REVISTA CEFAC
SPEECH, LANGUAGE, HEARING SCIENCES AND EDUCATION JOURNAL
Rev. CEFAC. 2019;21(3):e17618 http://dx.doi.org/10.1590/1982-0216/201921317618

Original articles

Prevalence of temporomandibular joint disorder in people with Parkinson's disease in a public university hospital

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Conflict of interests: Nonexistent

ABSTRACT

Objective: to evaluate the prevalence of temporomandibular joint disorder in people with Parkinson's disease in a public university hospital, and relate it to sociodemographic factors, general health and oral health self-report, and phase and time of illness.

Methods: the Research Diagnostic Criteria for Temporomandibular Disorders were used. The sample was classified according to the diagnosis of temporomandibular disorder and associated with the variables. The odds ratio of Chi-square was applied with a 95% confidence interval and a level of significance set at $p<0.05$.

Results: 110 people presented with Parkinson's disease were assessed. The prevalence of temporomandibular disorder was 35%, being more frequent among males (58%), in elderly people (53%), in phase 2 of the disease (61%), click (37%) being the predominant clinical indication. Of the variables analyzed, only gender and self-perception of oral health showed to be associated with temporomandibular disorders.

Conclusion: the presence of temporomandibular disorder has been observed in people with Parkinson's disease, and the fact of being male and reporting moderate oral health seen as associated factors.

Keywords: Parkinson's Disease; Temporomandibular Joint Disorders; Reported Pain

Received on: August 31, 2018
Approved on: April 17, 2019

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INTRODUCTION

The temporomandibular joints (TMJ) are considered to be one of the most complex in the human body. They are two joints connected to a single bone, the mandible, working simultaneously, making rotational and translational movements, with an important role in chewing. They're subject to unfavorable situations, needing to accommodate occlusive, muscle and cervical adaptations. Therefore, unbalanced circumstances may result in joint and/or muscle dysfunctional conditions[1].

As for the multifactorial etiology, temporomandibular disorder (TMD) is related to anatomic and neuromuscular aspects, as well as parafunctional habits, postural deviations, traumas and psychosocial changes. Thus, it causes a range of conditions and symptoms, such as pain in the muscles of mastication and TMJ, presence of noise and joint deviation, headache, hearing disorders, sensibility all over the muscles of the cervical and stomatognathic system[2]. These characteristics vary from person to person, whose quality of life is negatively affected by their presence. The person's physiological and structural tolerance is the aspect that will determine whether they will develop the disorder[2].

Chewing is a highly coordinated movement regulated by the central nervous system. The areas of the brain associated with chewing have important roles in the changes that occur in the orofacial functions; they are also responsible for determining the chewing rhythm, as well as for coordinating the activity of the muscles of mastication[3]. Hence, disorders occurring in the parts of the stomatognathic system may result not only from peripheral oral conditions, but also from neurologic disorders that might affect the orofacial motor functions[4].

Among these disorders is Parkinson's disease, a most frequent neurodegenerative disease in the world, second only to Alzheimer. It usually affects people over 55 years old, mostly men[5], and is characterized by the degeneration of dopaminergic neurons, thus leading to a depletion of dopamine and producing the main signs and symptoms of the disease, such as bradykinesia, stiffness, postural instability and shaking at rest[6]. As these symptoms extend to the structures of neck and face, changes in the mandibular movements may occur, indicating that such people are more prone to developing TMD[7].

Furthermore, studies show that factors such as myofascial pain, bruxism, limitations to mouth opening, articular disc displacement with reduction and asymmetry in the distribution of occlusive contact increase the incidence of TMD in this population[8-11]. In face of the need for studies that deal with this subject, the goal of this survey was to assess the prevalence of TMD in people with Parkinson's disease in a Brazilian public university hospital.

METHODS

This survey was carried out in the Neurology Clinic of the Clinics Hospital (abbreviated HC, from its name in Portuguese), situated in the city of Recife, in the state of Pernambuco, in partnership with the Pro-Parkinson Extension Program of the Federal University of Pernambuco (abbreviated UFPE, from its name in Portuguese), which is linked to a project called *Influence of temporomandibular disorder in the strength of biting and electric activity of the muscles of mastication in people with Parkinson's disease*, which was submitted to and approved by the Committee for Ethics in Research (CEP, in Portuguese) with Humans of the Federal University of Pernambuco. The number of the Certification of Submission for Ethical Appreciation (CAAE, in Portuguese) is: 59421416.9.0000.5208.

