Investigação Científica

Oral health condition of elderly people with Parkinson disease

Condição de saúde bucal de idosos com doença de Parkinson

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Abstract

The oral hygiene of individuals with Parkinson disease (PD) is markedly impaired by difficulties in toothbrushing due to motor impairment and tremors. Additionally, it appears that other features associated with PD have an impact on the quality of oral health. Objective: this cross-sectional observational study characterized the oral health condition of individuals with PD. Methods: fifty individuals with PD, aged 53 to 94 years, users of medication for such condition were examined. The research participants had their oral cavities examined to assess prosthetic use and need; index of Decayed, Missing and Filled Teeth (DMFT); Community Periodontal Index (CPI); Periodontal Attachment Loss (PAL); and oral mucosa. In addition, a questionnaire was applied to obtain personal data, general health, and oral health. The data were analyzed using descriptive statistics. Results: a high prosthetic use was observed in the upper arch (92%), while the lower arch revealed high prosthetic need (66%). The DMFT index showed a high number of missing teeth, CPI showed a prevalence of 43% of dental calculus, and PAL revealed 28% of attachment loss of 4-5 mm. The most frequent findings in the assessment of oral mucosa were denture stomatitis and inflammatory fibrous hyperplasia. Conclusion: PD patients refer xerostomia and present high number of missing teeth, a minority of healthy teeth, and oral lesions, representing a target population for specialized oral health care.

Keywords: Elderly people. Oral health. Parkinson disease. Xerostomia.

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Introduction

Parkinson disease (PD) is a dementia characterized by motor symptoms, namely bradykinesia, muscle rigidity, bent posture, motor blocking, and postural instability associated with tremors. Additionally, there are cognitive deficiencies even in the initial stages of the disease. The resting tremor, in most cases, is the first symptom¹. Its etiology is still unknown but some factors have been indicated as potential causes, such as genetic factors, environmental toxins, oxidative stress, idiopathic causes, and mitochondrial abnormalities².

The highest prevalence of PD involves elderly people, with an onset peak age of about 60 years²⁻⁴. Parkinson disease is universally distributed, affecting all ethnic groups and socioeconomic levels with an estimated prevalence of 100 to 200 cases every 100,000 inhabitants. Due to the high prevalence of the disease and the high demand for antiparkinsonian medication, PD generates a world annual cost of 11 billion dollars⁵.

The standard medication for PD treatment is levodopa and it may be associated with other medications. Treatment options vary depending on the stage of the disease, the patient's age, and the cost. Physical therapy and nutritional guidance should also be included in the rehabilitation to improve quality of life. The goal of PD treatment is to prevent the disease from progressing, considering that it has no cure currently⁵.

It is estimated that xerostomia affects approximately 55% of the individuals with PD because of the use of antidepressants and antipsychotics^{4,6,7}. Other common oral illnesses include oral ulcerations, tong edema, change in taste, oral discomfort, or problems with prosthesis retention. The 'burning mouth syndrome' is also associated with xerostomia and the use of levodopa^{4,6}. The adequate oral hygiene of PD patients may be impaired due to the motor impairment and tremors, and they might depend on family members and/or caregivers to have their oral hygiene properly done^{1,4}.

A debilitated oral health may be a risk factor for the development of other conditions

such as cardiovascular diseases, pulmonary disease, atherosclerosis, and cerebrovascular accident^{8,9,10}. In addition, pneumonia resulting from the aspiration of remnants from a poor oral hygiene is not uncommon in elderly people with PD^{1,6}. It has been suggested that the orofacial function of these individuals may be impaired by the loss of motor function of the orofacial muscles and it may affect jaw mobility and the extent of mouth opening¹¹.

Therefore, given the high global prevalence of PD and in light of the factors that affect the correct oral care of these individuals and its consequences, this study aimed to characterize the oral health status of patients with PD and its impact on daily life.

