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# Temporomandibular disorders in elderly individuals: the influence of institutionalization and sociodemographic factors

### ABSTRACT

**Purpose:** The aim of this study was to determine the factors associated with temporomandibular disorders (TMD) in the non-institutionalized and institutionalized elderly population of Feira de Santana, Bahia, Brazil. **Methods:** A cross-sectional study was carried out in 307 subjects over 60 years old of both genders, where 80 are institutionalized and 227 are non-institutionalized. The evaluation of TMD signs and symptoms was performed using the Fonseca Anamnestic Index (IAF) as to sociodemographic, systemic and otological factors. The results were analyzed by correlating the study factors and the prevalence of TMD. A 95% confidence interval (CI) and a 5% significance level were established for all the tests used. **Results:** The results showed that 50.5% of the subjects presented some degree of TMD. The prevalence of TMD was 49.8% among non-institutionalized elderly individuals and of 52.5% among institutionalized individuals. Variation in the prevalence of TMD, with statistical significance according to gender, age, income, tinnitus, dizziness, and depression was observed. **Conclusion:** The prevalence of TMD was significant among the elderly population. There was no statistically significant difference between the prevalence of TMD in institutionalized and non-institutionalized individuals. Identifying TMD in the elderly population may be difficult because the symptoms of these disorders are similar to symptoms commonly presented in some systemic disorders associated with aging.

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## INTRODUCTION

Temporomandibular disorders (TMD) has been described as a cluster of disorders characterized by pain in the preauricular area, masticatory muscles and temporomandibular joint (TMJ), limitation or deviations in mandibular range of motion, and clicking of the TMJ during mandibular function. The prevalence of this condition varies between 16 and 59% depending on the type of population studied, as well as on the diagnostic system used. Although not categorized as a public health problem, TMD are becoming important diseases in the healthcare field due to the number of people they affect. Literature reports great variability in the prevalence of clinical symptoms and signs, probably as a result of the different clinical criteria used<sup>(1,2)</sup>.

TMD may be a challenge due to its multifactorial etiology, with characteristics that can mimic many other different conditions. They have behavioral and systemic components and therefore are complex to diagnose. Their clinical manifestations can be acute or chronic, accompanied or not by pain and impaired jaw function<sup>(3,4)</sup>.

The degree of difficulty to diagnose TMD is increased among the elderly population because their symptoms are presented simultaneously with biochemical and physiological alterations related to aging<sup>(4)</sup>. Healthcare professionals need to understand how these changes lead to TMD, and how they affect pre-existing conditions<sup>(5)</sup>. It is important to bear in mind that the elderly may have complications of disease processes accumulated over their lifetime, which could lead to an increased prevalence of TMD in this age group<sup>(6,7)</sup>.

Studies have shown that changes in systemic conditions may vary among the institutionalized and non-institutionalized elderly population<sup>(7-9)</sup>. Thus, this study aimed to identify the association of sociodemographic, systemic and otological factors related to muscle pain with TMD in a non-institutionalized and institutionalized group of elderly people in a semi-arid region in Brazil.

## METHODS

A cross-sectional epidemiological study was conducted in Feira de Santana, state of Bahia, Brazil.

According to the World Health Organization (WHO), in developing countries an elderly person is defined as someone over 60 years old<sup>(10)</sup>. Psychological ability to respond to the survey instrument was used as an inclusion criteria. All residents of Long Term Institutions for the Elderly (NHs) registered in the

Secretary of Social Development of the City of Feira de Santana, and all registered seniors attending the workshop program of the Third Age Open University were considered eligible for this study. Thus, the study population comprised 307 elderly, where 80 were institutionalized (NHs) and 227 non-institutionalized individuals.

For the purpose of calibration for the researchers and adequacy of the instrument, we used a pilot study performed with the participation of 30 individuals who attend a daycare center for the elderly in the city. All participants were re-examined a week later.