For defining the participants of the survey, the sample calculation was based on a non-probabilistic sample (convenience) grounded on the number of people that were cared for in the Pro-Parkinson Extension Program of HC/UFPE, adding up to about 352 people.

People with Parkinson's disease from both genders were included, who presented clinic diagnosis of idiopathic Parkinson's disease in phases 1 to 3, as established by the world scale for classifying the disease, Hoehn and Yahr[12], and people on the "on" phase, that is, under the influence of antiparkinsonian drugs, possessing at least six natural front teeth or dental prosthesis that filled in the missing ones on both dental arches. All of them were well oriented and being taken care of by relatives. Exclusion criteria were: people with other neurologic diseases associated with Parkinson's disease; people with compromised cognition, as evaluated by the Mini-Mental State Examination (MMSE); and people lacking their teeth on both dental arches.

Data was gathered from November 2016 to November 2017, by means of individual face-to-face interviews. First contact was made with the possible participants at the Neurology Clinic of the HC/UFPE, which sent the information about the survey. Those who

agreed to participate were submitted to the eligibility criteria; the eligible ones signed an informed consent. Then, they were assessed with the help of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD)[13].

Evaluation began with cognitive screening, in which the MMSE was used, a questionnaire made up of 11 items with maximum score of 30 points, which lasts from 5 to 10 minutes to take[14]. In order to classify the severity of Parkinson's disease, the original version of Hoehn and Yahr's scale was used, which consists of a classification in five phases: Phase 1: unilateral disease, usually light symptoms; Phase 2: bilateral disease not affecting balance; Phase 3: worsening of symptoms, added to balance disorders; Phases 4 and 5: most severe forms of the disease in which people have serious disability or are bed confined.

Signs and symptoms of TMD were assessed according to RDC/TMD, which encompasses a series of diagnostic criteria, thus enabling the evaluation of the temporomandibular disorder and the psychosocial situations related to it[13]. It has a biaxial approach, making it possible to measure physical findings in axis I and to evaluate the psychosocial status in axis II. Data obtained in axis II are the basis for the diagnosis referred to in axis I[15]. The diagnoses acquired from axis I are divided in three groups: Group I: muscle disorders (myofascial pain, and myofascial pain with limited opening); Group II: disc displacement (disc displacement with reduction, disc displacement without reduction with limited opening, and disc displacement without reduction without limited opening); and Group III: arthralgia, arthritis, osteoarthritis (arthralgia, TMJ arthritis and TMJ osteoarthritis). Thus, a single person may have multiple diagnoses. However, for the diagnosis of each individual, only one muscle diagnosis (Group I) may be given, as well as only one Group II diagnosis and only one Group III diagnosis, for each side of the face[16].

The evaluations were carried out by a team made of a dental surgeon, a physiotherapist and in training undergraduate and graduate Dentistry students. Due to the clinical characteristics of the sample, the questionnaires were used in the form of interview. Questions were read always in the same order and the options for answering each question were presented.

Characteristics specific to each RDC/TMD group, as well as those people who had two or more diagnoses, were presented according to their frequency. Due to the small amount of people found in RDC/TMD subgroups, and with the intent on helping the analysis, these subgroups were blended into the three big groups of the questionnaire: Group I: muscle disorders; Group II: disc displacement; and Group III: arthralgia, arthritis and osteoarthritis.

Descriptive statistics and frequency count were used to characterize the sample. Firstly, the sample was categorized in accordance with TMD diagnosis in order to study the association according to demographic variables (age, gender, time of illness and progress of Parkinson's disease) and the self-reports on oral and general health. Secondly, the association between each pair of possible variables and the TMD groups was assessed. The odds ratio of the Chi-square with confidence interval of 95% was applied to the analysis and the Statistica 13.2 software was used, with a level of significance of 0.05.

