Prevalence and associations of temporomandibular disorders in older Brazilian adults

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Abstract

Objective: The objective of the study was to estimate the prevalence of temporomandibular disorders (TMD) and describe associations in a representative sample of community-dwelling older Brazilian adults.

Background: TMD cause recurrent or chronic pain and dysfunction with substantial impacts on quality of life, but little is known of their occurrence and associated factors among older adults.

Materials and Methods: This was a cross-sectional study using data from the second wave of the Brazilian Longitudinal Study of Aging, a nationally representative sample of older Brazilian adults aged 50 or older. The presence of temporomandibular disorder symptoms was measured by the Fonseca Anamnestic Index. Independent variables included sociodemographic characteristics, general health conditions and self-reported oral health measures. The association between the independent variables and TMD symptoms was evaluated using logistic regression models.

Results: Complete information for the variables of interest was available for 9391 individuals. The overall prevalence of TMD symptoms was 18.0% (95% CI 14.4–22.1). Relative to older adults aged 50–59 those in all age categories had lower odds of TMD symptoms. Individuals with depression, pain, sleep problems and self-reported poor general health had higher odds of reporting TMD symptoms. None of the oral health measures were related to TMD.

Conclusion: The prevalence of TMD symptoms among Brazilian older adults is associated with demographic and general health conditions, but not with dentition status.

Introduction

Temporomandibular disorders (TMD) are an umbrella term used to refer to several disorders associated with the temporomandibular joint, the muscles and the tissues of the jaws.1 These multifactorial disorders cause recurrent or chronic pain and dysfunction with substantial impacts on quality of life1–4 and psychosocial wellbeing.5–7

A recent meta-analysis of studies using the research diagnostic criteria for temporomandibular disorders (RDC/TMD) and diagnostic criteria for temporomandibular disorders (DC/TMD) estimated that 31% of adults and 11% of children had TMD.8 However, estimates of the prevalence of TMD in populations have been heterogeneous due to the use of different methods to define the disorders, most estimates being based on self-reported symptoms associated with TMDs and difficulties in conducting clinical diagnosis on large epidemiological studies.1 Furthermore, most of the national estimates are from high-income countries,9 and few studies have investigated TMD in older adults.8,10 However, there is some evidence suggesting that the prevalence is higher around the 45–64 years old and decreases in the older age groups.1,10

The aetiology of TMD is multifactorial11–13 and mixed findings have been reported using clinical oral health measures such as the number of teeth, use of dental prostheses and masticatory function. 12,14,15 A prospective cohort study in the United States found that among 202 phenotypic risk factors, the four most important risk factors for first onset TMD were the number of comorbid conditions, the number of non-specific orofacial symptoms, the study site and the SF-12 bodily pain score.13

It has been suggested that TMD onset has been disproportionally observed among individuals with relatively poor health.16 Thus, there is a clear need for further studies on older adults, especially in low-and middle-income countries. It is estimated that 80% of older people will be living in low-and middle-income countries by 2050.17 In addition, there is a high prevalence of individuals with poor oral health18 and impaired health conditions19,20 in such countries. In Brazil, the national prevalence of TMD and associations have not been investigated. Accordingly, this study aimed to estimate the prevalence of TMD and describe associations in community-dwelling older Brazilian adults.

Methods

This was a cross-sectional study using data from the second wave of the Brazilian Longitudinal Study of Aging (ELSI-Brazil), conducted in 2019/2021. This study is a nationally representative study of older adults aged 50 or older living, in 70 municipalities from the Brazilian five macro-regions. The sample is representative of the urban and rural areas of the small, medium and large municipalities, and the sampling adopted a design with selection stages, combining stratification of primary sampling units (municipalities), Census tracts and households. All residents in the selected households aged ≥50 years were eligible for interview and physical measurements, and the number of planned interviews was 10,000. In the second wave, all participants from the first wave, who were located, were reinterviewed and a replacement was done to keep the representativeness of the sample. The final samples for the first and second waves were 9412 and 9949 (6172 reinterviewed and 3777 new participants), respectively. Nonparticipation was due to losses or refusals (N = 2270) or deaths (N = 970). Sample weights were derived to account for the different probabilities of selection and differential

non-response. A detailed description of the study design and sampling has been published elsewhere.21