After the pilot study, adjustments were made to the instrument designed for the study, which consisted of an epidemiological survey divided into blocks of data comprising the sociodemographic, systemic and otologic factors, as well as muscle pain. The Fonseca Anamnestic Index (IAF) was used to detect TMD<sup>(11)</sup>. The IAF was chosen because it is available in Portuguese; it's a valid tool for characterization of TMD symptoms; it's recommended for use in the public health service for screening of TMD; and due to its simplicity, rapidity and low cost<sup>(11-14)</sup>.

The index consists of 10 questions that can be answered with "Yes", "Sometimes" and "No", associated with scores 10 (ten), 5 (five) and 0 (zero), respectively. The sum of these scores categorized TMD as: absent, if the score was below 20; and present, if the score was above 20. Where TMD was present, it was classified as: mild, if the score was below 45; moderate, if the score was below 70; and severe, if the score was above 70<sup>(11-14)</sup>.

The data collected was statistically analyzed using the program R version 2.9.0 (Vienna, Austria). In order to evaluate the association between the study factors, prevalence of TMD and prevalence rates, the chi-squared test ( $\chi^2$ ) was used with a 95% confidence interval and a 5% significance level.

The study was submitted to the Research Ethics Committee of Universidade Estadual de Feira de Santana and it was approved under the Kyoto Protocol In 0005/2010, CAEE 0006.0.059.000-10. All individuals who agreed to participate voluntarily in the study were informed of the purposes of the study and signed a consent form.

## RESULTS

The prevalence of TMD was 50.5% among 307 elderly participants; where 49.8% of those were non-institutionalized and 52.5% were institutionalized individuals. There was no significant difference between the two groups (Table 1).

**Table 1.** Prevalence (%) of TMD, according to the Fonseca Anamnestic Index (IAF), prevalence ratio (PR) with confidence interval (CI) of 95% and p-value of Chi-squared ( $\chi^2$ ) in non-institutionalized and institutionalized elderly individuals

TMD	Total		Non-institutionalized		Institutionalized		PR (CI <sub>95%</sub> )	$\chi^2$ p value
	N(307)	%	N (227)	%	N(80)	%		
Absent	152	49.5	114	50.2	38	47.5	1.02 (0.90-1.17)	0.676
Present	155	50.5	113	49.8	42	52.5		
Mild	113	72.9	76	67.2	37	88.1		
Moderate	34	21.9	31	27.5	03	07.1		
Severe	08	05.2	06	02.3	02	04.8		

We observed a higher prevalence of TMD among female individuals in the non-institutionalized elderly population of 2.48 (95% CI: 1.03 to 6.00) times that of male individuals, whereas there was no significant differences between the prevalence of TMD in the non-institutionalized population. With regard to age, those between 60 and 70 years old presented the highest prevalence (59.5%) among the non-institutionalized group, 1.63 (95% CI: 1.18 to 2.24) times higher than the group between 71 and 80 years old. Among institutionalized individuals, the highest prevalence was 57.7% for the ones between 71 and 80 years old (Table 2).

It was observed that TMD was more prevalent among those individuals with income between \$ 501.00 and 1500.00 dollars/month. Among the non-institutionalized elderly, a reduction in prevalence of 0.49 (95% CI: 0.42 to 0.57) times for the lower income group was observed, and among the institutionalized, a reduction of 0.52 (95%: 0.39 to 0.68) times compared to lower and higher income groups (Table 2).

The non-institutionalized elderly population with elementary education level had the highest prevalence of TMD (62.7%; Table 2).

There was a higher prevalence of TMD among those who reported tinnitus. In the non-institutionalized elderly population, a prevalence 2.28 times higher than those who do not report tinnitus was observed. For institutionalized subjects, the prevalence of

TMD among those with depression was 72.2%, representing an increase of 1.64 (95% CI: 1.07 to 2.50) times compared to those with no depression (Table 3).

Individuals who reported hypertension did not present statistical differences between the prevalence of TMD for both groups studied. The same is true for diabetes and daily use of medication (Table 3).

