

Epidemiology of Severity of Temporomandibular Disorders in Brazilian Women

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Aims: To evaluate the severity of temporomandibular disorders (TMD) of women in the municipality of Araraquara (Brazil) as well as the contribution of the perception of oral health, mandibular functional limitation, and sociodemographic variables on the severity of TMD. **Methods:** The participants were interviewed by telephone. Information regarding age, marital status, economic level, education, and use and type of dental prostheses was surveyed. To evaluate TMD severity, mandibular functional limitation and perception of oral health, Fonseca's Anamnestic Index (IAF), the Mandibular Function Impairment Questionnaire (MFIQ), and the General Oral Health Assessment Index (GOHAI) were used. To evaluate the contribution of these variables on TMD severity, a structural equation model (SEM) was fitted to the data and assessed by usual goodness-of-fit indices. **Results:** A total of 701 women with a mean age of 44.36 years (SD = 16.31) participated. According to the IAF, 59.6% (95% confidence interval = 56.0%–63.2%) of the women were classified as having TMD, of which 63.9% presented light, 26.8% moderate, and 9.3% severe TMD. Mandibular functional limitation was low in 91.0% of the women, moderate in 7.1%, and severe in 1.9%. Goodness-of-fit for the structural model was adequate. The predictors explained 43% of the variation in the TMD severity, with significant contributions of the variables dental prostheses ($\beta = -.008$; $P = .006$), perception of oral health ($\beta = -.43$; $P < .001$), and mandibular functional limitation ($\beta = .014$; $P = .014$). **Conclusion:** The severity of TMD among Brazilian women was greater in non-users of dental prostheses and was also associated with greater mandibular functional limitation and poor perception of oral health. *J Oral Facial Pain Headache* 2014;28:147–152. doi: 10.11607/ofph.1194

Key words: oral health, scales, structural equation modeling, temporomandibular disorders (TMD), women

Temporomandibular disorders (TMD) are a group of conditions that involve the masticatory muscles, the temporomandibular joints, and/or associated structures.¹ These conditions are considered to be a heterogeneous group of health problems related to pain that have an impact on the individual's eating habits and quality of life.²

Epidemiologic studies suggest that the symptoms related to TMD occur predominantly in young adults and females.^{2–5} The higher prevalence among women has been explained by hormonal characteristics, inflammatory responses to stress, and sociocultural behavior in response to pain.⁶ The socioeconomic level and psychosocial characteristics are also associated with the development of TMD and should be considered when conducting epidemiologic surveys.^{7–9}

A variety of etiologic factors and clinical signs and symptoms in patients with TMD have led to the development of several instruments for the screening and diagnosis of this condition. In epidemiologic screening studies, conducted with large samples, the choice of the measuring instrument must be based on its feasibility. Thus, in addition to the metric qualities (reliability and validity) of the instrument, its simplicity, application time, and cost should be considered. With these objectives in mind, some screening tools for TMD have been developed. Among the

most common are the Craniomandibular Index,^{10,11} Mandibular Function Impairment Questionnaire (MFIQ),¹² Fonseca's Anamnesic Index (IAF),¹³ the Questionnaire of the American Academy of Orofacial Pain,¹ and the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD).¹⁴

The RDC/TMD¹⁴ is the most commonly used screening instrument for TMD reported in the literature. However, despite its unquestionable credibility, it has two axes of analysis—one clinical and another psychosocial. Thus, the RDC/TMD requires direct contact with the individuals and a greater application time than other screening instruments.

The IAF and MFIQ are simpler and quicker instruments that assess the severity of TMD and mandibular functional limitation related to TMD, respectively. They are also commonly reported in the specialized literature.^{9,15–17}

Given the importance of oral health surveys to estimate the population's health status and its future needs, this study was conducted to evaluate the severity of TMD of women in the municipality of Araraquara (Brazil) as well as the contribution of the perception of oral health, mandibular functional limitation, and sociodemographic variables on the severity of TMD.

Materials and Methods

Study Design and Sampling

A cross-sectional study with a stratified probabilistic sample design was developed. The stratification was performed according to the number of women living in each census area in the Araraquara municipality (SP). The inclusion criteria were being at least 18 years of age, female, and a resident of the Araraquara municipality (SP), and having a landline telephone. The study was approved by the Ethics Committee of the Faculty of Pharmaceutical Sciences of Araraquara–UNESP (Protocol No 10/2009).