RESULTS

In total, 171 people were invited to take part in the survey. After excluding those that didn't meet the eligibility criteria, the final sample was made of 110 persons (Figure 1). Of these, 65% were male, elderly (63%), married (67%), with a family income of 2 to 3 minimum salaries, having attended school until high school, in phase 2 of the disease (54%), having had the disease for 1 to 10 years (85%) (Table 1)

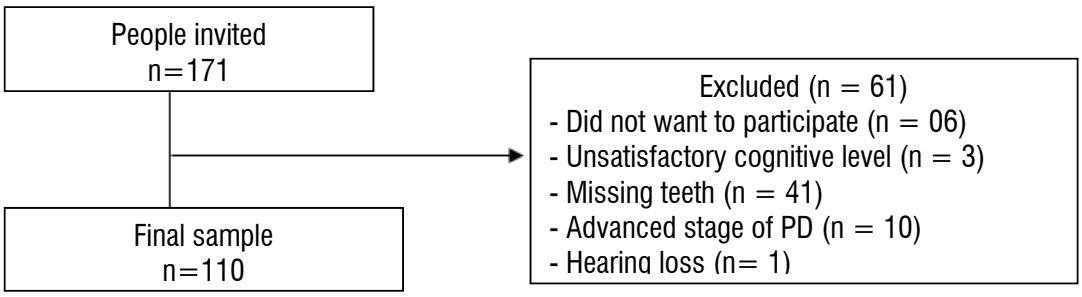


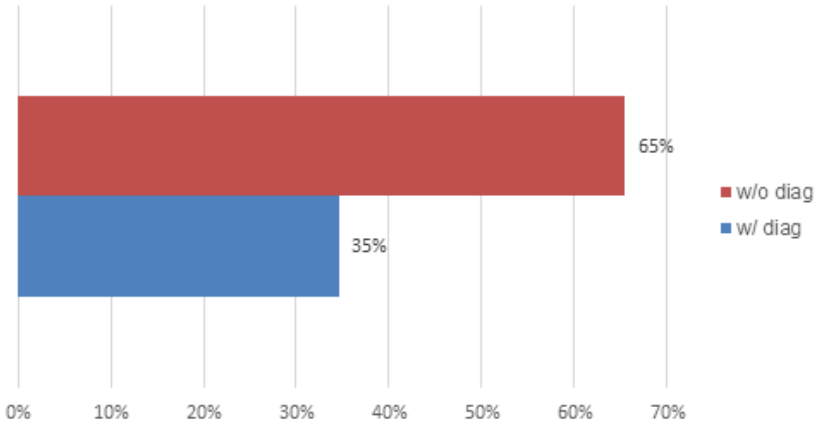
Figure 1. Sample selection flowchart

Table 1. Distribution of sociodemographic variables, phase of the disease and the prevalence of temporomandibular disorder. Recife, Brazil, 2017

Variables	n	%	Prev. TMD%	P[1] value
Gender				
Female	38	35%	42%	0.29
Male	72	65%	58%	
Age				
<60 years old	41	59%	47%	0.14
>60 years old	69	63%	53%	
Marital status				
Single	3	3%	3%	p>0.05
Married	74	67%	61%	
Widow(er)	11	10%	16%	
Cohabiting	11	10%	16%	
Separated	3	3%	0%	
Divorced	4	4%	5%	
Never married	4	4%	0%	
Level of education				
Illiterate	3	3%	3%	p>0.05
Primary school	24	22%	24%	
Middle school	27	25%	24%	
High school	33	30%	32%	
College	23	21%	18%	
Income				
1/2 to 1	10	9%	13%	p>0.05
2 to 3	44	40%	32%	
4 to 5	20	18%	13%	
6 to 10	24	22%	26%	
11 to 15	10	9%	13%	
16 to 20	2	2%	3%	
Hoehn & Yahr				
1	27	25%	21%	p>0.05
2	59	54%	61%	
3	24	22%	18%	
Time of illness				
1|---|10	94	85%	82%	p>0.05
11|---|20	16	15%	18%	

Prev. TMD: Prevalence of temporomandibular disorder; P1 value: Chi-Square test; *p<0.05

