Prevalence of temporomandibular disorder and possible associated factors in a sample of older adults: population-based cross-sectional study

Prevalência de disfunção temporomandibular e possíveis fatores associados em uma população de idosos: estudo transversal de base populacional

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DOI 10.5935/2595-0118.20210050

ABSTRACT

BACKGROUND AND OBJECTIVES: Temporomandibular disorders (TMD) are a group of conditions characterized by changes in the movements and function of the orofacial region and one of main reported symptoms is pain. As it has been increasingly described among different age groups, this study aimed to evaluate the presence of symptoms of TMD and their possible associated factors in older people from a city in southern Brazil.

METHODS: A cross-sectional household-based study using a per cluster sampling strategy was performed including 282 older adults aged ≥60 years in the city of Veranópolis/RS. A clinical oral examination and a structured questionnaire were applied. TMD symptoms were evaluated with Fonseca Anamnestic Index (FAI) questionnaire and divided into those "without TMD" and "with TMD" (the later including those reporting mild, moderate and severe TMD symptoms). Associations were performed by the chi-square or Mann-Whitney tests based on frequency distribution. Bi and multivariate analyses were performed using Poisson regression with robust variation to verify associations.

RESULTS: Prevalence among older adults that reported symptoms of TMD was 30.5% (n=86). In the final multivariate model, female older adults presented higher prevalence ratio (PR) for symptoms of TMD, presenting 62.8% (p=0.040) higher PR to at least mild symptoms of TMD when compared to older adult men. Number of teeth, need for dental prosthesis or other demographic variables were not associated with symptoms of TMD.

CONCLUSION: The results demonstrated a prevalence of TMD symptoms in the seniors of approximately 30%, which was most associated with females. Despite its relevance in public health strategies focused on older adults, these findings should be interpreted with caution due to their observational and cross-s-sectional nature.

Keywords: Aging, Risk factors, Temporomandibular joint disorders.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As disfunções temporomandibulares (DTM) são um grupo de condições caracterizadas por alteração dos movimentos e função da região orofacial e um dos maiores sintomas relatados é a dor. Como estas disfunções têm sido descritas de forma crescente entre diversas faixas etárias, o objetivo deste estudo foi avaliar a presença de sintomas de DTM e seus possíveis fatores associados em idosos de uma cidade do sul do Brasil.

MÉTODOS: Estudo transversal de base domiciliar com amostra probabilística por conglomerado incluindo 282 idosos com idade ≥60 anos da cidade de Veranópolis/RS. Um exame clínico de saúde bucal e questionário estruturado foram aplicados. Sintomas de DTM foram avaliados pelo Índice Anamnésico de Fonseca (IAF) e categorizados em "Sem DTM" e "Com DTM", sendo que o último incluiu aqueles com sintomas compatíveis com DTM, moderada ou grave. Associações foram avaliadas pelos testes de Qui-quadrado ou Mann-Whitney por distribuição de frequências. Análises bi e multivariadas foram realizadas utilizando-se regressão de Poisson com variância robusta para verificar associações.

RESULTADOS: A prevalência de idosos que relataram sintomas de DTM foi de 30,5% (n=86). No modelo multivariado final, idosas do sexo feminino apresentaram maior razão de prevalência (RP) para sintomas de DTM, apresentando 62,8% maior RP (p=0,040) de ter, pelo menos, sintomas leves de DTM quando comparados a idosos do sexo masculino. O número de dentes presentes, necessidade de prótese ou outras variáveis demográficas não estiveram associadas com a presença de sintomas de DTM.

CONCLUSÃO: Os achados do presente estudo demonstraram prevalência de sintomas de DTM em idosos de aproximadamen-

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Submitted on January 05, 2021.
Accepted for publication on July 06, 2021.
Conflict of interests: none – Sponsoring sources: none.

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te 30%, com maior associação com o sexo feminino. Apesar de relevantes para delineamento de estratégias de saúde para idosos, os achados do presente estudo devem ser interpretados com cautela por sua natureza observacional e transversal.
Descritores: Envelhecimento, Fatores de risco, Transtornos da articulação temporomandibular.

