⁹.

When symptoms were assessed, 67.65% of the sample presented myofascial pain, with this value rising to 73.04% among

women. The findings of the present study show that women are 1.91 and 2.09 more likely to present myofascial pain and changes in the TMJ, respectively, corroborating a systematic review and meta-analysis that showed a higher prevalence of TMD diagnosis in female patients, and stated women are two times more likely to develop TMD than men³⁰. Furthermore, the limitation of mandibular function was the most expressive result of the study, with female individuals being 16.42 times more likely to develop this alteration.

A study that verified the relationship between TMD, menopause, and puberty, suggests that TMD symptoms could exist in every menstrual cycle, and that they exhibit a more impressive pain presentation than the male TMD cohort⁵. The present study's findings, which corroborate the researched literature, affirm that women have more TMD and, therefore, deserve specialized treatment. However, many studies exclude women and other ethnic minority groups in clinical studies, mainly those involving treatments with drugs³¹.

Other demographic characteristics, such as economic income, may influence TMD^{32,33}. The study sample was composed of 48.85% of unemployed individuals and 51.78% of individuals with a monthly family income below three minimum wages. Evidence shows that higher mortality, morbidity, and disability rates occur in the lower classes³⁴ as well as a tendency for a higher occurrence of depressive symptoms as the age group increases and the education and income levels decrease³⁵.

Even though the patient's main complaint might have given important information regarding the reasons for seeking TMJ assessment, the strengths of the present study include the use of the RDC/TMD for the diagnosis of TMD. The RDC/TMD is an instrument validated and used worldwide, considered the gold standard until the recent implementation of its update, the DC/TMD¹⁸, which was validated in Brazil while this work was already underway. The use of RDC/TMD as a diagnostic tool is a way of concentrating data from a specific population, standardizing them, and making them amenable to comparison with studies carried out in other countries. As a limitation, this study used a convenience sample, collecting data from a center that provides the benchmark treatment for TMD in the region. Thus, future researches using randomized and representative samples of the population are suggested to confirm the findings of the present study.

These outcomes have significant clinical implications. The higher prevalence of TMD, as well as the increased odds for its development observed in women, along with comorbidities (such as depressive symptoms, somatization of pain, and limited mandibular function), highlight the importance of gender-specific considerations in the diagnosis and treatment planning of TMD.

Clinically, health professionals must be aware of women's greater susceptibility to TMD and associated conditions, adapting interventions and therapeutic strategies. Moreover, the identification of women as the majority seeking treatment emphasizes the importance of targeted healthcare initiatives and resources

to cater to this demographic. Overall, this study contributes valuable information that can inform clinicians, researchers, and health policymakers in refining their approaches to TMD management, promoting more effective and personalized interventions for individuals, especially women, affected by these conditions.

CONCLUSION

The results of this study showed that women have more TMD, are more likely to develop this disease, and seek treatment more often. In addition, female patients have more severe levels of depressive symptoms, somatization of pain, limitation of mandibular function, and myofascial pain. Therefore, there is a relevant difference regarding prevalence and greater chances of developing TMD between men and women, in a sample of young subjects of southern Brazil with a relatively low income, and who received only elementary education.

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