

Factors associated with mandibular function impairment in people with Parkinson's disease during social isolation due to COVID-19

Haryssa Guimarães de Lima Feliciano¹ 

Jonatas Silva de Oliveira² 

Crislayne Felix da Silva¹ 

Tales Severiano da Silva¹ 

Raissa Barreto Tavares¹ 

Laiza de Oliveira Lucena³ 

Maria das Graças Wanderley de Sales Coriolano³ 

Carla Cabral dos Santos Accioly Lins³ 

¹ Universidade Federal de Pernambuco - UFPE, Curso de Odontologia, Centro de Ciências da Saúde - CCS, Recife, Pernambuco, Brasil.

² Universidade Estadual Paulista - UNESP, Faculdade de Odontologia de Araraquara, Departamento de Materiais Odontológicos e Prótese, Araraquara, São Paulo, Brasil.

³ Universidade Federal de Pernambuco - UFPE, Programa de Pós-Graduação em Gerontologia, Centro de Ciências da Saúde - CCS, Recife, Pernambuco, Brasil.

A study conducted at Universidade Federal de Pernambuco, Recife, Pernambuco, Brasil.

Financial support: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.

Conflict of interests: Nonexistent.

Corresponding author:

Carla Cabral dos Santos Accioly Lins
Programa de Pós-Graduação em Gerontologia
Universidade Federal de Pernambuco - UFPE
Avenida Professor Moraes Rego, 1235, Cidade Universitária
CEP: 50670-90 – Recife, Pernambuco, Brasil
E-mail: carla.santos@ufpe.br

Received on: April 20, 2023
Accepted on: July 27, 2023

ABSTRACT

Purpose: to analyze factors associated with mandibular function impairment in people with Parkinson's disease during social isolation due to COVID-19.

Methods: this cross-sectional, quantitative, analytical study used a database with 115 records of patients presented with this condition (obtained via telemonitoring in a research conducted in 2020) and assessed sociodemographic aspects and the Mandibular Function Impairment Questionnaire (MFIQ). The variables addressed in the associations were sex, age, marital status, denture use, disease duration, and daily levodopa dose. Results were obtained with the Fisher's exact test, with the significance level set at $p < 0.05$.

Results: after analyzing the database, the final sample comprised 62 eligible records – 61% were males, 79% were above 60 years old, 63% wore dentures, and 93% had low severity of mandibular function impairment, according to MFIQ. No significant associations were found between the study variables and MFIQ ($p < 0.05$).

Conclusion: the degree of mandibular impairment was low, and the study variables were not associated with mandibular function impairment in patients presented with Parkinson's disease, during social isolation, due to COVID-19.

Keywords: Parkinson Disease; COVID-19; Pandemics; Signs and Symptoms; Aged



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INTRODUCTION

COVID-19, thus named by the World Health Organization (WHO) in 2019, is an acute respiratory infection caused by the coronavirus SARS-COV-2. The first case of the disease was identified in 2019, in the region of Wuhan, China, and it took less than 3 months for more than 210 countries and territories to confirm, by early 2020, contaminations with the new virus – hence, decreeing a pandemic^{1,2}.

Older people received greater attention during the COVID-19 pandemic because they were at a greater risk of death, due to chronic comorbidities and immunosenescence, which make them more vulnerable to contracting contagious infectious diseases³. Since Parkinson's disease (PD) is the second most prevalent neurodegenerative disease in older adults (affecting 1% to 3% of the population, according to WHO), it was essential to pay close attention to the possible impacts of the interaction between PD and COVID-19 on these patients' daily lives⁴.

PD is characterized by an accumulation of alpha-synuclein in the substantia nigra of the central nervous system⁴, resulting in the progressive loss of dopaminergic neurons and, consequently, the development of Lewy bodies – one of the pathological characteristics of this disease⁵. Disease progression also includes the onset of neurological symptoms such as bradykinesia, muscle stiffness, tremors at rest, and postural instability⁴.

Mouth opening, mastication, speech, and swallowing occur with a balance between perioral and tongue muscles, due to the forces exerted by the contraction of these structures. However, these stomatognathic functions are impaired in PD. Muscle stiffness, present in the disease, influences the whole muscle system and the face, negatively impacting the main mastication and swallowing muscles: masseter, temporal anterior, medial, and lateral pterygoid, digastric, stylohyoid, mylohyoid, and geniohyoid⁶⁻⁷.