Material and Method

Cross-sectional observational study including the elderly population with Parkinson disease (PD) in the city of Chapecó, state of Santa Catarina, southern Brazil. The study was approved by the institutional Research Ethics Committee under protocol no. 078/CEP/2013. The pharmaceutical department of the Municipal Health Service provided a list of individuals who required the medication for PD treatment. A sample of 50 elderly people received a full explanation of the objective of the study and they were invited to participate in the study through phone call. Oral health was assessed according to the World Health Organization criteria¹²:

- (i) use and need of dental prostheses. Prosthetic need was characterized as the use of a non-functional, defective prosthesis; therefore, one could use prosthesis and need prosthesis in the same arch;
- (ii) index of decayed, missing and filled teeth (DMFT) subdivided into coronal and root. A tooth was considered decayed when there was visual evidence of cavity that could be confirmed in occlusal, buccal, and lingual aspects of the tooth by probing with the CPI probe;
- (iii) Community Periodontal Index (CPI), evaluated as the presence and depth of periodontal pockets, subgingival calculus,

and gingival bleeding in index teeth for sextants on probing with the CPI probe, designed with a 0.5 mm ball tip, a black band between 3.5 and 5.5 mm, and rings or marks at 8.5 and 11.5 mm¹². The CPI was coded as follows: 0 (healthy), 1 (bleeding on probing), 2 (calculus detected during probing, but all the black band of the probe is visible), 3 (4-5 mm periodontal pocket and gingival margin within the black band of the probe), 4 (periodontal pocket of 6 mm or more, with the black band of the probe not visible), X (sextant excluded, less than two teeth present);

- (iv) Periodontal Attachment Loss (PAL), assessed by probing of the same index teeth. It is referenced by the exposure of the cementoenamel junction, which indicates the presence of gingival recession. The PAL was coded as 0 (attachment loss of 0-3 mm, CEJ is not visible and CPI value between 0-3 mm), 1 (attachment loss of 4-5 mm, CEJ within the black band), 2 (attachment loss of 6-8 mm, CEJ between the upper limit of the black band and the 8.5 mm ring), 3 (attachment loss of 9-11 mm, CEJ between the 8.5 and 11.5 mm rings), 4 (attachment loss of 12 mm or more, CEJ beyond the 11.5 mm ring), X (sextant excluded, less than two teeth present). For both periodontal indexes the worst condition was registered;
- (v) presence of mucosal oral lesions, categorized as normal mucosa or presence of lesion. It assessed upper and lower labial mucosa and labial sulci, labial part of the dorsal and ventral commissures and margins of the tongue, buccal mucosa, palate, floor of the mouth, retromolar area, and upper and lower gingiva.

The independent variables were assessed by applying a modified version of the Geriatric Oral Health Assessment questionnaire¹³ and it involved data on sociodemographics, education, access to oral health services, and oral and general health data.

Aspecialist in periodontology and stomatology and a specialist in operative dentistry trained two dental students of the fourth year (CZ and NRSM) using slide presentations and discussion sessions for consensus. Clinical examinations for calibration were performed in eight elderly people with mean age of 74 years and of both genders. Due to the categorical nature of the variables, the inter-examiner agreement was assessed using the Kappa coefficient, which varied from 0.4 to 1.0. The student who presented the highest agreement with the gold-standard examiners conducted the clinical examinations during the fieldwork.

The research subjects were examined at home and signed a consent form after being instructed on the study objectives. Clinical examinations were performed using sterile gauze, dental mirror, and CPI probe. The examiner used a light source attached to the head. The data were tabulated and analyzed using descriptive statistics with the SPSS 20 package.

Results

The mean age of the participants was 72.9 ± 9.6 years, ranging from 53 to 94 years. Sixty-four percent of the participants were women, 52% were married, 38% widows, 6% divorced, and 4% single. Seventy-two percent were illiterate or had not completed primary education, 4% had completed primary education, 12% had not completed high school, 10% had completed high school, and 2% had completed higher education.

All the research subjects used medications daily. The most frequent medications consumed were antiparkinsonians and antihypertensives. Eighty-four percent had the last visit to the dentist within the last 3 years and 10% for more than 5 years. Fifty percent claims having received hygiene instructions from the dentist and 46% claims to brush their teeth twice a day and 48% three times a day. Figure 1 presents the frequency of prosthetic use and need and the DMFT index of the participants.