The current study included all participants with complete information for the variables of interest with a final sample of 9391 individuals. There were no differences between those included in the study and those not by all the independent variables, except for self-rated health (P = .002) and sex (P = .027). Among the included individuals, 54.7% were female with a corresponding 49.0% in the sample not included. Good, moderate, or poor health was reported by 47.5%, 37.3% and 15.2%, respectively, of the included individuals. These proportions corresponded to 55.2%, 23.6% and 21.1%, respectively, among the non-included.

ELSI-Brazil was approved by the Fiocruz Research Ethics Committee, Minas Gerais (CAAE 34649814.3.0000.5091). All participants signed separate informed consent forms for each of the research procedures.

The dependent variable for the current study was temporomandibular disorder symptoms, measured using the Fonseca Anamnestic Index (FAI), a screening instrument developed in Brazil.22–24 It consists of 10 questions about the presence and severity of symptoms. Each question has three response options: “Yes” (10 points), “Sometimes” (5 points) or “No” (0 points). The sum of the scores results in the Anamnesis Index, which classifies individuals as without TMD (0–15 points), or with mild (20–45 points), moderate (from 50 to 65 points) or severe TMD (70–100 points).22 For association analyses, participants were grouped into two categories: absence (without TMD) and presence (mild, moderate, and severe TMD). In the descriptive analyses according to each symptom, both “yes” and “sometimes” responses represented the presence of symptoms, as reported in previous studies.25,26

The independent variables included in the study were age (50–59 years, 60–69 years, 70–79 years, 80+ years), sex (male, female), education (0–3 years, 4–7 years, 8–11 years, 12+ years), marital relationship (no, yes), depression (yes, no), pain, self-rated health (good, moderate, poor), self-reported sleep quality (good, moderate, poor), self-reported functional dentition (no, yes) and use of dental prostheses (no, yes).

Depression was based on self-report of a medical diagnosis of the condition. The presence of pain was evaluated by asking “Do you have any pain that bothers you often?” with a yes or no response. Functional dentition was defined as the presence of 20 or more teeth.27

Descriptive analyses were performed for all variables followed by a bivariate analysis of TMD symptoms by the independent variables. The association between the independent variables and TMD symptoms was evaluated using logistic regression models, the results were expressed as odds ratios and their 95% confidence intervals (95% CI). In the adjusted analyses, all variables with a $p < 0.20$ in the bivariate analyses were included in the model in the following order: sociodemographic, general health and oral health. The variables significantly associated with the outcome ($p < 0.05$) were kept in the adjusted model.

Results

The description of the study sample by TMD status is presented in Table 1. The majority of the participants were women and there was a higher proportion of individuals aged 50–59or with 0–3 years of schooling. Most of the older adults

did not report depression or pain. About one in six reported poor self-rated health or poor sleep quality. Nearly a third of the sample did not have a functional dentition and 62% used dental prostheses. Women, those with depression, without a functional dentition and with poor self-rated health and sleep quality had a higher prevalence of TMD. The overall prevalence of TMD was 18% (95% CI 14.4–22.1).

Concerning the level of symptoms, 0.7% of the participants were classified as having severe symptoms (Table 2). Self-reported evaluation of tension (37.8%), followed by frequent headaches (20.2%), neck pain or stiff neck (19.9%) and teeth not coming together (16.9%) were the most prevalent symptoms reported.

