Symptoms of Temporomandibular Disorders in the Population: An Epidemiological Study

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Aims: *To estimate the prevalence of symptoms of temporomandibular disorders (TMD) as a function of age and gender, in a representative urban sample from the Brazilian population.* ***Methods:*** *A total of 1,230 inhabitants (51.5% women) aged 15 to 65 years were interviewed by a validated phone survey. Sample size had been previously calculated. TMD symptoms were assessed through five questions, as recommended by the American Academy of Orofacial Pain, in an attempt to identify possible TMD. Data were derived by age and gender. Prevalence of each TMD symptom, and of combination of symptoms, was calculated.* ***Results:*** *At least one TMD symptom was reported by 39.2% of the individuals. Pain related to TMD was noted by 25.6% of the population. Temporomandibular joint (TMJ) sound was the most common symptom of TMD, followed by TMJ pain and masticatory muscle pain. All symptoms were more prevalent in women than in men. With men used as the reference, a relative risk (RR) of at least one TMD symptom in women was 1.31 (95% confidence interval [CI] = 1.14 to 1.52). When at least two symptoms were present, the RR was 1.93 (95% CI = 1.49 to 2.51). For three or more TMD symptoms, the RR was 2.49 (95% CI = 1.67 to 3.71). Women were also more likely than men to have TMD pain (RR = 1.78; 9% CI = 1.45 to 2.18).* ***Conclusion:*** *Individual symptoms, as well as a combination of TMD symptoms, are prevalent in the Brazilian urban population and are more frequent in women than in men. Additional studies should focus on risk factors for and relevance of TMD for the sufferers.* J OROFAC PAIN 2010;24:270–278

Key words: epidemiology, facial pain, prevalence, temporomandibular joint

Temporomandibular disorders (TMD) represent clusters of related disorders in the masticatory system.[1] They are characterized by pain in the temporomandibular joint (TMJ), in the periauricular area or muscles of mastication, TMJ sounds, and by deviations or restrictions in the mandibular range of motion.[1] TMD are a major cause of nondental pain in the orofacial region,[1] negatively impacting sufferers' quality of life. Furthermore, the impact of TMD is documented even in TMD cases with little or no pain.[2]

Although the epidemiology of TMD has been studied,[3–10] reported prevalence rates vary broadly (from around 11% to over 50%), likely reflecting important differences in samples, criteria, and methods used for collecting the information.[8,11,12] For instance, clinical studies have reported higher prevalence rates (45% to 50%) and are more likely to enroll severely affected patients.[10,13,14]

Furthermore, they are likely not representative of the population as a function of disease severity, so issues of representativeness and generalizability of data arise. Thus, studies conducted in representative samples are of importance.[12]

In clinical practice, TMD diagnosis requires a comprehensive examination. For clinic-based research, the diagnosis of TMD is well defined,[15] since the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) are universally accepted and validated. However, the use of the RDC/TMD in populational epidemiological studies is not feasible, since in-person interviews and examinations are required. In this setting, disease is typically assessed through questionnaires.[16–18] A major limitation of these instruments is that, since cut-scores for establishing diagnosis and criteria are not validated or clearly defined, any positive symptom raises the suspicion of TMD, likely inflating prevalence rates. According to these approaches, individuals with only one TMD symptom versus several TMD symptoms would be equally considered as having TMD. The relevance of this potential bias has not been fully explored.

Accordingly, the aim of this study was to estimate the prevalence of symptoms of TMD (single and multiple symptoms) as a function of age and gender, in a representative urban sample from the Brazilian population. Standardized methods were used to select the sample, collect data, and correlate TMD symptoms with gender and age. The number of symptoms, rather than TMD diagnosis, was described to address the above-mentioned limitation.

Materials and Methods

Description of the Sample

This was a population-based cross-sectional study conducted to determine the prevalence rates of the most common TMD symptoms and their association with age and gender in a Brazilian urban population. It was part of a project that aimed to determine the prevalence rates of symptoms possibly related to TMD, primary headache syndromes, and body pain in a representative sample. The overall aim of the project was to define the mutual associations and comorbidities, with a focus on the concomitance of pain syndromes.[19,20] As a prelude to conducting this study, the epidemiology of TMD, headaches, and other pain syndromes was estimated.