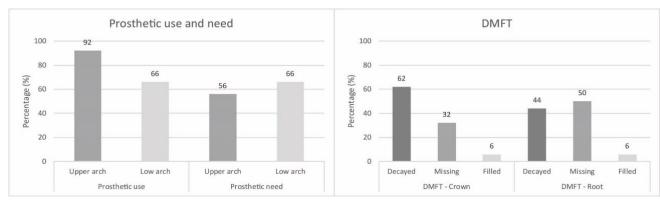


Figure 1 – Frequency of prosthetic use and need, and decayed, missing and filled teeth of the participants

Seventy-four percent of the participants who used prosthesis in the upper arch used total dentures, followed by 12% who used removable partial dentures, 4% who used one fixed bridge, and 2% who used more than one fixed bridge. Forty-two percent of those who used prosthesis in the lower arch used total dentures, followed by 22% who used removable partial dentures, and 2% who used one fixed bridge. Most of those who needed prosthesis in the upper arch needed total dentures (42%), followed by 12% who needed a fixed or removable denture to replace one dental element, and 2% who needed a combination of either fixed or removable dentures to replace more than one dental element. Most of those who needed lower prosthesis (32%) needed a fixed bridge or a removable denture to replace more than one dental element, followed by 26% who needed total dentures, 6% who needed the combination of fixed and removable dentures to replace more than one element, and 2% who needed a fixed or removable denture to replace one dental element.

The mean total DMTF index for crown was 28.9 ± 4.0 , with mean indexes of decayed, missing and filled crowns of 0.6 ± 1.4 , 26.1 ± 7.2 and 2.2 ± 3.3 , respectively. The mean total DMTF index for root was 26.2 ± 7.1 , with mean indexes of decayed, missing and filled roots of 0.1 ± 0.5 , 25.7 ± 7.6 and 0.4 ± 0.8 , respectively.

Forty percent of the participants presented oral mucosal lesions, 38% presented palatal lesions, 10% in the lips, 8% in the buccal mucosa and commissures, and 6% in the labial sulci. Fifty percent of the participants presented calculus, while other 16% were considered healthy. In spite of being lower, the rate of healthy subjects, when considered as a sextant/subject ratio, was the highest observed (Table 1). Proportions of 20% and 4% were observed for the presence of 4-5 mm deep pockets and 6 mm or more, respectively. As for periodontal attachment loss, the highest rate was for healthy sextants, with 48% of the subjects, followed by 30% of the subjects presenting 4-5 mm attachment loss.

Table 1 – Community periodontal index (CPI) and periodontal attachment loss (PAL) of the study participants (n=50), expressed as number of sextants, number of subjects, and sextant/subject ratio

	Sextants	Subjects	Sextant/subject ratio
Community Periodontal Index (CPI)			
0 Healthy	21	8	2.63
1 Bleeding on probing	3	3	1
2 Calculus detected during probing	35	25	1.4
3 Pocket of 4-5 mm	18	10	1.8
4 Pocket of 6 mm or more	3	2	1.5
Periodontal Attachment Loss (PAL)			
0 Healthy – attachment loss of 0-3mm	53	24	2.21
1 Attachment loss of 4-5 mm	23	15	1.53
2 Attachment loss of 6-8 mm	5	4	1.25
3 Attachment loss of 9-11 mm	0	0	0
4 Attachment loss of 12 mm or more	0	0	0

Source: the authors.

Table 2 presents results regarding oral health impact and Table 3 shows the data for the oral health impact on feeding and dietary habits. When asked whether they had a regular intake of fermentable sugar-rich food, pasty food, and soft drinks, 48%, 94%, and 76% answered affirmatively, respectively.