INTRODUCTION

Oral health conditions in older adults represent an important problem in different areas of dentistry. In this age group, problems associated with tooth loss and aging of teeth and oral structures are frequent and can be a challenge in health care for this population[1]. One of the dental problems in this group are temporomandibular disorders (TMD), a group of conditions that affect the masticatory muscles and/or the temporomandibular joints (TMJ), as well as associated structures[2]. It is a heterogeneous set of diagnoses, which can be attributed to a range of individuals located in a broad spectrum of age groups and with different reported symptoms.

Joint noises and muscle and/or joint pain are the main complaints reported by patients, predominantly females[3]. Pain and limited mandibular function are outcomes often associated with this group of diseases and their presence can have a significant impact on the stomatognathic system of affected individuals[4]. Data published in a cross-sectional study suggest that older adults with moderate/severe TMD symptoms have worst oral health-related quality of life[5].

It is controversial whether aging is a variable actually related to increased occurrence of TMD. While some studies report a higher frequency of associated symptoms in seniors[6], other authors argue that in this population TMD is less observed[7]. The influence of conditions such as institutionalization and other variables such as sex on the presence of TMD-related symptoms has also been discussed[6,7].

Studies that verify the prevalence of TMD symptoms and that involve representative samples of non-institutionalized Brazilian older adults are scarce in the literature. The occurrences of orofacial pain or mandibular disability resulting from TMD can have a considerable impact on the quality of life of seniors, as well as on their self-perception of oral health[8].

Moreover, the association between TMD and changes in chewing and swallowing has been reported, which can have a major impact on the nutritional status of older adults[9]. Therefore, considering the relevance of TMD diagnosis to promote health in this group, this study aimed to assess the prevalence and factors associated with TMD symptoms in a senior population of a city in southern Brazil. The null hypothesis of this study is that, in the older adults, TMD symptoms are not significantly associated with sociodemographic, behavioral, medical and dental variables.

METHODS

A cross-sectional study of residential households with interview and examination of senior individuals with at least 60 years in urban and rural areas of Veranópolis, a city located about 160 km from the capital, Porto Alegre, with a population of approximately 3554 inhabitants aged around 60 years old[10].

The formula for sample calculation was: sample size = standardized variation^2 X outcome prevalence X (1 - outcome prevalence) / absolute error^2. For statistical purposes, a 5% error (1.96 standardized variation) and a 5% absolute error were assumed. The estimated sample was based on the prevalence of 13.2% of moderate or severe TMD symptoms in older adults, as reported in another study with similar methodology[11]. Therefore, the total number of subjects needed was 168.

A 20% attrition rate was added, resulting on a final sample of 202 subjects. A per cluster probability sample was conducted to interview and examine seniors from the city's urban and rural areas, respecting proportionality between them. Based on the map of urban area, all blocks were numbered. A total of 82 blocks (20% of the total blocks) of the urban area were drawn to participate in the study in a simple random way, using the www.random.org website.

For each block drawn, three households were visited and included as long as they had at least one senior resident. In addition, the corners of the blocks drawn were numbered from one to four, and a new draw was conducted to determine the starting point of the first interview. After the first interview, the visits continued clockwise until the planned work was completed. New blocks were drawn to contemplate the number of households required when, for some reason, the blocks drawn did not contain enough participants to complete the survey. Three rural communities were, randomly drawn from among the town's rural area and in each of them 12 households with at least one senior resident were visited. The rural area households involved the households in the central core of the community and those located along the side roads that lead to the community.

The inclusion criteria were individuals over 60 years old residents of the selected households. This cutoff point was established according to the recommendations of the World Health Organization for developing countries. Individuals whose physical, medical, and mental condition made it possible to conduct the study, as well as to understand the examinations and interviews that were conducted, were included.

If the researcher observed during the initial contact that the senior was not able to take part in the study, or if the person responsible for the subject communicated that he or she was not able to participate in the study, he or she was excluded. If more than one resident in the household met the eligibility criteria, all were included. In the case of absence on the day of the data survey, a new time was chosen for data collection. Visitors, residents of *Instituições de Longa Permanência de Idosos* (ILPI – Long Stay Institutions for Seniors), as well as commercial and uninhabited homes were excluded.