A stratified probability sample of 1,263 habitants was sampled from 484,422 habitants, according to the demographic census.[21] These individuals were contacted and invited to participate in a telephone survey. The city of Ribeirão Preto, São Paulo State, is well diversified and provides good demographic representation. Furthermore, according to the census, the vast majority of the households have telephones.[21] The strategy (a representative city) is similar to what has been extensively used in populational surveys.[22–24] The urban area of the city is geographically divided into four different regions and subdivided into 59 subregions. The entire urban geographic area was sampled. The survey received full approval from a Human Research Committee (School of Medicine, São Paulo State University). The Investigation Review Board waived the need for written consent and approved a verbal consent invitation that was read to potential participants at the beginning of the phone conversation.

For sample size calculation, due to the variability of TMD prevalence presented in the literature, an average of those rates was considered.[1,3–5,8,11] Based on the sample size calculations, to be representative and adequately powered, our sample should consist of over 1,000 individuals (see Data Analysis, below).

Since the study was conducted using telephone interviews, sampling was done with households (not individuals) as the unit. Accordingly, sample size calculation focused on number of respondent homes as a surrogate to number of responding individuals (since only one adult was interviewed per home [1,263 individuals]). The total sample was proportionally distributed according to the numbers of inhabitants in each subsector.

All blocks of each subsector were initially numbered using detailed city maps, and random number codes were used to select the blocks. Then the authors randomly selected streets representative of the city by subregion and also randomly selected three houses per street to attend sample size calculation requirements (see below). When none of the houses participated, the "street" was considered as nonparticipant. Therefore, participation rate refers to participant streets rather than participant homes (see limitation section in discussion). For each house, three call attempts, at different times of the day, were made.

One individual per household was interviewed. Eligibility criteria were: age 15 to 65 years, capability of answering the questions, and agreement to do so. Gender distribution was representative of the city (women = 51.5%). Complete responses were obtained from 1,230 individuals.

Table 1 Questions About Possible TMD Symptoms

TMD questionnaire
1. Have you ever been aware of noises (eg, clicks) when you open your jaw?
2. Have you ever had pain in the joint around your ears?
3. Have you ever had pain around your cheeks, temple, or jaw?
4. Have you ever had any difficulty opening your mouth?
5. Have you ever had any difficulty making lateral movements with your jaw?

Table 2 Age and Gender Distribution of Participants

Age groups	Women (%)	Men (%)	Total (%)
15 to 20	80 (12.6)	95 (15.9)	175 (14.2)
21 to 30	136 (21.5)	113 (18.9)	249 (20.2)
31 to 40	127 (20.1)	135 (22.6)	262 (21.3)
41 to 50	119 (18.8)	108 (18.1)	227 (18.5)
51 to 60	105 (16.6)	92 (15.5)	197 (16.0)
61 to 65	66 (10.4)	54 (9.0)	120 (9.8)
Total	633 (100)	597 (100)	1230 (100)

Questionnaire

The questions focusing on TMD symptoms were adapted from the anamnesis proposed by the American Academy of Orofacial Pain (AAOP)[1,25] for the survey of TMD symptoms and identification of possible TMD. The questionnaire consisted of five questions that individually asked about TMJ sounds and pain, masticatory muscle pain (MMP) or fatigue of the jaw, difficulty during mouth opening (DDMO), or difficulty during lateral deviation (DDLD) (Table 1). The individual was first asked if he or she had ever had any of the symptoms investigated. If the answer was positive, the respondent was asked about the presence of the symptom more than once. Finally, the respondent was asked if he or she had presented the symptom in the last month. Only last month data were considered for capturing information on TMD.

The questionnaire had been validated[26] and has excellent internal consistency (0.70) in addition to good internal measure constructs.[26–28] The questionnaire also has good reproducibility with overall Kappa scores > 0.71.[28–30] According to the guidelines of the AAOP, a positive answer to any of the questions suggests TMD.[1,25] Therefore, the individuals who answered "yes" to at least one of the five questions were classified as presenting possible TMD. However, to achieve the study aims, a separate presentation was made of the proportion of individuals presenting a combination of symptoms. Finally, the presence of pain (MMP and TMJ pain) as a surrogate to possible TMD dysfunction was also considered.

Data Analysis

For power calculation, a prevalence rate of 38% was considered for at least one TMD symptom.[14] A confidence interval (CI) of 95% and a sampling error of 3% were fixed. The sample size calculation resulted in 1,006 individuals. To account for nonresponders, an attrition of 20% was considered, and the size of the sample was corrected to 1,258 individuals.