Table 2 – Perceived oral health impact of the study participants (n=50)

	N (%)
How do you classify the salivary flow in your mouth?	
Low (dry mouth)	33 (66%)
Normal	15 (30%)
High (hypersalivation)	2 (4%)
Do you feel your mouth burning?	
Always	1 (2%)
Sometimes	11 (22%)
Never	38 (76%)
Are your teeth or gingiva sensitive when in contact with cold, warm, or sweet?	
Always	4 (8%)
Sometimes	12 (24%)
Never	34 (68%)
Do you feel your speech is impaired due to your teeth or prosthesis?	
Always	0 (0%)
Sometimes	13 (26%)
Never	37 (74%)
Have you noticed any mobility in your teeth?	
Yes	5 (10%)
No	45 (90%)
Have you had any tooth, restoration, or prosthesis fractured due to tremors?	
Yes	2 (4%)
No	48 (96%)
Do you bite your tongue, lips, or cheeks?	
Yes	12 (24%)
No	38 (76%)
Have you used any medication to relieve the discomfort in your mouth?	
Yes	3 (6%)
No	47 (94%)

Source: the authors.

Table 3 – Oral impact on feeding of the study participants (n=50)

	N (%)
Do you limit the type and/or amount of food intake due to problems with your teeth or prostheses?	
Always	5 (10%)
Sometimes	22 (44%)
Never	23 (46%)
Do you have any difficulty in chewing solid food, such as meat or an apple?	
Always	10 (20%)
Sometimes	15 (30%)
Never	25 (50%)
Do you swallow comfortably?	
Always	31 (62%)
Sometimes	16 (32%)
Never	3 (6%)
Can you eat without any discomfort?	
Always	22 (44%)
Sometimes	25 (50%)
Never	3 (6%)

Source: the authors.

Discussion

Descriptive studies are performed to describe the occurrence of a condition or the health status of a certain population¹⁴. Characterizing the health condition of a population is the first step for planning health promotion activities. In this study, a specific sample including subjects with Parkinson disease (PD) had their oral health assessed, considering the specificities of the disease and their impact on oral health management. This study identified a high number of missing teeth associated with a low number of healthy teeth, high need of prosthesis in the lower arch, and high prevalence of oral mucosal lesions. Most participants also referred xerostomia.

Parkinson disease is an age-related condition that rarely manifests in individuals under 40 years old. It most commonly begins in older adults with an onset age of about 60 years and it presents a lifetime risk of about $2\%^2$. In the present study, the age of PD patients ranged between 53 and 94 years, with a mean of 73 years old, which confirms the aging trend aforementioned.

There is also a tendency for increased use of medication as age advances, due to the incidence of new diseases. The most common medications PD patients use include antidepressants, antihistamines, antiparkinsonians, antipsychotics, diuretics, antihypertensives, anticholinergics, and antineoplasics¹⁵. In this study, all research subjects reported daily use of antihypertensives and antiparkinsonians, and levodopa was the mostly used.

Sixty-six per cent of our research participants referred dry mouth (Table 2). Xerostomia, which is characterized by the subjective sensation of dry mouth, is one of the most frequently reported oral manifestations in elderly people with PD^{16,17}. The prevalence of xerostomia, which is of 3-5% in the general population and 20% in elderly people with no neurological disorders, raises up to 55% in subjects with PD¹⁶. Regardless of the fact that the mechanism behind this condition is not fully understood at the moment, it appears to occur due to a dysfunction in the center of salivary control in the brain¹⁸ and it has also been associated with the use of levodopa and with its dose¹⁷.

Saliva plays an important protective role in the oral cavity, working as a natural lubricant that washes out bacteria and biofilm from mucosal and dental surfaces. It also has a buffer effect that helps controlling the oral pH and it is an ion carrier, storing and providing ions for the process of tooth remineralization^{17,18}. Therefore, the reduction of salivary flow has a negative impact on the oral health condition of subjects with PD, considering its protective effect against caries and periodontal diseases decreases^{17,18}.