Prevalence of TMD was greater among older adults who reported pain or tenderness of the muscles involved in mastication. Among those who presented click on TMJ, prevalence of TMD was 66.7% in non-institutionalized elderly individuals, causing an increase of 1.56 times when compared to the group who did not present click (Table 4).

## DISCUSSION

The prevalence of TMD in non-institutionalized and institutionalized groups presented similar results with no statistically significant difference. In a study performed by Abud et al.<sup>(5)</sup>, the prevalence of TMD was similar for both groups, however with lower prevalence rates (29.5%).

Some studies have shown that prevalence of TMD in elderly populations is rare<sup>(15-17)</sup>. However, other authors reported that the elderly can often suffer from TMD, but do not complain because they are more concerned with other overall health

**Table 2.** Prevalence (%) of TMD according to sociodemographic factors among non-institutionalized and institutionalized elderly individuals and their prevalence ratios (PR) with confidence interval (CI) of 95% and p-values for Chi-square ( $\chi^2$ ) test

Variable	Non-institutionalized				institutionalized			
	N	%	PR (IC <sub>95%</sub> )	$\chi^2$	N	%	PR (IC <sub>95%</sub> )	$\chi^2$
<b>Gender</b>	109	52.4	1	0.009	28	52.8	1	-
Female	04	21.0	2.48 (1.03-6.00)*		14	51.8	1.01 (0.65-1.58)	0.934
Male								
<b>Race</b>	21	45.6	1	-	08	47.0	1	-
White	25	58.1	0.78 (0.52-1.17)	0.239	06	54.5	0.86 (0.41-1.80)	0.699
Black	67	48.5	0.94 (0.65-1.34)	0.733	27	54.0	0.87 (0.49-1.53)	0.620
Mixed								
<b>Age</b>	75	59.5	1	-	08	40.0	1	-
60 to 70	30	36.6	1.63 (1.18-2.24)*	0.001	15	57.7	0.69 (0.36-1.30)	0.234
71 to 80	08	42.1	1.41 (0.82-2.44)	0.152	09	47.3	0.84 (0.41-1.72)	0.642
Above 81								
<b>Marital Status</b>	31	54.3	1	-	26	56.5	1	-
Single	34	54.8	0.99 (0.71-1.37)	0.960	04	44.4	1.27 (0.58-2.75)	0.505
Married	47	44.3	1.22 (0.89-1.69)	0.220	12	48.0	1.17 (0.72-1.90)	0.491
Widower								
<b>Educational Level</b>	01	50.0	0.87 (0.21- 3.58)	0.856	21	58.3	1	-
Illiterate	32	62.7	0.69 (0.48-0.98)*	0.042	07	41.2	1.41 (0.75-2.66)	0.242
Incom Elem I	15	53.5	0.81 (0.52-1.27)	0.377	03	50.0	1.16 (0.50-2.71)	0.702
Comp Elem I	21	44.7	0.97 (0.63-1.49)	0.906	05	71.4	0.81 (0.47-1.40)	0.516
Incom Elem II	09	50.0	0.87 (0.50-1.49)	0.628	01	20.0	2.91(0.49-7.20)	0.107
Comp Elem II	02	40.0	1.08 (0.35-3.30)	0.877	00	0.0	inf	0.245
Incom HS	27	43.5	1	-	01	33.3	1.75 (0.34-8.87)	0.401
Comp HS	03	60.0	0.72 (0.33-1.56)	0.476	01	100	0.58 (0.44-.76)*	0.042
Incom Higher Ed	03	33.3	1.30 (0.49-3.43)	0.562	00	0.0	inf	0.245
Comp Higher Ed								
<b>Income</b>	02	100.0	0.49 (0.42-0.57)*	0.152	01	100.0	0.52 (0.39-0.68)*	0.342
<500	83	49.1	1	-	25	52.0	1	-
501 to1.500	08	34.7	1.41 (0.79-2.52)	0.196	00	0.0	-	0.302
1.501 to 2.500	02	20.0	2.45 (0.70-8.56)	0.073	01	100	0.52 (0.39-0.68)*	0.342
>2.500								