To characterize the sample, descriptive statistics were performed. The sample was stratified by each TMD symptom, number of TMD symptoms, and presence of TMD pain (muscle and TMJ pain). The chi-square test was performed for comparison of proportions, and the relative risk ratio (RR) test, with 95% CI, was also applied to study association with age and gender. Individuals 15- to 20-years old were used as the reference to estimate the odds of having TMD symptoms in different age groups, among women, men, and overall. Prevalence of symptoms between genders were also contrasted. The level of significance adopted was 5%. Statistical analysis was performed with the aid of SPSS 15.0 for Windows (SPSS).

Results

Responses were obtained from households at 97.4% of the 1,263 habitats initially selected. The final sample consisted of 1,230 individuals, 48.5% men and 51.5% women. Demographics are described in Table 2. Reflecting the age distribution of the Brazilian population, the largest age groups were the 31- to 40-year old and 21- to 30-year old (21.3% and 20.2%), followed by those at 41 to 50 years (18.5%), 51 to 60 years (16%), 15 to 20 (14.2%), and 61 to 65 years (9.8%).[21] There were no statistically significant differences in the distribution of men and women on age groups ($\chi^2 = 5.196$; $P = .392$).

Prevalence of Individual TMD Symptoms

Table 3 displays the prevalence of individual TMD symptoms as a function of age and gender. Overall, relative risk of symptoms increased with age, although nonsignificantly. Similar patterns were seen overall and for both genders.

Table 3 Frequency of Individual TMD Symptoms by Age and Gender (n = 1,230)