The sample size was calculated using standard formulas for a finite population sampling, considering $\alpha = .05$, $\beta = .20$, a sampling error of 10%, and an expected prevalence of TMD in the female population of 40%, based on data presented by Gonçalves et al.⁵ Given an expected no-response rate of 20%, the minimum sample size was estimated at 715. A total of 848 telephone calls were made, of which 757 were answered. Of the women who answered the calls, a total of 701 agreed to participate in the present study (response rate of 92.6%). Only one woman per household was interviewed. All interviews were made by the second author of this paper and had a mean duration of 8 minutes (SD = 1.2 minutes).

Procedures

Data collection was done via telephone interview due to evidence presented about the validity of this collection method for comprehensive epidemiologic studies¹⁸ and given the simplicity of the measuring instruments used.

The interviewer who made the calls was trained and calibrated in a pilot study ($\kappa = 0.89$). When the call was answered, the resident was informed about the purpose of the study and invited to participate after agreeing to the informed consent terms. All participants were informed that the call was being recorded. The recording was performed using the program Sound Forge 9.0 (Sony Creative Software Inc).

Study Variables and Measuring Instruments

To characterize the sample, information concerning age (years), marital status (single, married, divorced, widowed), and educational and economic levels was gathered. Information on the use and type of dental prostheses (not using prostheses, fixed partial prosthesis, removable partial prosthesis, or full denture) was also collected. Economic and educational classification of individuals was done according to the Brazilian Economic Classification Criterion.¹⁹

To assess the severity of temporomandibular dysfunction and mandibular functional limitation associated with TMD, the IAF¹³ and the MFIQ¹² were used, respectively. To assess the perception of oral health, the General Oral Health Assessment Index (GOHAI)²⁰ was used.

The IAF¹³ is an instrument, developed in Brazil, that consists of 10 questions, with a three-point Likert-type response scale (0 = no, 5 = sometimes, 10 = yes). The sum of the scores allows classification of individuals according to TMD severity. The psychometric characteristics of this instrument in the sample were studied and documented ($\chi^2/df = 3.319$; Comparative Fit Index [CFI] = .978; Tucker Lewis Index [TLI] = .967; root mean square error of approximation [RMSEA] = .058; average variance extracted [AVE] = .513; $\alpha = .745$) in a previous study.²¹

The MFIQ¹² consists of 17 questions, with a five-point Likert-type response scale (0 = no difficulty to 4 = very difficult or impossible without help). Mandibular functional limitation was classified into: low (scores 0 or 1); moderate (scores 2 or 3); severe (scores 4 or 5), according to the proposal of the authors of the scale.¹² The Portuguese version, which was psychometrically assessed by Campos et al.,²² was used.

The GOHAI²⁰ consists of 12 questions, with a five-point Likert-type response scale (1 = never to 5 = always). In this study, the Portuguese version proposed by Pinto²³ was used, where nine questions were formulated in the positive direction and three

in the negative direction. The psychometric properties of the instrument in the sample were tested ($\chi^2/df = 3.503$; CFI = .966; Goodness of Fit Index [GFI] = .967; RMSEA = .060; AVE = .405; $\alpha = .865$) in a previous study (unpublished data).

Statistical Analyses

The distribution of participants according to the classification of the TMD severity and mandibular functional limitation was estimated by point and by a 95% confidence interval (95% CI).

The psychometric characteristics of the data collected with the selected scales (MFIQ, IAF, and GOHAI) were evaluated by using the psychometric sensitivity, construct validity (factorial, convergent, and discriminant validity), and reliability (composite reliability and internal consistency). These properties, in the present study sample, were reported in previous studies.^{21,22}

To evaluate the contribution of the perception of oral health, mandibular functional limitation, and sociodemographic variables (dichotomously arranged and/or at least in ordinal form) on the severity of the TMD, a structural model was developed where the severity of TMD was the endogenous construct.

The causal model was evaluated in two stages with SPSS AMOS 18.0 (SPSS, an IBM Company) as described by Maroco.²⁴ The goodness-of-fit of the measuring model (step 1) and of the causal model (step 2) was assessed by the chi-square over degrees of freedom (χ^2/df), CFI, GFI, TLI, and RMSEA and their reference values.²⁴ The items' goodness-of-fit was assessed by the factorial weights (λ) and by their individual reliability. The fit was considered acceptable when $\lambda \geq .45$; $\chi^2/df \leq 5.0$; CFI, GFI, and TLI $\geq .90$; and RMSEA $\leq .10$.²⁴

The significance of the causal pathways was assessed with the z test, produced by SPSS AMOS. The Parsimony Normed Fit Index (PNFI) was also calculated to evaluate the quality of the overall structural model, which was considered adequate when PNFI $\geq .60$. Trajectories were considered significant for $P < .05$.