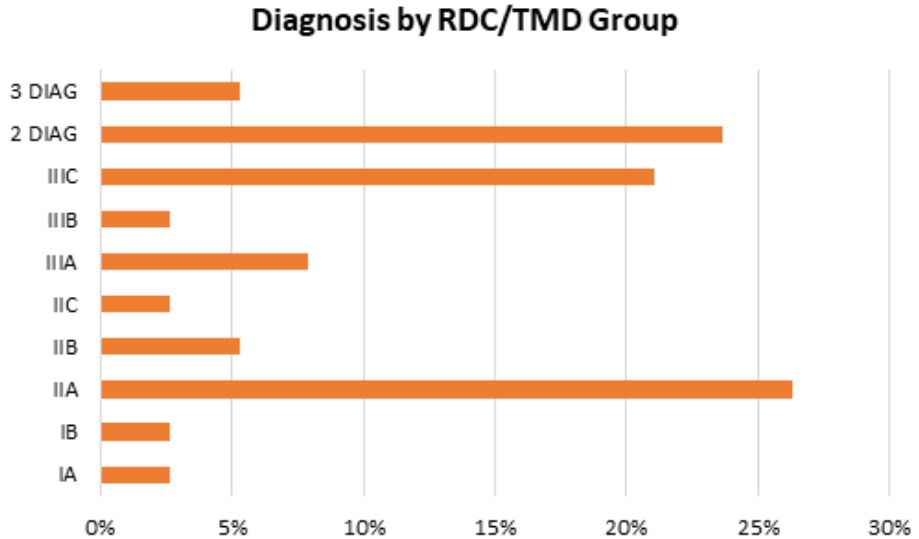
Diagnosis of temporomandibular disorder was of 35%, as seen in Figure 2, and its relation to the sample's qualitative variables may be verified in Table 1. There has been a predominance of TMD in males (58%), in the elderly (53%), in married people (61%), in those averaging 2 to 3 minimum wages of family income (32%), in those having attended up to 11 years of school, classified as high school (32%), in phase 2 of the disease (61%). However, there hasn't been found significant correlation of the analyzed variables with the presence of TMD ($p<0.05$).



Footnote: W/o diag = Without diagnosis; W/ diag = With diagnosis

Figure 2. Sample distribution according to diagnosis of temporomandibular disorder, in a Public University Hospital in Recife, Brazil, 2017

Diagnosis by group may be observed in in Figure 3, with a greater percentage of people diagnosed with TMD of the IIA Group (26%) - disc displacement with reduction, characterized by the presence of click - followed by people that presented two clinical signs for diagnosis (24%) and the Group IIIC (21%) - TMJ osteoarthritis, characterized by the presence of crepitation.



Footnote: IA: myofascial pain; IB: myofascial pain with limited opening; IIA: Disc displacement with reduction; IIB: Disc displacement without reduction, with limited opening; IIC: Disc displacement without reduction, without limited opening; IIIA: Arthralgia; IIIB: Arthritis of the temporomandibular joint; IIIC: Osteoarthritis of the temporomandibular joint; Diag: Diagnosis

Figure 3. Graph of sample distribution according to Research Diagnostic Criteria for Temporomandibular Disorders groups

Regarding self-report related to health in the groups with and without TMD, by means of the graphics in Figure 4 it can be noticed that most of the individuals classified their general health as moderate; these were 42% of the group without TMD and 56% in the group with TMD. As for oral health, it is noticeable that more people in the group with TMD (24%) reported their oral health as poor, as compared to the 13% who did so in the group without TMD.