Burning mouth syndrome is another condition commonly associated with the elderly (prevalence of approximately 40%)¹⁹, including those with PD²⁰. Twenty-four per cent of our sample referred the feeling of burning mouth, but only one subject referred it as a constant occurrence. The burning mouth syndrome is a challenging condition to health professionals because it lacks diagnostic criteria, a clear understanding of its etiology and risk factors, and a well-established clinical guideline indicating the adequate treatment options¹⁹. Additionally, it affects the quality of life of the subjects, which is determined by severity²¹. Some hypotheses for the causes of burning mouth syndrome include the organic deficiency

of vitamins and minerals, hormonal dysfunction, candida infection, parafunctional habits, and depression²¹. However, it is worth noting that some of these conditions are differential diagnoses for burning mouth syndrome and they should be properly acknowledged for a correct diagnosis. Although xerostomia may be associated with burning mouth syndrome, a potential further etiological role requires clarification²¹. In fact, in our study, the prevalence of xerostomia was more than twice higher than that of burning mouth and the subjects referring burning pain in their mouths did not necessarily manifest dry mouth symptoms.

Although the rate of individuals with decayed teeth and restorative need ranged from 40% to 62%, for root and crown, respectively (Figure 1), the mean index of decayed teeth was 0.62 for crowns and 0.12 for roots. The National Oral Health Survey - SBBrasil²² (2010) revealed a 0.23 average of decayed roots in individuals aged 65-74 years. The oral health of subjects with PD has shown to be poorer than for those with no neurological impairment^{1,11,18,23}. In this sense, oral health maintenance, especially the control of caries and periodontal disease, strongly rely on satisfactory oral hygiene. Several features associated with PD may affect the quality and frequency of oral hygiene procedures, namely the impaired fine motor skills that interfere with hand performance during toothbrushing and flossing. Motor difficulties include tremor, akinesia, and muscle rigidity^{23,24}. Swallowing dysfunctions and cognitive disturbances such as dementia and apathy may also interfere with the oral hygiene routine of PD patients^{18,23}.

Nevertheless, Fukayo et al.⁶ (2003) observed that PD patients with mild symptoms presented higher toothbrushing frequency than the control subjects and concluded that the features of PD may not entirely explain the differences in oral health status. In our study, for instance, 94% of the subjects with PD stated brushing their teeth twice or three times a day and 50% acknowledged having received oral hygiene instructions from their dentists. One likely explanation for the low index of decayed teeth is the high missing component of the DMFT index. Thirty-two

percent of the subjects presented missing crowns and 50% presented missing roots.

The general DMFT index of individuals aged 65-74 years by the National Oral Health Survey – SBBrasil²² (2010) was 27.53, with the missing component accounting for 92% of the total index. In our study, missing teeth accounted for 90% and 98% of the DMFT index for crown and root, respectively. The total DMFT index of the study was similar to that reported by the epidemiological survey. Significantly, poorer nutrition has been associated with edentulous people in comparison to those with natural teeth¹⁴.

The periodontal status of the subjects with PD was evaluated by the Community Periodontal Index and the Periodontal Attachment Loss index¹². The analysis of CPI revealed that 73% of the research subjects presented excluded sextants. This indicates the absence of the index teeth in the sextant and it reinforces the high tendency of edentulism observed by the National Oral Health Survey — SBBrasil²² (2010) in individuals aged 65-74 years. Our study presented a higher rate of subjects with lower scores when compared to other studies^{1,23}.

The Periodontal Attachment Loss index provides information about the accumulated tissue destruction throughout the life of the periodontal attachment¹⁰. Most subjects (48%) were considered healthy as to the periodontal attachment loss (0-3 mm loss) and 30% revealed loss of 4-5 mm, which was similar to the average loss presented by PD subjects in another study (ranged from 3.14 to 6.74 mm)²⁵. The impaired motor skills for oral hygiene is considered the primary risk factor for the development of periodontal disease in subjects with PD²⁶. As a result, the literature has extensively reported compromised periodontal health status. Moreover, emphasis should be given to the quality of oral health care that most PD patients receive from caregivers, who commonly become responsible for oral health care measures²⁷.

The adequate prosthetic replacement of missing teeth is key for proper nutrition, communication, and social interaction⁴. Our results indicated a higher rate of prosthetic use in the upper arch (Table 5), most of them constituted

by total dentures. It is speculated that such higher prevalence in the upper arch would indicate a concern about social and communicational issues. However, approximately 60% of upper arch prostheses required replacement, indicating that the functional aspect had not been considered. This is reinforced by the fact that a lower proportion of prosthetic use was observed in the lower arch, similar to the rate of prosthetic need. One of the most common indications for prosthetic replacement was poor fitting and retention, which might be aggravated by the typical tremors of subjects with PD. Ill-fitting dentures generate socialization difficulties, as they affect pronunciation and cause nutritional impairment, leading to weight loss and diet shift4.