	Women (n = 633)		Men (n = 597)		Overall (n = 1,230)		
Age	n (%)	RR (95%CI)	n (%)	RR (95%CI)	n (%)	RR (95%CI)	*P* value
TMJ sounds							
15–20	16 (20.0)	Reference	18 (18.9)	Reference	34 (19.4)	Reference	
21–30	37 (27.2)	1.36 (0.81–2.28)	29 (25.7)	1.35 (0.80–2.28)	66 (26.5)	1.36 (0.94–1.96)	
31–40	41 (32.3)	1.61 (0.97–2.67)	27 (20.0)	1.05 (0.61–1.80)	68 (26.0)	1.33 (0.92–1.92)	
41–50	36 (30.3)	1.51 (0.90–2.53)	18 (16.7)	0.87 (0.48–1.59)	54 (23.8)	1.22 (0.83–1.79)	
51–60	26 (24.8)	1.23 (0.71–2.14)	24 (26.1)	1.37 (0.80–2.36)	50 (25.4)	1.30 (0.88–1.92)	
61–65	8 (12.1)	0.60 (0.27–1.32)	11 (20.4)	1.07 (0.54–2.10)	19 (15.8)	0.81 (0.48–1.35)	
Total	164 (25.9)*		127 (21.3)		291 (23.7)		.056
TMJ pain							
15–20	15 (18.8)	Reference	11 (11.6)	Reference	26 (14.9)	Reference	
21–30	31 (22.8)	1.21 (0.70–2.11)	8 (7.1)	0.61 (0.25–1.45)	39 (15.7)	1.05 (0.66–1.66)	
31–40	28 (22.0)	1.17 (0.67–2.06)	20 (14.8)	1.27 (0.64–2.54)	48 (18.3)	1.23 (0.79–1.91)	
41–50	34 (28.6)	1.52 (0.89–2.60)	8 (7.4)	0.63 (0.26–1.52)	42 (18.5)	1.24 (0.79–1.94)	
51–60	18 (17.1)	0.91 (0.49–1.70)	7 (7.6)	0.65 (0.26–1.62)	25 (12.7)	0.85 (0.51–1.42)	
61–65	12 (18.2)	0.96 (0.48–1.92)	8 (14.8)	1.27 (0.54–2.98)	20 (16.7)	1.12 (0.65–1.91)	
Total	138 (21.8)		62 (10.4)		200 (16.3)		< .0001
MMP							
15–20	18 (22.5)	Reference	4 (4.2)	Reference	22 (12.6)	Reference	
21–30	27 (19.9)	0.88 (0.52–1.49)	15 (13.3)	3.15 (1.08–9.18)	42 (16.9)	1.34 (0.83–2.16)	
31–40	26 (20.5)	0.90 (0.53–1.54)	18 (13.3)	3.16 (1.10–9.06)	44 (16.8)	1.33 (0.83–2.14)	
41–50	21 (17.6)	0.78 (0.44–1.37)	10 (9.3)	2.19 (0.71–6.78)	31 (13.7)	1.08 (0.65–1.80)	
51–60	23 (21.9)	0.97 (0.56–1.67)	10 (10.9)	2.58 (0.83–7.94)	33 (16.8)	1.33 (0.80–2.19)	
61–65	11 (16.7)	0.74 (0.37–1.45)	7 (13.0)	3.07 (0.94–10.04)	18 (15.0)	1.19 (0.66–2.12)	
Total	126 (19.9)		64 (10.7)		190 (15.4)		< .0001
DDMO							
15–20	4 (5.0)	Reference	3 (3.2)	Reference	7 (4.0)	Reference	
21–30	14 (10.3)	2.05 (0.70–6.04)	10 (8.8)	1.80 (0.79–9.89)	24 (9.6)	2.41 (1.06–5.46)	
31–40	21 (16.5)	3.30 (1.17–9.28)	13 (9.6)	3.04 (0.89–10.41)	34 (13)	3.24 (1.47–7.15)	
41–50	15 (12.6)	2.52 (0.86–7.32)	9 (8.3)	2.63 (0.73–9.46)	24 (10.6)	2.64 (1.16–5.99)	
51–60	15 (14.3)	2.85 (0.98–8.28)	5 (5.4)	1.72 (0.42–6.99)	20 (10.2)	2.53 (1.10–5.85)	
61–65	5 (7.6)	1.51 (0.42–5.41)	6 (11.1)	3.51 (0.91–13.51)	11 (9.2)	2.29 (0.91–5.74)	
Total	74 (11.7)		46 (7.7)		120 (9.8)		.019
DDLD							
15–20	7 (8.8)	Reference	3 (3.2)	Reference	10 (5.7)	Reference	
21–30	16 (11.8)	1.34 (0.57–3.12)	5 (4.4)	1.40 (0.34–5.71)	21 (8.4)	1.47 (0.71–3.05)	
31–40	14 (11.0)	1.26 (0.53–2.98)	4 (3.0)	0.93 (0.21–4.09)	18 (6.9)	1.20 (0.56–2.54)	
41–50	9 (7.6)	0.86 (0.33–2.22)	7 (6.5)	2.05 (0.54–7.71)	16 (7.0)	1.23 (0.57–2.65)	
51–60	11 (10.5)	1.19 (0.48–2.95)	4 (4.3)	1.37 (0.31–5.98)	15 (7.6)	1.33 (0.61–2.88)	
61–65	2 (3.0)	0.34 (0.07–1.61)	2 (3.7)	1.17 (0.20–6.80)	4 (3.3)	0.58 (0.18–1.81)	
Total	59 (9.3)		25 (4.2)		84 (6.8)		< .0001

P value for age: *$P < .05$.

TMJ Sounds

Overall, TMJ sounds were the most prevalent symptom, reported by 23.7% of the participants. Prevalence rates were higher from 21 to 50 years of age, overall, and in both genders (although significance was not achieved). They were lowest in the 61- to 65-year-old group (15.8%) to highest in the 21- to 30-year-old group (26.5%). With men as the reference, the RR was numerically but not significantly increased in women (RR = 1.21; 95% CI = 0.99 to 1.49).

TMJ Pain

TMJ pain was the second most commonly reported symptom, present in 16.3% of the total sample. Prevalence ranged from 12.7% (51- to 60-year-old group) to 18.5% (41- to 50-year-old group) ($P > .05$). Prevalence was significantly increased in women, relative to men (RR = 2.09; 95% CI = 1.59 to 2.77).