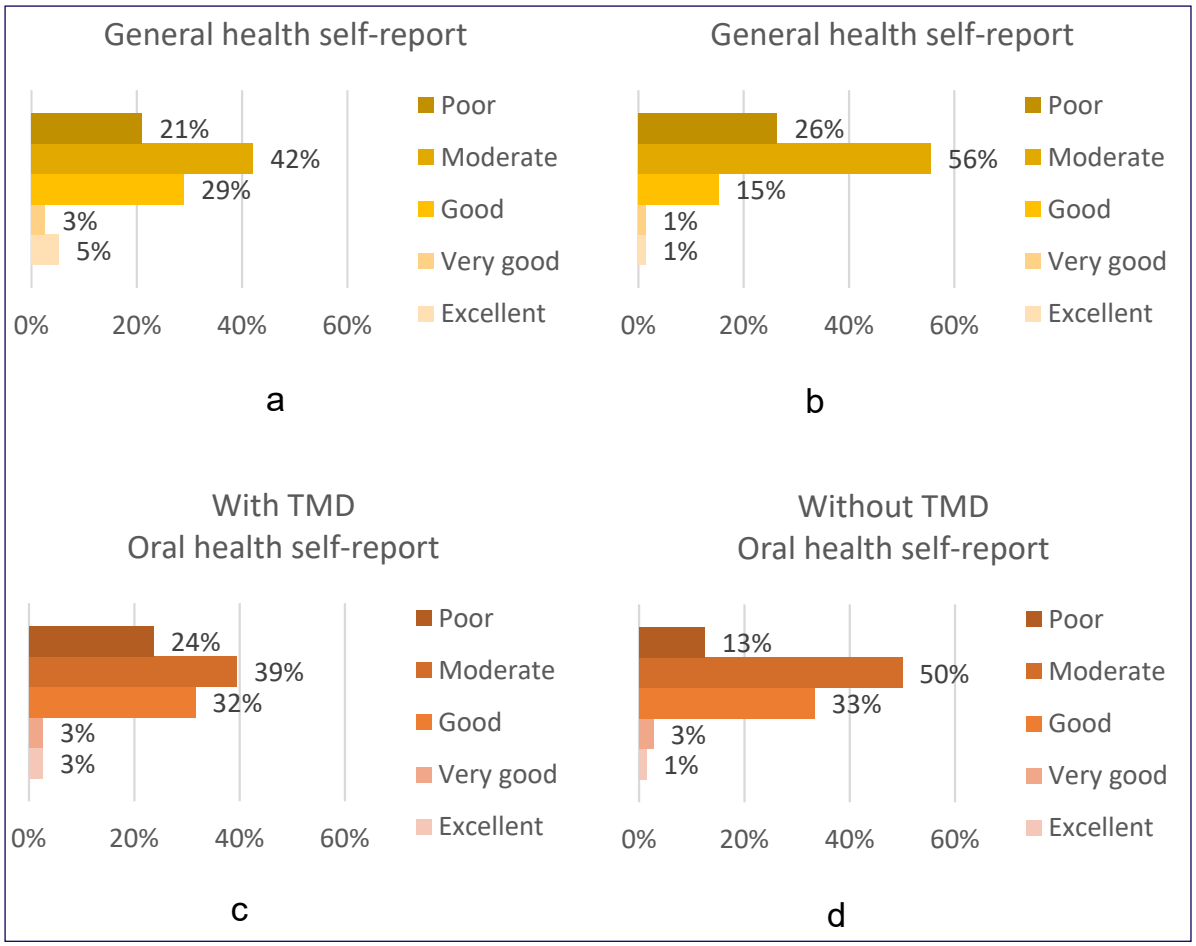


Figure 4. a) Frequency of general health self-report in the temporomandibular disorder group (TMD); b) Frequency of general health self-report in the group without TMD; c) Frequency of oral health self-report in the TMD group; d) Frequency of oral health self-report in the group without TMD

Concerning the classification of variables in relation to the groups (muscle disorders, disc displacement and arthralgia, arthritis and osteoarthritis), there has been significant association ($p<0.05$) in relation to gender and oral health self-report; that is, being male reduces in 17% the likelihood of the person being classified in the TMD group of crepitation; and, reporting their own oral health as moderate increases five times the probability of being classified in the arthralgia, arthritis and osteoarthritis group (Table 2).

Table 2. Distribution of the groups of the Research Diagnosis Criteria for Temporomandibular Disorder according to sociodemographic variables, phase of illness, time of illness, self-reported general health and self-reported oral health. Recife, Brazil, 2017

Variables	RDC Groups			p[1] value
	Group I	Group II	Group III	
Gender				0.045*
Female	8	6	2	OR = 0.17
Male	4	8	10	CI95 = 0.021- 1.12
Age				
>60 years old	7	5	6	0.50
<60 years old	5	9	6	
Marital status				
Single	0	1	0	0.30
Married	5	10	8	
Widow(er)	4	2	0	
Cohabiting	2	1	3	
Divorced	1	0	1	
Level of education				
Illiterate	0	1	0	0.16
Primary school	4	4	1	
Middle school	2	2	5	
High school	5	2	5	
College	1	5	1	
Income				
1/2 to 1	2	1	2	0.24
2 to 3	7	3	2	
4 to 5	1	2	2	
6 to 10	2	3	5	
11 to 15	0	4	1	
16 to 20	0	1	0	
Hoehn & Yahr				
1	1	5	2	0.23
2	9	8	6	
3	2	1	4	
Time of illness				
1|---|10	11	9	11	0.11
11|---|20	1	5	1	
General health				
Excellent	0	1	1	0.74
Very good	0	1	0	
Good	2	5	4	
Moderate	6	5	5	
Poor	4	2	2	
Oral health				
Excellent	0	0	1	0.05*
Very good	0	1	0	OR =5.42
Good	2	7	3	CI95= 1.00 – 31.84
Moderate	5	2	8	
Poor	5	4	0	

GruGroups of the Research Diagnosis Criteria for Temporomandibular Disorders – RDC: Group I – Muscle disorders, Group II – Disc displacements; Group III – Arthralgia, arthritis, osteoarthritis. OR: odds ratio; CI: confidence interval; P1 value: Chi-Square Test; *p<0.05

DISCUSSION

Parkinson's disease is a progressive neurodegenerative disorder of the central nervous system which affects more men than women at a proportion of approximately 1.5[17], an aspect that has been perceived in this study. A similar result has been found in relation to the prevalence of TMD by gender, most of the cases being of males. This result does not align with recent studies that assessed the prevalence of TMD in people with PD and found more cases among the females[7,9]. This study might have reached this result due to the fact that most of the people diagnosed with PD in the sample were men[5].