\* Statistically significant at level of 5%

**Table 3.** Prevalence (%) of TMD, according to otologic and systemic factors in non-institutionalized and institutionalized elderly, and their prevalence ratios (PR) with confidence interval (CI) of 95% and p-values for Chi-square test ( $\chi^2$ )

Variable	Non-institutionalized				Institutionalized			
	N	%	PR (IC 95%)	$\chi^2$	N	%	PR (IC 95%)	$\chi^2$
<b>Tinnitus</b>								
Yes	87	64.4	1		28	71.8	1	-
No	26	28.2	2.28 (1.60-3.23)*	<0.001	13	32.5	2.21 (1.35-3.59)*	< 0.001
<b>Dizziness</b>								
Yes	78	68.4	1		30	73.1	1	-
No	35	30.9	2.20 (1.63-2.99)*	<0.001	12	30.7	2.37 (1.43-3.94)*	<0.001
<b>Hypertension</b>								
Yes	70	51.5	1	0.533	17	65.3	1	-
No	43	47.2	1.09 (0.83-1.42)		19	41.3	1.58 (1.01-2.46)	0.049
<b>Diabetes</b>								
Yes	20	46.5	1	0.657	10	55.6	1	-
No	92	50.2	0.92 (0.65-1.31)		25	48.0	1.16 (0.70-1.91)	0.584
<b>Depression</b>								
Yes	43	67.2	1	-	13	72.2	1	-
No	68	42.7	1.57 (1.22-2.01)*	<0.001	22	44.0	1.64 (1.07-2.50)*	0.040
<b>Use of daily medication</b>								
Yes	84	48.3	1	-	32	58.2	1	-
No	29	54.7	0.88 (0.66-1.17)	0.412	10	40.0	1.45 (0.85-2.47)	0.131
<b>Indication?</b>								
Circulatory	67	49.2	1	-	13	59.0	1	-
Bone/articulation	02	40.0	1.23 (0.41-3.65)	0.684	00	0.0	-	-
Nervous	05	83.3	0.59 (0.39-0.87)*	0.102	03	33.3	1.77 (0.66-4.75)	0.192
Endocrine	03	21.4	2.29 (0.83-6.53)	0.046	03	75.0	0.78 (0.40-1.53)	0.547
Others	07	53.8	0.91 (0.53-1.55)	0.752	03	60.0	0.98 (0.44-2.18)	0.970
Do not know	-	-	-	-	10	76.9	0.76 (0.48-1.21)	0.282
No medication	29	54.7	0.90 (0.66-1.21)	0.500	10	38.4	1.53 (0.84-2.79)	0.154

\* Statistically significant values

**Table 4.** Prevalence (%) of TMD, according to factors related to muscular hyperfunction and the respective prevalence ratios (PR) with confidence interval (CI) of 95% and p-values for Chi-square test ( $\chi^2$ ), in non-institutionalized and institutionalized elderly individuals

Variable	Non-institutionalized				Institutionalized			
	N	%	PR (CI 95%)	p	N	%	PR (CI 95%)	p
<b>Temporalis</b>								
Yes	27	96.4	1		13	92.8	1	
No	85	43.5	2.21 (1.85-2.63)*	<0.001	29	43.9	2.11 (1.55-2.88)*	<0.001
<b>Masseter</b>								
Yes	47	74.6	1		18	78.2	1	
No	65	40.6	1.83 (1.45-2.33)*	<0.001	24	42.0	1.85 (1.28-2.70)*	0.003
<b>Sternocleido mastoid</b>								
Yes	62	82.7	1		12	80.0	-	
No	50	33.7	2.44 (1.90-3.13)*	<0.001	30	46.9	1.70 (1.18- 2.45)*	0.020
<b>TMJ Clicks</b>								
Yes	38	66.7	1		08	88.9	1	
No	69	42.6	1.56 (1.21-2.02)*	0.002	33	48.5	1.83 (1.30-2.56)*	0.022

\* Statistically significant values

issues or more painful and debilitating diseases, leaving aside the symptoms related to the masticatory system<sup>(18)</sup>.