Table 4 Prevalence of at Least One, at Least Two, and Three or More TMD Symptoms According to Gender (n = 1,230)

	Women (n = 633)		Men (n = 597)		Overall (n = 1,230)		
Age	n (%)	RR (95%CI)	n (%)	RR (95%CI)	n (%)	RR (95%CI)	*P* value
At least 1 TMD symptom							
15–20	33 (41.3)	Reference	29 (30.5)	Reference	62 (35.4)	Reference	
21–30	65 (47.8)	1.15 (0.84–1.58)	40 (35.4)	1.16 (0.78–1.71)	105 (42.2)	1.19 (0.92–1.52)	
31–40	57 (44.9)	1.08 (0.78–1.50)	52 (38.5)	1.26 (0.87–1.82)	109 (41.6)	1.17 (0.91–1.50)	
41–50	62 (52.1)	1.26 (0.92–1.72)	29 (26.9)	0.87 (0.56–1.35)	91 (40.1)	1.13 (0.87–1.46)	
51–60	42 (40)	0.96 (0.68–1.37)	30 (32.6)	1.06 (0.70–1.63)	72 (36.5)	1.03 (0.78–1.35)	
61–65	22 (33.3)	0.80 (0.52–1.24)	21 (38.9)	1.27 (0.81–2)	43 (35.8)	1.01 (0.74–1.38)	
Total	281 (44.4)		201 (33.7)		482 (39.2)		< .0001
At least 2 TMD symptoms							
15–20	16 (20)	Reference	7 (7.4)	Reference	23 (13.1)	Reference	
21–30	30 (22.1)	1.10 (0.64–1.89)	16 (14.2)	1.92 (0.82–4.47)	46 (18.5)	1.40 (0.88–2.23)	
31–40	35 (27.6)	1.37 (0.81–2.32)	16 (11.9)	1.60 (0.68–3.75)	51 (19.5)	1.48 (0.94–2.33)	
41–50	30 (25.2)	1.26 (0.73–2.15)	14 (13)	1.75 (0.74–4.17)	44 (19.4)	1.47 (0.92–2.34)	
51–60	24 (22.9)	1.14 (0.65–2)	11 (12)	1.62 (0.65–4)	35 (17.8)	1.35 (0.83–2.19)	
61–65	11 (16.7)	0.83 (0.41–1.67)	7 (13)	1.75 (0.65–4.75)	18 (15)	1.14 (0.64–2.02)	
Total	146 (23.1)		71 (11.9)		217 (17.6)		< .0001
At least 3 TMD symptoms							
15–20	9 (11.3)	Reference	2 (2.1)	Reference	11 (6.3)	Reference	
21–30	15 (11)	0.98 (0.44–2.13)	7 (6.2)	2.94 (0.62–13.83)	22 (8.8)	1.40 (0.69–2.82)	
31–40	23 (18.1)	1.61 (0.78–3.30)	7 (5.2)	2.46 (0.52–11.60)	30 (11.5)	1.82 (0.93–3.53)	
41–50	16 (13.4)	1.19 (0.55–2.57)	6 (5.6)	2.63 (0.54–12.77)	22 (9.7)	1.54 (0.76–3.09)	
51–60	15 (14.3)	1.27 (0.58–2.75)	5 (5.4)	2.58 (0.51–12.97)	20 (10.2)	1.61 (0.79–3.27)	
61–65	4 (6.1)	0.53 (0.17–1.67)	4 (7.4)	3.51 (0.66–18.59)	8 (6.7)	1.06 (0.43–2.55)	
Total	82 (13)		31 (5.2)		113 (9.2)		< .0001

P value for age: **P* < .05; ***P* < .01.

MMP

Overall, 15.4% of participants had pain on the masticatory muscles. Prevalence was relatively consistent across ages and was increased in women versus men (19.9% versus 10.7%, RR = 1.85; 95% CI = 1.40 to 2.45).

DDMO

This symptom was reported by 9.8% of the participants. Peak of prevalence (13%) was found among individuals aged 31 to 40 years. Lower prevalence (4%) was noted in the reference group. Prevalence increased in young and middle-aged adults and declined in the elderly. Prevalence was higher in women than in men (11.7% versus 7.7%, RR = 1.51; 95% CI = 1.06 to 2.15).

DDLD

This was the least prevalent symptom, reported by 6.8% of the sample, with prevalence ranging from 3.3% in those aged 61 to 65 years to 8.4% in the 21- to 30-year-old group. It occurred more frequently in women than in men (9.3% versus 4.2%, RR = 2.22; 95% CI = 1.41 to 3.50).

Number of TMD Symptoms

Respondents were also grouped according to the number of TMD symptoms (Table 4). At least one TMD symptom was reported by 39.2% of participants. The rate ranged from 35.4% in the 15- to 20-year-old group to 42.2% in the 21- to 30-year-old group. It was noted by 44.4% of the women and 33.7% of men ($P < .0001$, RR = 1.31; 95% CI = 1.14 to 1.52).