The observation of the affections caused by the COVID-19 pandemic on people with PD and their association with mandibular functional limitation shows how scarce the literature is. It is important to consider the psychological and physical impacts of the pandemic circumstances and the symptoms of the disease, including muscle stiffness, which may worsen as mandibular movements decrease, influencing daily activities such as mastication. Hence, this study aimed to analyze which factors were associated

with mandibular functional limitation in people with PD, during isolation because of COVID-19.

METHODS

This cross-sectional, quantitative, analytical study used the database of a study named "Telemonitoring of the oral health condition of people with Parkinson's disease during the COVID-19 pandemic"⁸, conducted from August to December 2020 in 115 PD patients who attended the Clinics Hospital (HC/UFPE) and the Parkinson Association of Pernambuco (ASP/PE) and participated in the Pro-Parkinson Dental Outreach Program. This research was registered in the Research Ethics Committee of the Federal University of Pernambuco (CEP/UFPE), Brazil, under evaluation report no. 5.474.593 and CAAE 59472622.6.0000.5208.

The inclusion criteria were as follows: PD patients of both sexes who answered the sociodemographic questionnaire and the Mandibular Function Impairment Questionnaire (MFIQ)⁹. The exclusion criteria were PD patients who could not communicate properly at the time of the interview due to hearing or speech impairment, duplicate forms, and people who answered only one of these questionnaires.

MFIQ, whose scoring system classifies the severity of function impairment, was the dependent variable. It has 17 items addressing everyday situations (such as laughing, yawning, and speaking) in which individuals may have mandibular pain or function difficulties. Each item has five answer options: "No difficulty", "A little difficulty", "Quite a bit of difficulty", "Much difficulty", and "Very much difficulty", which correspond respectively to 0, 1, 2, 3, and 4 points. The final score is obtained by summing each question's score; then, it is divided by the number of items that were answered and multiplied by four (which is the maximum value in each question). Lastly, the resulting coefficient is weighted with certain conditions in the set of answers in the questionnaire, resulting in the degree of function impairment, which ranges from 0 to 5. Based on the degree of impairment, the severity is classified as "low", "moderate" or "severe", corresponding respectively to "0 or 1 point", "2 or 3 points", and "4 or 5 points"⁹⁻¹⁰.

The sociodemographic data, disease duration, denture use, and drug dosage (levodopa) were the independent variables associated with MFIQ. The sociodemographic data included age (in years, considering the last birthday before data collection), sex (male or female), marital status (single, married, in a domestic partnership, widow(er), separated, or divorced),

whether they had children and how many, whether they had had COVID-19, and whether it had been diagnosed with examinations. PD duration was analyzed in years from diagnosis until 2020, and levodopa dose was considered in the number of milligrams (mg) they took per day, divided into two groups: from 300 to 600 mg and > 600 mg.