The unadjusted analysis showed a positive association between TMD and all independent variables, except for functional dentition and age. Accordingly, individuals with a functional dentition had lower chances of reporting TMD symptoms (Table 3). In the adjusted analyses (Table 3), relative to older adults aged 50–59 those in all age categories had lower chances of TMD. Individuals with depression (OR 1.49 95% CI 1.20–1.84) and pain (OR 3.27 95% CI 2.74–3.91) had higher odds of having TMD symptoms. Older adults with moderate or poor self-reported health (moderate: OR 1.84 95% CI 1.49–2.26; poor: 2.03 OR 95% CI 1.54–2.68) or sleep quality (moderate: OR 1.99 95% CI 1.65–2.41; poor: OR 2.48 95% CI 1.91–3.21) had higher odds of TMD than those reporting good sleep quality.

Discussion

Studies on the prevalence of TMD symptoms among community-dwelling older Brazilian adults are scarce. The current findings suggest that almost one in five had TMD and that this condition was associated with demographic and general health conditions, but not with oral health measures.

The prevalence of TMD symptoms in this study was lower than that estimated globally for adults and older adults in a recent meta-analysis using the research diagnostic criteria.8 Among older adults, few population-based studies evaluated this condition, and the estimates are based mostly on self-reported measures. Using data from the Spanish Oral Health Surveys from two decades (from 1993 to 2015), Montero et al.28 found that the prevalence of self-reported symptoms was found to be stable and around 11.5% among older adults aged 65–74 years. In a survey conducted in two Swedish counties, 12% of the women and 7% of the men in the 70-year-old group reported some, rather great or severe pain in the temporomandibular joint region. Among those aged 80 years the prevalence was 8% and 7% among women and men, respectively. The present findings are also lower than previous estimates for older Brazilian adults. Studies using the same instrument to evaluate TMD symptoms found prevalence ranging from 15.5%,29 among institutionalized older adults, to 55%,30 among community-dwelling individuals 65–74-year-olds living in a city in the south region of Brazil.

Lower estimates of TMD prevalence among older adults have been reported, although most samples included young and adult individuals. 10,31 A study with data from 137 718 individuals, who had attended for a routine dental check-up at the Public Dental Health Service (PDHS) in a Swedish county found that the prevalence of frequent symptoms of temporomandibular pain and jaw dysfunction is greater during adolescence, highest in middle age, and

progressively lower in older age groups.31 A community-based prospective cohort study of American adults aged 18–44 years found that TMD incidence increased with age,11 while other cohort studies including older adults have found a negative association with age.32–34

The association of sex with TMD has been mixed. Consistent with the current one, other cross-sectional studies have observed a higher prevalence among women,29,35 but prospective studies, using data from the project entitled Orofacial Pain: Prospective Evaluation and Risk Assessment (OPPERA), have found no sex difference.11,36 It has been suggested that the higher prevalence among women could be due to the prevalence incidence bias arising in cross-sectional studies. Whereby, their longer duration of TMD would make them the group with higher prevalence in cross-sectional analyses since they have significantly higher odds of chronic TMD.16

The aetiology of TMD is multifactorial, but the pathways linking general health conditions to TMD are not well understood.12,16 Similar to previous studies, an association was observed with sleep,13,16,37 depression38 and pain.12,13 Bodily pain ranked fourth among 202 phenotypic risk factors for TMD evaluated in a cohort study of 2737 American individuals followed for 2.8 years.13 More recently, a systematic review found a high prevalence of comorbid chronic pain conditions among patients with TMDs, with more than 50% of patients reporting chronic back pain, myofascial syndrome or chronic stomach problems.3

Concordant with previous findings, older Brazilian adults with poor sleep quality had higher chances of reporting TMD symptoms. 37,39 A meta-analysis of studies that applied diagnostic criteria for TMD, found that individuals with poor subjective sleep quality had 4.5 times greater odds of having TMD.39 A prospective cohort study in the United States found a significantly higher risk of developing TMD in participants with poor sleep quality than in those with good sleep quality. In the nested case–control study, it was observed that subjective sleep quality had worsened progressively before the onset of painful TMD and was stable over time in participants who remained free of TMD.37 In other analyses with data from the same study, sleep latency also ranked among the 30th most important risk factors of TMD.13 It has been hypothesized that this association is due to the fact that poor sleep quality may lower pain thresholds. 37,40 However, this relationship is still inconclusive. A systematic review and meta-analysis reported limited evidence to support that total sleep deprivation reduced pain threshold and tolerance. They found moderate evidence for the association between partial sleep deprivation and greater intensity of spontaneous pain. The findings also suggested that, among people with chronic pain, there is limited evidence for aggravated spontaneous pain intensity due to total or partial sleep deprivation.41