At least two TMD symptoms were reported by 17.6% of the sample, ranging from 13.1% in the 15 to 20 year-old group to 19.5% in the 31- to 40-year-old-group. Prevalence was 23.1% in women and 11.9% in men ($P < .0001$; RR = 1.93; 95% CI = 1.49 to 2.51).

Three or more TMD symptoms were reported by 9.2% of the sample. Prevalence ranged from 6.3% to 11.5%, and was higher in women versus men (13% versus 5.2%, $P < .0001$, RR = 2.49; 1.67 to 3.71).

Table 5 Distribution of Pain Symptoms Associated with TMD (TMJ Pain and MMP) According to Gender (n = 1,230)

	Women (n = 633)		Men (n = 597)		Overall (n = 1,230)		
Age	n (%)	RR (95%CI)	n (%)	RR (95%CI)	n (%)	χ^2 (*P*)	RR (95%CI)
TMD pain							
15–20	26 (32.5)	Reference	14 (14.7)	Reference	40 (22.9)		Reference
21–30	47 (34.6)	1.06 (0.71-1.57)	20 (17.7)	1.20 (0.64-2.24)	67 (26.9)		1.17 (0.83–1.65)
31–40	40 (31.5)	0.96 (0.64-1.45)	33 (24.4)	1.65 (0.94-2.92)	73 (27.9)		1.21 (0.87–1.70)
41–50	44 (37)	1.13 (0.76-1.68)	16 (14.8)	1 (0.51-1.95)	60 (26.4)		1.15 (0.81–1.63)
51–60	32 (30.5)	0.93 (0.61-1.43)	14 (15.2)	1.03 (0.52-2.04)	46 (23.4)		1.02 (0.70–1.48)
61–65	17 (25.8)	0.79 (0.47-1.33)	12 (22.2)	1.50 (0.75-3.02)	29 (24.2)		1.05 (0.69–1.60)
Total	206 (32.5)		109 (18.3)		315 (25.6)	32.911 (<.0001)	

TMD Pain

The sample was also grouped as a function of pain potentially related to TMD (Table 5). TMD pain was reported by 25.6% of the sample. Prevalence was higher in women than in men (32.5% versus 18.3%; $P < .0001$, RR = 1.78; 95% CI = 1.45 to 2.18). No significant age differences emerged.

Discussion

TMD are highly prevalent disorders.[1,11] Although several epidemiological studies have been conducted, population-based studies are still necessary due to incongruent results on prevalence, as well as on the need of establishing regional differences. Furthermore, since biological predisposition (reflecting racial differences) and external exposures may vary as a function of region, the present study was justified. Its most important findings are: *(1)* At least one TMD symptom was reported by almost 40% of the individuals from the population. Since the clinical relevance of presenting only one symptom was not established, multiple symptoms were also measured. Prevalence remained elevated; *(2)* Pain potentially related to TMD happened in one fourth of the population; *(3)* TMJ sounds represented the most common symptom of TMD, followed by TMJ pain and MMP; and *(4)* TMD symptoms were more prevalent in women than in men.

According to the AAOP,[1] a precise diagnosis of TMD comes from the history, examination, and psychological evaluation of the individual. However, this approach is expensive and often unfeasible for populational surveys. Supported by the literature,[3–5,7,31] the present study was based on telephone interviews. However, since questionnaire-based assessments of TMD may be inaccurate and the number of symptoms required to define a disease is not established, the authors opted to present the prevalence of each symptom individually and grouped in different sets of combinations according to the number of the symptoms reported, as well as according to the presence of pain.

It is difficult to conceptualize the findings in the context of the literature due to differences in samples, criteria, and methods used for collecting the information; accordingly, published results vary enormously. However, similarities were found between the present results and previous findings. For example, with regard to age, symptoms were more common in those from 20 to 50-years old, as previously described.[32,33] This finding differs from another publication.[34] The gender influence on TMD is also well described,[1,3,7,10,12] with women more affected than men. The present findings are strengthened by the fact that the data was collected in a population-based sample with women and men in balanced ratios (51.5% and 48.5%).