Results

The participants' mean age was 44.36 years (SD = 16.31, range = 18 to 86 years). The sample's characterization (marital status, education level, economic status, use of dental prosthesis) is presented in Table 1. It is noteworthy that only the variable "use of dental prosthesis" was completed by all individuals.

Most of the evaluated women were married and did not use a dental prosthesis. Among the users of dental prostheses, 20.4% had a fixed partial prosthesis,

Table 1 Characterization of the Study Sample

Variable	n	%
Marital status		
Single	160	22.9
Married	407	58.1
Divorced	55	7.9
Widowed	78	11.1
Total	700	100.0
Educational level		
Illiterate/did not complete primary school	86	12.3
Completed primary school/ did not complete middle school	147	21.0
Completed middle school/ did not complete high school	135	19.3
Completed high school/ did not complete college	260	37.1
Completed college	72	10.3
Total	700	100.0
Economic level (USD/mo)		
\$4,075.00	8	1.3
\$1,373.00	258	39.6
\$ 480.50	338	51.9
\$ 190.50	47	7.2
Total	651	100.0
Use of a dental prosthesis		
No	427	60.9
Yes	274	39.1
Total	701	100.0

It is noteworthy that only the variable "use of a dental prosthesis" was completed by all individuals.

42.0% had a removable partial prosthesis, and 37.6% had a full denture.

Assessing the severity of TMD by the IAF indicated 283 (40.4%; 95% CI = 36.8%–44.0%) women were classified without TMD, 267 (38.1%; 95% CI = 34.5%–41.7%) with mild TMD, 112 (16.0%; 95% CI = 13.3%–18.7%) with moderate TMD, and 39 (5.6%; 95% CI = 3.9%–7.3%) with severe TMD.

According to the classification proposed by Stegenga et al,¹² the degree of mandibular functional limitation was low in 638 women (91.0%; 95% CI = 88.9%–93.1%), moderate in 50 women (7.1%; 95% CI = 5.2%–9.0%), and severe in 13 women (1.9%; 95% CI = 0.9%–2.9%).

The contribution of each measured variable on TMD severity is presented in Table 2.

The variables included in the model explained 43% of variation in the severity of TMD, with a significant contribution of the following variables: use of a dental prosthesis, perception of oral health, and mandibular functional limitation. Figure 1 shows the structural model only with the variables that were statistically significant in the prediction of TMD severity.

There was a significant contribution ($P < .001$) of perception of oral health, use of a dental prosthesis, and mandibular functional limitation on TMD severity.

Table 2 Estimates (β), Standardized Estimates, Standard Error, P Value, and Explained Variability (r^2) of the Structural Equation Model of TMD Severity on Sociodemographic and Clinical Variables

Variable	β		SE	P	r^2
	β	standardized			
Age	-0.011	-.008	0.055	.847	
Educational level	0.120	.007	0.676	.860	
Use of a dental prosthesis	-3.380	-.077	1.691	.046	
Socioeconomic level	0.238	.012	0.660	.718	
Perception of oral health	-9.214	-.430	2.296	<.001	
Mandibular functional limitation	5.361	.250	2.261	.018	
Model*					.43

*Model's fit indices: $\chi^2/df = 3.705$; Comparative Fit Index (CFI) = .919; Goodness of Fit Index (GFI) = .882; Tucker-Lewis Index (TLI) = .908; root mean square error of approximation (RMSEA) = .062; Parsimony Normed Fit Index (PNFI) = .782.

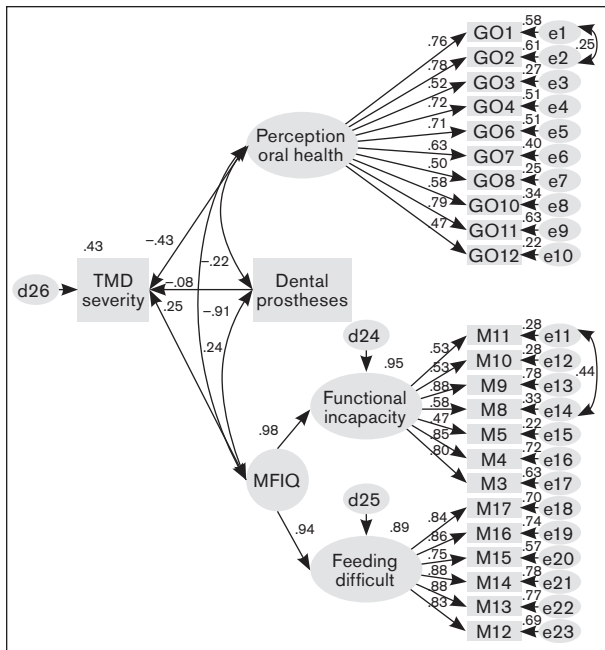


Fig 1 Structural equation model of the TMD severity, perception of oral health, dental prosthesis use, and Mandibular Function Impairment Questionnaire (MFIQ). The model also shows the factor weights of the latent variables oral health and MFIQ. $\chi^2/df = 4.178$; Comparative Fit Index (CFI) = .917; Goodness of Fit Index (GFI) = .879; Tucker-Lewis Index (TLI) = .907; root mean square error of approximation (RMSEA) = .067; Parsimony Normed Fit Index (PNFI) = .799.