The role of psychosocial factors in the aetiology of TMD has been explored previously, and a bidirectional association has been observed with depression,38,42,43 possibly due to its effect on parafunctional habits, physical illness and pain perception,44–47 but few studies have evaluated this association among older adults. Corroborating this evidence, the present study showed that older adults with depression had higher odds of TMD symptoms. Similarly, findings from a prospective cohort study of healthy female volunteers aged 18–34 years showed that after 3 years of follow-up individuals with depression, perceived stress and mood had 2- to 3-fold higher risk of TMD.48

The last finding that should be highlighted in this study is the lack of association between TMD and oral health measures. Despite a few studies having reported higher odds of TMD among individuals with dental impairment, the quality of the studies has been described as poor and the patterns of association were not consistent across studies.49,50 Furthermore, two previous systematic reviews concluded that there is no scientific evidence to support a negative effect of tooth loss or occlusal support on TMD signs and symptoms.49,50

This study has some strengths and limitations that should be acknowledged. This was, to the best of our knowledge, the first population-based study to estimate the prevalence and associated factors of TMD symptoms among a representative sample of older Brazilian adults. The prospective design of the wider study might enable the evaluation of the incidence of this outcome and study its determinants among this age group overcoming the gaps in the literature. The cross-sectional design of the current study is a limitation because it does not allow causal inference. Although the use of a screening instrument might be seen as a limitation because it does not provide diagnoses, it has important advantages that qualify it for use in epidemiological studies. First, the use of the diagnostic criteria for TMD in populational studies is not feasible due to their extensive detail and respondent burden. Second, the Fonseca Anamnestic Index was described as a sensitive instrument that is valid for screenings.23 Finally, it has been one of the most widely translated and used instruments.24

In conclusion, this large nationally representative sample of community-dwelling older Brazilian adults aged 50 and older showed the nationwide prevalence of TMD symptoms to be 18.0%, and that TMD symptoms were associated with demographic and general health conditions, but not with dentition status.

Author contributions

Fabíola Bof de Andrade conceptualised, designed the study, carried out the analyses, drafted the paper. Fabíola Bof de Andrade, Doralice Severo da Cruz Teixeira, Rafael da Silveira Moreira and Cesar de Oliveira contributed to the interpretation of the results and revised the manuscript. All authors approved the final article as submitted and agree to be accountable for all aspects of the work.

Conflict of interest statement

None.

Data availability statement

The data that support the findings of this study are available at the study website: https://elsi.cpqrr.fiocr uz.br/.

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TABLE 1 TMD prevalence by sociodemographic and other characteristics (brackets contain 95% CIs)