Researchers applied a structured questionnaire that included sociodemographic, behavioral, medical and dental history data obtained by using blocks of questions from the PCA Tool-Brazil[12]. The Fonseca Anamnestic Index (FAI)[13] was used to assess TMD symptoms. Oral health was assessed by counting teeth and checking the use and need for prosthesis. Teeth counting and use

of and need for dental prosthesis were performed with the aid of a wooden spatula without artificial lighting or mouth mirrors. Teeth counting was performed on all teeth present, excluding third molars.

Individuals were examined and interviewed between December 2018 and January 2019 by two teams composed of an interviewer and an oral health examiner, previously trained by the study coordinators to ensure data uniformity. Training consisted of theoretical classes, discussion of all the questions of the questionnaire, as well as explanations about oral health examinations. Training was previously carried out with the application of the questionnaire and the oral health examination in senior patients under treatment in the clinics of the Dentistry School of the University of Passo Fundo (UPF).

The intraexaminer and interexaminer reproducibility of the clinical oral health exam was verified in 5% of the examined individuals, 14 days after the initial exam, chosen at random. The Kappa coefficient for tooth loss was 0.89 for both intraexaminer and interexaminer reproducibility. The Kappa coefficient for prosthesis use intraexaminer and interexaminer was 1.00 and 0.935, respectively. The Kappa coefficient for intraexaminer and interexaminer need for prosthesis was 1.00.

The present study was reviewed and approved by the University of Passo Fundo Ethics Committee, under protocol number 2.990.088 and approved on 10/30/2018. All research participants read and signed the Free and Informed Consent Term (FICT) before participating in the study.

Statistical Analysis

The study's dependent variable was prevalence of TMD symptoms, obtained from the FAI instrument, that classifies classifies individuals by symptom severity as: no TMD, mild, moderate and severe TMD. For data analysis, the older adults were categorized into two groups: with or without TMD. Independent variables included sociodemographic conditions, behavioral aspects, and oral and general health conditions.

Age was categorized into two groups, those aged < 70 years or aged ≥70 years old. Ethnicity/skin color was categorized as white or non-white. Non-white group included the seniors who referred to themselves as black, yellow, brown, or indigenous. Instruction level was categorized as low education, which includes seniors with up to at most complete primary education, including illiterates; medium schooling, for those with incomplete or complete secondary education; and high schooling, for seniors with incomplete or complete higher education. Housing included the older adults living in urban or rural areas, according to data and maps provided by the city hall. Retirement was categorized into three groups: one with non-retired older adults, another with retired individuals, and a third one with retired seniors who continue with some work activity. Marital status was categorized into two groups: married or unmarried. The unmarried group included: widowed, single, or divorced.

Health problems were categorized into two groups, one with older adults who reported having no health problem, or who reported not knowing if they had one, and another group with older adults who reported having some health problem. Drug use was categorized into two groups, one with older adults who reported using one or more drugs, and another with older adults who reported not using any. Toothbrushing frequency was categorized into <2 times a day and ≥2 times a day. Use of dental prosthesis was categorized as yes and no. Senior patients were considered as dental prosthesis users if they had: at least one fixed prosthesis; removable partial prosthesis; fixed prosthesis and removable partial prosthesis; and total prosthesis. The need for dental prosthesis was categorized as yes or no and individuals who needed partial or full prosthesis were considered to be in the first group.

Data analysis was performed using the statistical package SPSS 21 (SPSS Inc., Chicago, United States). Associations between the dependent and independent variables were evaluated by the Chi-square or Mann-Whitney test, presented by means of frequency distribution. The significance level was 5%. Bi and multivariate analyses were performed, using Poisson regression with robust variance to verify association between dependent and independent variables. Only those variables that showed p<0.20 in the bivariate analysis were included in the multivariate model. A backwards modeling strategy was used. Statistical significance and alterations in model effect modification were used to determine the final multivariate model.

RESULTS

A total of 282 older adults were interviewed and examined, being 244 (86.5%) from the urban area and 38 (13.5%) from the rural area. Mean age was 71.42 ± 7.89, of which 81 (28.7%) were male and 201 (71.3%) were female. As for ethnicity/skin color, 252 (89.4%) declared themselves to be white and 30 (10.6%) reported being non-white. Regarding the educational level, 208 (79.8%) presented low schooling, and 17 (6%) declared themselves illiterate. Around 53% of the seniors were married, while approximately 47% were single, divorced, or widowed.