Discussion

The identification of the severity of TMD in the normative population of women and the contribution of the variables perception of oral health, mandibular

functional limitation, and sociodemographic characteristics may be important for the understanding of these disorders. It may also help in the development of educational, preventive, and curative strategies.

The inclusion of only female subjects in this study was due to the higher prevalence of TMD symptoms in women reported in the literature.^{2,16,25} Roda et al²⁶ have stated that the chance of developing TMD among women is approximately four times higher than among men. Furthermore, LeResche et al^{3,4} and Licini et al⁶ justify the higher occurrence in women as dependent on hormonal, behavioral, and psychosocial characteristics.

The recruitment and inclusion criteria used, based on the random selection of individuals through the municipality's phonebook, have also been used in other studies.^{5,27} Despite the limitations inherent to the fact that some people do not have a landline telephone, this type of data collection has been shown to be a viable option in epidemiologic studies with large samples.^{18,28,29}

Besides the sample selection and type of data collection, another important aspect in population studies is the choice of instruments that must have their metric qualities carefully evaluated. Thus, before the MFIQ, IAF, and GOHAI scales were used, their psychometric properties were evaluated and documented to ensure the validity and reliability of the collected data as described previously.^{21,22}

Epidemiologic studies have pointed to a high prevalence of TMD signs and symptoms in clinical and subclinical levels in the general population.²⁷ Despite this high prevalence, only the presence of moderate or severe degrees of TMD has been associated with the need for referral and evaluation by experts, with possible indication for treatment.¹³ The prevalence of these levels of severity (21.6%, 95% CI = 18.5%–24.6%) in the women evaluated in this study was higher than the results found by Campos et al³⁰ (14.8%, 95% CI = 12.8%–16.9%) among both sexes.

According to the literature,^{1,31,32} the etiology of TMD is associated with multiple factors; for example, biopsychosocial, environmental, and genetic factors can contribute to the onset and persistence of TMD.³² Thus, determining the importance of each factor in the occurrence of these disorders is essential for the prevention and control of TMD. Among the studied variables, a significant contribution of perception of oral health, use of a dental prosthesis, and mandibular functional limitation on the TMD severity was observed.

The way by which individuals perceive their oral health can determine their behavior regarding their clinical condition.³³ The significant negative contribution of perception of oral health (GOHAI) to TMD severity (IAF) found in this study points to the need

to increase individuals' awareness about the factors involved in oral health as a way to raise their awareness of the importance of self-assessment and early detection of problems.

Speculations about the reasons for the significant relationship observed between the use of dental prostheses and the severity of TMD cannot be made, or must be elaborated with extreme caution, since other important clinical variables were not evaluated, eg, the functionality of the dental prosthesis and/or the performance of a detailed clinical oral examination.

The impact of the mandibular functional limitations on TMD severity can be associated with the sharing of anatomical structures.^{1,34} Stegenga et al¹² and Sugisaki et al³⁵ warn that the perception of mandibular functional limitations is also associated with the presence of clinical and subjective pain in this region, indicating moderate impairment in patients with pain.³⁶

Another aspect that deserves attention is that mandibular functional limitation directly impacts the eating process; thus, the more severe the individual's impairment, the greater the change in food consumption. Pereira et al¹⁷ reported that changes described by individuals with TMD include the loss of appetite, limited choice of foods, and changes in the way meals are prepared. Although there is evidence in the literature of the relationship between TMD and food and nutrition,^{37–39} this has often been underestimated in the development of the instruments proposed for the assessment of TMD.

Regarding the limitation of this study being a cross-sectional study with a sample composed only of women, it must be noted that these limitations are commonly found in epidemiologic studies of the same nature. Even so, it is expected that the results of this and similar studies are an important aid for decision-making either by researchers and/or clinicians regarding dysfunction and orofacial pain. Further studies are required to evaluate the influence of the socio-cultural contexts on the predictors of the severity of dysfunction before the generalizability of the presented model can be applied to other parts of the world.

Conclusions

The severity of TMD among Brazilian women was greater in non-users of dental prostheses and was also associated with greater mandibular functional limitation and poor perception of oral health.

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