This investigation observed a higher frequency of elderly with PD, in agreement with surveys that show that PD is more common in this age group[17]; it has also observed a higher frequency of TMD among them[9]. However, literature is contradictory when it comes to the frequency of TMD in the elderly population without PD. While some studies had results similar to the ones found in this one, with higher prevalence in the elderly[18,19], a few others indicated the disorder to be more present among non-elderly, in age groups ranging from 20 to 45[20-22].

The presence of TMD in people with PD in the sample was of 35%, which is in accordance with a study that evaluated the presence of the disorder in that same population, finding a similar frequency[9]. As for marital status, most of the participants were married, similarly to studies that assessed sociodemographic studies involving PD[23]. Similar results proceeded from the group with TMD, which doesn't agree with Sampaio et al.'s study[19] that linked the prevalence of TMD with sociodemographic factors, finding a higher percentage in the widowed population.

As for income, elderly who receive up to two minimum wages are more likely to develop TMD[19,20,24]; a similar result was found in this survey. Studies have shown that the prevalence of TMD is higher in people who had studied up until high school, in agreement with what was found in this study[19,20,23,25]. This may happen because health issues are related to social inequalities involving the level of education, having in mind that education is associated to the cognitive self-report of one's health condition; such factors may or may not cooperate in the diagnosis[20,25].

In the researched literature, there has been found no correlation between time of illness and TMD prevalence that could be associated to this study. However, regarding the phase of the disease, the higher frequency among the population being studied was in phase 2, characterized by bilateral clinical manifestations, which could evolve to posture being compromised. This reaffirms a survey that assessed orofacial functions of people with PD and observed the influence of the severity of the motor control symptoms in relation to the occurrences of TMD in this population[26].

In this study, the signs and symptoms of TMD were evaluated in accordance with the RDC/ TMD. Group IIA was the more prevalent, whose clinical sign was the click, which may be associated with signs of abnormal morphology of the joint; it's also the most frequent symptom of TMD[27,28]. Clicks in the TMJs happen due to the misplacement of the cartilage as it abruptly dislodges to the top of the condyloid process when the patient opens their mouth, with or without pain[29]. However, no articles have been found in the researched literature that connected sociodemographic factors to the subgroups of RDC/TMD for discussion.

Crepitation is indicative of friction of fibrocartilages with one another, resulting from the surfaces being irregular. It corresponds to a joint degenerative process and has been considered as representative of advanced TMD[30]. It frequently points to a degenerative process, as osteoarthritis, which is predominant among women. Its prevalence peaks among adolescents and young adults[31], agreeing with the findings of this study, which says that being male reduces by 17% the likelihood of a person being classified as group III TMD, showing significant association.

The world population above the age of 60 has been growing rapidly and, due to the characteristics of this age group, other health issues end up being more of a priority, in detriment of oral health[32]. This, in turn, is influenced by many factors, including general health self-report.

Self-report qualifies oral conditions, since it considers the elderly's eyesight, for the very elderly perceives their situation and the need for treatment[7]. In this study, general health self-report in the TMD group was pointed out by the participants as moderate, and oral health was self-reported as poor. A similar result was found in Brennan and Singh's study[33], which linked self-reports of general and oral health of an elderly sample, noticing that oral health was highly influenced by the state of the general health. Thus, the results have shown that there is a limitation to general and oral health self-report of people with PD in relation to TMD[34]. This reaffirms the idea that poor conditions in

oral health are affected by disabling diseases, such as the cognitive and motor control disorders, and that people with advanced stage PD present implications in oral health that might result in the presence of TMD[35,36].

Furthermore, this investigation has observed that having moderate oral health self-report increases five times the chances of being classified in the arthralgia, arthritis, osteoarthritis group, as obtained by RDC/TMD. This data agree with a study that has associated the characteristics of TMD with oral health self-report in institutionalized elderly and that has observed a significant association between having the characteristics of the disorder and being dissatisfied with oral health[37].

CONCLUSION

The presence of TMD in people with Parkinson's disease has been observed in this study, in which the associated factors were being male and having moderate oral health self-report.

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