This study showed a high prevalence of TMD in the elderly. Therefore, it is necessary to analyze how diagnosis is generally performed. This condition is often diagnosed by observation of symptoms that are very subjective. Identification of these symptoms depends on cognitive ability, which varies widely both individually and among groups<sup>(15-18)</sup>. According to Schmitter et al.<sup>(18)</sup>, the elderly population presents a higher

prevalence of objective signs of TMD; however, they rarely complain of pain.

There was a variation in the prevalence of TMD related to gender, age, educational level and income. Some studies have been reporting that several health problems are associated with social inequalities. These inequalities have been increasing worldwide, as is the elderly population<sup>(7,19,20)</sup>.

Martins et al.<sup>(21)</sup>, in a study performed in São Paulo (Brazil), observed the relationship between occurrence of TMD and economic class, educational level, age and gender, but found a

statistically significant level for females only. Several studies have showed a higher prevalence of TMD in females. Behavioral, psychosocial, and hormonal differences between male and female individuals have been studied with no conclusive results<sup>(3,5,14)</sup>.

This study found differences in the prevalence of TMD among different educational levels. According to another study<sup>(21)</sup>, education was associated with the acquisition of more information, allowing cognitive assessment of health, which could lead to a different perception of TMD.

A socioeconomic factor that was associated with the prevalence of TMD in this study was monthly rent. Studies report that the poor elderly have worse quality of life related to health<sup>(6-9)</sup>. With regard to income, findings were similar among the groups studied, the elderly who received between one and two minimum wages having the most prevalent TMD rate. Those receiving lower income presented an increase in prevalence of TMD.

Otological factors, such as tinnitus and dizziness, are shown to be associated with the prevalence of TMD in the elderly for both groups studied. An increased prevalence of TMD among the elderly who reported these symptoms was observed. Studies report that tinnitus and dizziness are common in elderly patients<sup>(6,7,22-24)</sup>, as well as in patients with TMD<sup>(25-27)</sup>.

Depression was a stronger predictor associated with prevalence of TMD. Psychological factors are indicated as etiological for TMD in many studies; however, little is known about the relationship between TMD and neurophysiological etiology of depression<sup>(27-29)</sup>.

The presence of clicks in the TMJ during opening and closing of the mouth was observed with the aid of a stethoscope placed near the external ear. It was noted that among the elderly with clicks the prevalence of TMD was higher than 60%. Although clicks are often present in people with TMD, they cannot be regarded as a diagnostic symptom for these disorders, as they can also be found in individuals who do not suffer from TMD<sup>(30)</sup>.

It is important to be aware of the limitations of the findings of this study, as they were based on self-reported information. In addition, there was no cognitive assessment test prior to data collection.

## CONCLUSION

This study found a high prevalence of TMD, considering the population studied and the results of other studies. There was no statistically significant association between this prevalence and institutionalization. Gender, age, educational level, income, tinnitus, dizziness, and depression were associated with TMD in the non-institutionalized elderly population. However, in the institutionalized population, only gender was not associated with the presence of TMD.

This study highlights the need for further epidemiological studies to better understand the prevalence of TMD and their systemic, physiological, social and cultural implications for the elderly population. Additionally, it is important to emphasize the need to identify symptoms of TMD in the elderly, particularly those commonly present in some systemic disorders associated with aging.

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### Author contributions

*NMS is the Lead Researcher of the study, responsible for research, worked on all fronts to carry out the work; MCO is Researcher collaborator in data collection, tabulation and preparation of the article; AOO is Researcher responsible for statistical analysis and article correction; LBS is Collaborating researcher in data collection and correction of the article; TDBA is a Collaborative Researcher in data collection and article preparation.*