Some type of health problem was observed in 248 seniors (87.9%). A total of 137 subjects (48.6%) were considered edentulous. In addition, 27% of the sample required some type of rehabilitation with prosthesis (Table 1). The overall prevalence of TMD symptoms was 30.5% (n=86). Individually, the prevalences of TMD symptoms were 69.5% (n=196), 24.8% (n=70), 4.3% (n=12) and 1.4% (n=4) for no TMD symptoms, mild TMD, moderate TMD and severe TMD, respectively. The female sex showed statistically significant association with TMD symptoms (p=0.028). The need for dental prosthesis (p=0.265) and edentulism (p=0.405), among others, were not statistically associated with TMD symptoms.

Table 2 demonstrates the bivariate analysis of the association between TMD symptoms and the exploratory variables. Females presented significantly more TMD symptoms when compared to males. Senior females had 63.6% higher PR for presenting TMD symptoms (PR: 1.636; 95% confidence interval [95% CI]: 1.029 - 2.601). On the other hand, being

Table 1. Association between temporomandibular disorders symptoms and demographic, socioeconomic, behavioral, medical, and oral history in seniors, Veranópolis, 2018

Variables		No TMD n=196 (69.5%)	TMD n=86 (30.5%)	p-value
Sex	Male – n (%)	64 (32.7)	17 (19.8)	0.028*
	Female – n (%)	132 (67.3)	69 (80.2)	
Age (years)	<70 – n (%)	89 (45.4)	40 (46.5)	0.864*
	≥70 – n (%)	107 (54.6)	46 (53.5)	
Ethnicity/skin color	White – n (%)	179 (91.3)	73 (84.9)	0.106*
	Non white – n (%)	17 (8.7)	13 (15.1)	
Schooling level	Low – n (%)	154 (78.6)	71 (82.6)	0.191*
	Medium – n (%)	23 (11.7)	12 (14.0)	
	High – n (%)	19 (9.7)	3 (3.5)	
Residency area	Urban – n (%)	169 (86.2)	75 (87.2)	0.824*
	Rural – n (%)	27 (13.8)	11 (12.8)	
Retirement	Not retired – n (%)	18 (9.2)	15 (17.4)	0.110*
	Retired – n (%)	133 (67.9)	50 (58.1)	
	Retired and working – n (%)	45 (23.0)	21 (24.4)	
Marital status	Married – n (%)	102 (52.0)	48 (55.8)	0.559*
	Single – n (%)	94 (48.0)	38 (44.2)	
Health problem	Yes – n (%)	171 (87.2)	77 (89.5)	0.587*
	No – n (%)	25 (12.8)	9 (10.5)	
Drug use	Yes – n (%)	170 (86.7)	75 (87.2)	0.913*
	No – n (%)	26 (13.3)	11 (12.8)	
Exposure to smoking	Smokers – n (%)	14 (7.1)	6 (7.0)	0.996*
	Former smokers – n (%)	47 (24.0)	21 (24.4)	
	Non-smokers – n (%)	135 (68.9)	59 (68.5)	
Exposure to alcohol	Yes – n (%)	111 (56.6)	45 (52.3)	0.503*
	No – n (%)	85 (43.4)	41 (47.7)	
Access to dentist	Yes – n (%)	88 (44.9)	43 (50.0)	0.429*
	No – n (%)	108 (55.1)	43 (50.0)	
Toothbrushing frequency	< 2 times/day – n (%)	23 (11.7)	11 (12.8)	0.802*
	≥ 2 times/ day – n (%)	173 (88.3)	75 (87.2)	
Use of dental prosthesis	Yes – n (%)	171 (87.2)	75 (87.2)	0.993*
	No – n (%)	25 (12.8)	11 (12.8)	
Need for dental prosthesis	Yes – n (%)	49 (25.0)	27 (31.4)	0.265*
	No – n (%)	147 (75.0)	59 (68.6)	
Number of teeth	Mean ± SD	7.58±9.24	6.62±8.89	0.381#
Edentulism	Yes – n (%)	92 (46.9)	45 (52.3)	0.405*
	No – n (%)	104 (53.1)	41 (47.7)	

*Chi-square; #Mann-Whitney; TMD = Temporomandibular disorders; SD = standard deviation.