	TMD	Total
	% (95% CI)	% (95% CI)
Age		
50–59	20.2 (16.0–25.2)**	46.8 (43.6–50.0)
60–69	16.7 (13.1–21.0)	29.4 (28.0–30.9)
70–79	15.0 (12.2–18.4)	16.3 (14.6–18.1)
80+	15.3 (11.0–20.8)	7.5 (6.4–8.8)
Sex		
Male	13.3 (9.7–17.9)**	45.3 (43.1–47.4)
Female	21.8 (18.1–26.1)	54.7 (52.6–56.9)
Years of schooling		
0–3	19.5 (15.0–25.0)	32.8 (29.0–36.9)
4–7	17.8 (13.9–22.5)	30.8 (28.9–32.8)
8–11	17.4 (13.5–22.2)	28.9 (26.0–32.0)
12 or more	13.8 (10.4–18.0)	7.4 (6.3–8.7)
Depression		
No	15.7 (12.4–19.7)**	86.8 (84.5–88.8)
Yes	32.8 (26.3–40.1)	13.2 (11.2–15.5)
Self-reported pain		
No	9.0 (7.3–11.1)**	63.5 (59.8–67.0)
Yes	33.5 (27.5–40.0)	36.5 (33.0–40.1)
Self-rated health		
Good	9.4 (7.5–11.6)**	47.5 (44.3–50.7)
Moderate	22.9 (17.7–29.1)	37.3 (34.7–40.1)
Poor	32.5 (26.9–38.8)	15.2 (13.4–17.2)
Sleep quality		
Good	10.6 (8.4–13.2)**	60.6 (58.0–63.1)
Moderate	24.4 (18.7–31.1)	23.4 (21.4–25.5)
Poor	36.4 (30.0–43.3)	16.0 (14.0–18.3)
Functional dentition		
No	18.9 (15.2–23.2)*	69.5 (66.7–72.3)
Yes	15.9 (12.2–20.4)	30.5 (27.7–33.3)
Use of dental prostheses		
No	18.2 (14.4–22.7)	38.0 (35.3–40.9)
Yes	17.8 (14.2–22.1)	62.0 (59.1–64.7)
All combined	18.0 (14.4–22.1)	$N = 9391$ (100%)

Abbreviations: CI, confidence interval; TMD, temporomandibular disorders.

*$P < .05$.; **$P < .001$.

TABLE 2 Prevalence of TMD among older adults. Brazil, 2019 (brackets contain 95% CIs)

	% (95% CI)
TMD	
No	82.0 (77.9–85.6)
Mild	14.8 (12.1–17.9)
Moderate	2.5 (1.7–3.5)
Severe	0.7 (0.5–1.1)
Symptoms	
Difficulty opening mouth	5.5 (3.9–7.5)
Difficulty moving jaw to the sides	5.6 (3.8–8.3)
Fatigue or muscle pain when chewing	9.9 (7.7–12.8)
Frequent headaches	20.2 (16.7–24.2)
Neck pain or a stiff neck	19.9 (16.0–24.5)
Earaches or pain in that area TJ	8.1 (6.3–10.5)
Noise in TJ while chewing or opening mouth	7.9 (6.2–10.1)
Clenching or grinding teeth	8.4 (6.6–10.6)
Teeth do not come together well	16.9 (13.9–20.4)
Consider yourself a tense (nervous) person	37.8 (32.0–44.0)

Abbreviations: CI, confidence interval;TJ, temporomandibular joint; TMD, temporomandibular disorders.

Table 3. Unadjusted and adjusted logistic regression models for the factors Note: Ref = category of reference.

	TMD	
	Unadjusted	Adjusted
	OR (95% CI)	OR (95% CI)
Age (ref = 50–59)		
60–69	0.79 (0.67–0.93)	0.74 (0.61–0.88)
70–79	0.70 (0.55–0.88)	0.62 (0.48–0.80)
80+	0.71 (0.55–0.92)	0.61 (0.46–0.80)
Sex (ref = male)		
Female	1.83 (1.47–2.28)	1.50 (1.17–1.91)
Depression (ref = no)		
Yes	2.63 (2.03–3.40)	1.49 (1.20–1.84)
Self-reported pain (ref = no)		
Yes	5.05 (4.23–6.04)	3.27 (2.74–3.91)
Self-rated health (ref = good)		
Moderate	2.88 (2.36–3.51)	1.84 (1.49–2.26)
Poor	4.67 (3.64–5.98)	2.03 (1.54–2.68)
Sleep quality		
Moderate	2.73 (2.24–3.31)	1.99 (1.65–2.41)
Poor	4.83 (3.80–6.15)	2.48 (1.91–3.21)
Functional dentition (ref = no)		
Yes	0.81 (0.66–1.00)	–

Note: Ref = category of reference.

Abbreviations: CI, confidence interval; OR, odds ratio; TMD, temporomandibular disorders.