The tremor of orofacial muscles may generate tooth abrasion, orofacial pain, discomfort in the temporomandibular joint, tooth fractures, and involuntary bites in the tongue, cheeks, or lips4. Episodes of fractures in teeth, restorations, or prosthetic crowns were identified in 4% of the subjects, while biting the tongue, lips, and cheeks was observed in 24% of the cases (Table 3). As PD progresses, tremors and dyskinesia impair the ability of subjects to have a meal on his own, requiring changes in dietary habits and the usual need for having their food cut by the caregivers²⁸. In our study, 10% of the subjects reported some kind of limitation related to the amount or type of food, due to problems with teeth or prostheses. As for masticatory ability, 50% of subjects never had problems to bite or chew solid food, but 50% reported feeling some kind of discomfort during eating (Table 3).

Our results also showed that 88% of the participants consumed sugar-rich foods and 76% drank sugar-rich soft beverages. Miller et al.²⁸ (2006) highlights the need to assess swallowing capacity during all the phases of PD to maximize function and stop or slow down the onset of preventable problems for feeding and swallowing. Our study identified 6% of individuals with problems for swallowing. The implications of swallowing difficulties are dietary changes, with a tendency of increasing the amount of pasty food intake, including fermentable-sugar rich foods^{1,4}.

Regarding the health status of the oral mucosa, the most prevalent lesions found were prosthetic stomatitis and inflammatory fibrous hyperplasia. None of these conditions are specific to subjects with PD, but both have been associated with poor oral hygiene and lack of adequate care with total and partial removable dentures. In this sense, the concern with oral health should not be restricted only to situations involving oral-related pain. Poor oral health conditions were observed among older people with and without PD29, suggesting similar oral health care demands. Perhaps the ideal condition would involve interdisciplinary health care for individuals with PD, including dentists among the health professionals providing periodical assistance to these subjects.

Conclusion

Individuals with PD presented a high number of missing teeth, a minority of healthy teeth, and oral lesions. They also referred dry mouth symptoms and, to a lower extent, difficulty for eating and swallowing. This study suggests a target population for specialized oral health care.

Resumo

A higiene bucal de indivíduos com doença de Parkinson (DP) é claramente prejudicada por dificuldades na escovação devido ao comprometimento motor e aos tremores. Além disso, outros aspectos relacionados à doença parecem impactar a qualidade da saúde bucal. Objetivo: este estudo observacional seccional caracterizou a condição de saúde bucal de indivíduos com DP. Métodos: foram examinados cinquenta indivíduos com DP, com idades variando entre 53 e 94 anos, que utilizavam medicamentos para DP. Os participantes da pesquisa foram submetidos a exame bucal para avaliar: uso e necessidade de prótese, índice de dentes cariados, perdidos e obturados (CPOD), Índice Periodontal Comunitário (IPC), Índice de Perda de Inserção Periodontal (PIP) e mucosa bucal. Além disso, foi aplicado um questionário para obtenção de dados pessoais e sobre saúde geral e saúde bucal. Os dados foram analisados usando estatística descritiva. Resultados: observou-se alto percentual de uso de prótese superior (92%), enquanto o

arco inferior apresentou elevada necessidade de prótese (66%). O CPOD revelou um alto número de dentes perdidos; o IPC apresentou prevalência de 43% de cálculo dentário; e o PIP revelou 28% de perda de inserção de 4-5 mm. Os achados mais frequentes na avaliação da mucosa bucal foram estomatite por dentadura e hiperplasia fibrosa inflamatória. Conclusão: os indivíduos com DP mencionam xerostomia, apresentam alto número de dentes faltantes, um número reduzido de dentes saudáveis e lesões bucais, representando uma população-alvo para o cuidado de saúde bucal especializado.

Palavras-chave: Idoso. Saúde Bucal. Doença de Parkinson. Xerostomia.

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