Table 2. Bivariate analysis of the association between temporomandibular disorders symptoms and independent variables

Variables		Prevalence ratio (95% CI)	p-value
Sex	Male	1	0.038
	Female	1.636 (1.029 – 2.601)	
Age (years)	<70	1	0.864
	≥70	0.970 (0.681 – 1.380)	
Ethnicity/skin color	White	1	0.081
	Non-white	1.496 (0.951 – 2.352)	
Schooling level	Low	1	
	Medium	1.087 (0.661 – 1.787)	0.744
	High	0.432 (0.148 – 1.259)	0.124
Residency area	Urban	1	0.825
	Rural	0.942 (0.553 – 1.604)	
Retirement	Not retired	1	
	Retired	0.601 (0.386 – 0.935)	0.024
	Retired and working	0.700 (0.419 – 1.171)	0.174

Continue...

Table 2. Bivariate analysis of the association between temporomandibular disorders symptoms and independent variables – continuation

Variables		Prevalence ratio (95% CI)	p-value
Marital status	Married	1	0.560
	Single	0.900 (0.630 – 1.284)	
Health problem	Yes	1	0.596
	No	0.853 (0.473 – 1.538)	
Drug use	Yes	1	0.914
	No	0.971 (0.572 – 1.650)	
Exposure to smoking	Smoker	1	
	Former smoker	1.029 (0.482 – 2.197)	0.940
	Non-smoker	1.014 (0.502 – 2.047)	0.970
Exposure to alcohol	Yes	1	0.502
	No	1.128 (0.793 – 1.604)	
Access to dentist	Yes	1	0.429
	No	0.868 (0.610 – 1.234)	
Toothbrushing frequency	<2 times/day	1	0.800
	≥2 times/day	0.935 (0.555 -1.575)	
Use of dental prosthesis	Yes	1	0.993
	No	1.002 (0.591 – 1.698)	
Need for dental prosthesis	Yes	1	0.256
	No	0.806 (0.556 – 1.169)	
Number of teeth		0.992 (0.972 – 1.012)	0.425

Table 3. Multivariate analysis of association between temporomandibular disorders symptoms and the independent variables

Variables		Prevalence ratio (95% CI)	p-value
Sex	Male	1	0.040
	Female	1.628 (1.022 – 2.593)	
Ethnicity/ skin color	White	1	0.076
	Non-white	1.481 (0.960 – 2.285)	

retired demonstrated significantly lower PR for TMD symptoms when compared to not being retired (PR: 0.601; 95% CI: 0.386 - 0.935).

In the final multivariate model, sex remained associated with the presence of TMD symptoms (Table 3). Being a female older adult was significantly associated with higher PR for presenting TMD symptoms when compared to senior males (PR: 1.628; 95% CI: 1.022 - 2.593). Skin color was not significantly associated with presence of TMD symptoms (p=0.076). Similarly, no other dental or demographic variables remained in the final multivariate model.

DISCUSSION

This study evidenced that females are associated with TMD symptoms. The evaluation of these symptoms is important in senior population, since their grown in recent decades in developed and developing countries like Brazil. Furthermore, its identification may help in the prevention and early treatment of TMD, avoiding its chronicity and possible repercussions. Considering this target audience, the city of Veranópolis was chosen for being one of the first towns involved in addressing issues related to the human aging process in Brazil. Therefore, it has been included in numerous research studies in all areas of interest in Gerontology and Geriatrics over the past decades[14].

Using FAI as a tool, the literature reports a prevalence of approximately 50% of TMD symptoms in older adults[6,11,15-18], regardless of severity, while in the present study the overall prevalence of TMD symptoms was 30.5%. Nevertheless, the present findings are similar to those of another Brazilian study, which also used a clinical examination in addition to a questionnaire[19]. Moreover, similar prevalence of symptoms can be observed in studies conducted in other countries[7,20].