TMJ sounds, followed by TMJ pain, were the most common symptoms. Previous studies found rates ranging from 11% to 48.6% for TMJ sounds.[3–5,7,9,10] TMJ sounds reflect articular changes, often disc displacement with reduction.[1] However, since high variability of the position of the disc happens in asymptomatic subjects, TMJ sounds are sometimes considered to be nonpathologic or, at least, requiring no treatment.[35]

Despite methodological differences, a review of 18 epidemiological studies suggested that prevalence of TMD in adults ranges from 16% to 59%.[11] In representative population studies, prevalence ranges from 30% to 47%,[3,5,6] aligned to the present findings. Pain potentially related to TMD was reported by a sizable proportion of participants in the present study. The authors have a

specific interest in this symptom since it seems to be comorbid with other pain syndromes, such as primary headaches and back pain,[19–40] and since they recently found that TMD pain is a factor that increased the odds to migraine chronification.[20] Among the several symptoms of TMD, pain deserves special attention. Nonetheless, it is acknowledged that pain as a symptom is particularly prone to methodological differences. For example, demographic features such as race[41–44] are of importance: it has been suggested that Caucasians are more likely to report pain than African-Americans,[41–44] and Asians.[45] Geographic differences also seem to be of importance; highest reported rates of TMD have been reported by Italians (38.2%)[35] and Mexicans (46.1%).[13] In the present sample, prevalence of TMD pain (25.6%) was lower but, of any TMD symptom, was similar to the above mentioned studies. Since ethnic background does not seem to influence severity of TMD pain or TMD-related behavior, risk factors for TMD pain (eg, depression, somatization, stress) should be explored.[46]

Since the present study relied on a telephone-based questionnaire, data were self-reported (and, accordingly, investigated symptoms rather than signs). Nonetheless, this questionnaire was developed from a 10-item questionnaire.[26] In the process of validating a shorter version of this questionnaire, the authors found that although all of the original questions had good reliability, the five retained questions were associated with maximum reliability. Thus, they opted not to separately analyze questions assessing symptoms from questions assessing signs.

Caution is required when interpreting the results. First, TMD was not assessed, but rather the presence of any of the TMD symptoms that raise the clinical suspicion of TMD; therefore, what was identified were individuals with possible TMD. It can be argued that the diagnostic criteria were too loose. Indeed, when assessing the prevalence of two or more TMD symptoms, the proportion of individuals endorsing the criteria fell from 39.2% to 17.6% and 9.2%. If the criterion for possible TMD was the presence of TMD pain, the prevalence was 25.6%. Second, the methodology did not include clinical examinations, so there was no independent confirmation of complaints. Hence, diagnostic error may have applied to some participants. Additionally, recall of temporomandibular pain is known to be poor, and questionnaire-based screenings may overestimate the severity of pain.[47] However, the potential for this bias seems to be low, according to a validating study.[48] Third, the sample was selected ultimately through the telephone directory. In none of the preidentified subregions (regardless of socioeconomic status) did the authors find difficulties in enrolling participants per street. Nonetheless, results are from individuals with fixed telephones in their residences. Finally, although the authors computed the nonrespondent "streets," they did not have figures for nonrespondent households. This was clearly a mistake. Nonetheless, the fact that sampling was rigorous, stratified by subregion, and with homogeneous income per subregion of the city (as previously established by the demographic census), the authors feel reassured that the potential for bias is small, although they acknowledge the error.

Strengths of the study include the use of a randomized stratified probability sample representative of the urban areas of the city, allowing an estimate of the prevalence of TMD symptoms according to gender and age. Also, the sample was homogeneously distributed between women and men, preventing bias related to care-seeking behavior more common among women.[49]

The present study has a confirmatory component and some new findings. From the confirmatory perspective, the prevalence rates of symptoms are consistent with the literature with regard to the distribution of the symptoms according to the age and gender. Nonetheless, the merit of this confirmatory component (eg, the higher prevalence of all symptoms and TMD pain among women compared to men) consists in replicating the findings in a large population setting and also in generating regional epidemiology data. Furthermore, in contrast to most studies, a combination of symptoms was collected and presented as well. The authors consider that using any single symptom as suggestive of TMD may lack specificity. Therefore, as a prelude to field test screening questionnaires for TMD, they described isolated as well as a combination of symptoms.

Conclusions

Individual TMD symptoms, as well as a combination of TMD symptoms, were prevalent in the urban Brazilian population and more frequent in women than in men. Additional studies should focus on risk factors for and relevance of TMD for the sufferers.

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