In the present study, senior women had 62.8% higher PR for reporting TMD symptoms. Several studies conducted in Brazil have also shown this association, regardless of the instrument used[6,17,21], and this association can also be observed in other countries[22-24]. These findings are consistent with those of a systematic review with meta-analysis which demonstrated an twice-fold increase risk of TMD in women as in men[25].

Thus, literature is clear about the higher prevalence of TMD in women compared to men[26]. This difference has been related to psychological and, above all, hormonal differences between sexes, especially variations in estrogen levels[27,28]. Therefore, it is natural to expect a decrease in TMD occurrence in the absence or less influence of this hormone, as evidenced by the study[29], which presented a lower prevalence in postmenopausal women when compared to women of reproductive age. When considering the prevalence among the older adults, there is divergence in the literature, as some studies have shown no association between females and the presence of TMD symptoms in this

population[11,30,31], and others report a higher occurrence in older women compared to men[7,32] similarly to what was reported in the present work.

It is important to highlight that 71.28% of the participants in this study were women, and the representativeness for the studied population partially explains this finding. Besides, literature has already shown that women tend to be more colaborative when invited to participate in epidemiological surveys[33,34].

On the other hand, the results of the present study have showed no association between age and TMD symptoms. Such association has been observed in some studies[6,11,35], demonstrating that the older TMD symptoms tend to decrease with the age. Some authors suggest that this may be a gradual adaptation of older adults to oral changes during the aging process and that, therefore, TMD signs and symptoms may be more common among seniors than commonly reported in studies[27,35]. Moreover, most of the older people are no longer professionally active, and it is speculated that they are therefore less subject to stress than young adults, this being an important predisposing factor for the development of TMD symptoms[36].

Issues related to oral health of seniors should receive more attention in the coming years due to the demographic phenomenon of human aging, which is also observed in Brazil. The consequences of poor oral health conditions are numerous, which may include problems such as high rates of edentulism, periodontal disease and TMD. The present study showed no association between TMD symptoms and oral health conditions, specifically with regard to tooth loss. However, such association was observed in a study with similar design, which showed an increase in the PR of TMD symptoms in the older adults for each lost tooth[11].

It is interesting to point out that the Brazilian seniors have, in general, a high average of 20 teeth lost, with a high prevalence of need for prosthesis above 50%[37]. In the present study, the need for dental prosthesis was observed in 27%, showing a higher proportion of rehabilitated individuals[11]. The association between use of dental prosthesis and TMD symptoms has been suggested in some studies[38-40]. Although the relationship between the emergence of TMD symptoms and tooth loss is discouraged in the literature[4, 41], some studies show that individuals with multiple losses there is a greater occurrence of oral behaviours, such as clenching, which, in turn, is a predisposing factor to the occurrence of TMD[42].

This study sought to be representative of socioeconomic layers in the city of Veranópolis, RS, Brazil. Therefore, a study methodology with probability sampling by cluster was performed. On sample selection, there was proportionality between urban and rural areas. In addition, educational level in the senior participants was similar to that observed in the last national census for the city[10]. Moreover, examiners were trained and calibrated for data collection, which increases its internal validity.

Regarding the instrument used, its simplicity, shorter application time, and lower cost explain its use in population-based epidemiological studies[11]. It is not a diagnostic instrument and its used for TMD symptom tracking, allowing the classification of the individual at an early stage. On the other hand, the study has limitations, such as its cross-sectional design, which does not allow to assess the temporality of the associations between TMD symptoms and exploratory variables. Moreover, no clinical examinations were performed to diagnose TMD, as recommended by the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD)[43]. Finally, the quality of the prosthetic rehabilitation of the included subjects was not evaluated. Thus, readers should be aware of these limitations when reading the present work. Nevertheless, study design allows generalization of data for comparisons with other household-based studies with a representative sample.

CONCLUSION

This present study identified an overall prevalence of TMD symptoms in the older adults of approximately 30%, with a higher occurrence in females. Despite the predominance of mild TMD symptoms in this group, the presence of moderate/severe symptoms was identified.

ACKNOWLEDGMENTS

This study was conducted with the support of the *Coordenação de Aperfeiçoamento de Pessoal do Nível Superior* - Brazil (CAPES - Coordination for the Improvement of Higher Level Personnel) - Funding Code 001.

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