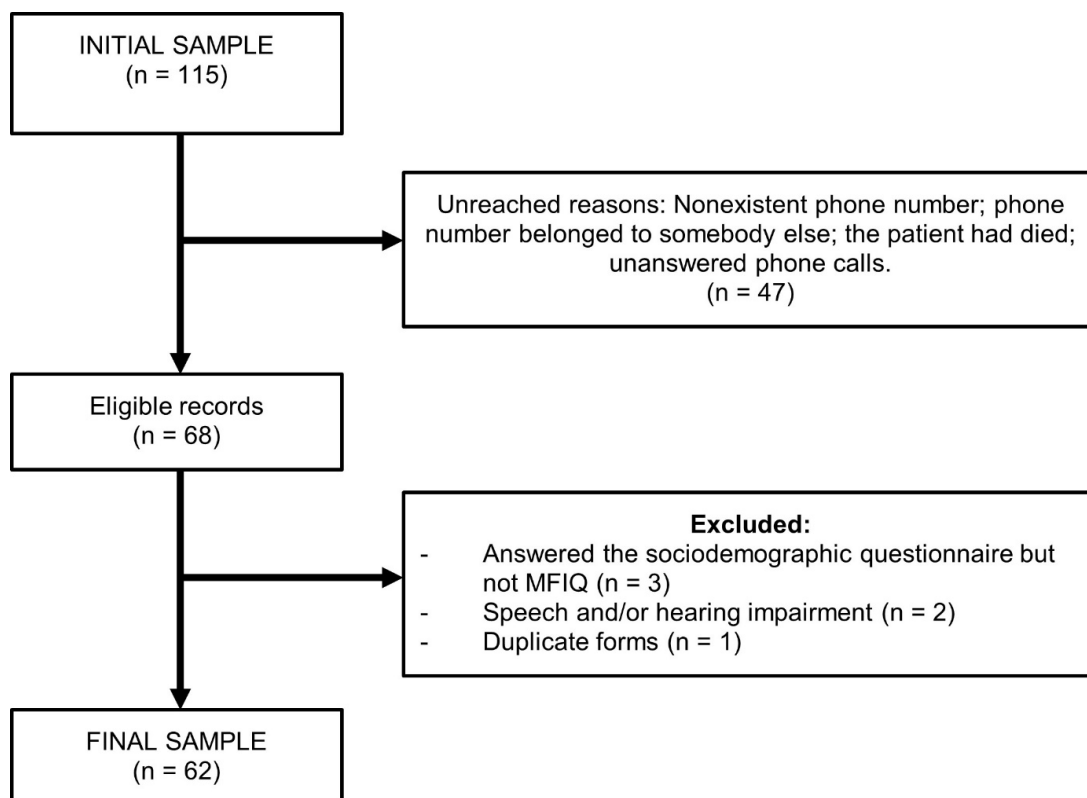
Dentures were addressed as to whether they were worn and for how long they had been worn, as reported by the patient. Those who wore dentures were classified according to the type: upper complete dentures, lower complete dentures, upper removable partial dentures, lower removable partial dentures, and upper and lower implant-supported dentures. Denture usage time was divided into 1 to 15 years and 16 to 40 years. Possible oral problems in PD patients were identified with the question, "Did you have any mastication complaint during the pandemic?", to which they could answer "never", "rarely", "sometimes", or "often".

Collected data were saved in Excel spreadsheets. The sample was characterized with descriptive

and frequency statistics and stratified according to the degree of severity of function impairment (low, moderate, or severe), which was then associated with the independent variables (sex, age, marital status, disease duration, and daily levodopa dose). Data were computed in 2x2 tables for the chi-square test with a 95% confidence interval (CI); however, it could not be performed due to the characteristics of the sample and the unmet chi-square distribution assumption. Hence, the Fisher's exact test was used, setting the significance level at $p < 0.05$, and using the BioEstat 5.0 program.

RESULTS

Altogether, 115 records of PD patients were found in the database. After trying to contact them, 47 records were excluded. It was then verified which of the 68 eligible records had answered MFIQ, resulting in a final sample of 62 PD patients (Figure 1).



Caption: MFIQ = Mandibular Function Impairment Questionnaire

Figure 1. Flowchart of the research final sample selection process

Most of the sample in this study were males above 60 years old, either married or living with a partner, who predominantly had two children. There were more individuals among those who presented PD for 0-13 years, with a mean of 10 years. Few people with PD reported having been infected with COVID-19; most of

them had been tested to verify whether they had been contaminated with the virus, and only a small portion of them tested positive. Moreover, more than half of the sample used dentures, and there was a greater prevalence of individuals taking 300 to 600 mg of levodopa per day (Table 1).

Table 1. Characterization of the sample according to sociodemographic data, number of children, Parkinson's disease duration, COVID-19 data, denture use, and daily levodopa use. Recife, Brazil, 2023

Variables	n = 62	(%)	Mean ± SD
Age (years)			
< 60	13	21%	66±8
> 60	49	79%	
Sex			
Males	38	61%	
Females	24	39%	
Marital status			
Single	7	11%	
Married or in a domestic partnership	45	73%	
Widow(er)	4	6%	
Separated or divorced	6	10%	
Has children?			
Yes	58	94%	
No	4	6%	
Number of children			
One	6	10%	
Two	25	41%	
Three	12	19%	
Four or more	15	24%	
Parkinson's disease duration			
0-13 years	47	76%	10±5
14-26 years	15	24%	
Had COVID-19?			
Yes	4	6%	
No	54	87%	
Tested to diagnose COVID-19?			
Yes	5	8%	
No	57	92%	
COVID-19 test result			
Positive	1	20%	
Negative	4	80%	
Wears dentures?			
Yes	39	63%	
No	23	37%	
Daily levodopa dose			
300 - 600 mg	38	55%	
> 600 mg	24	45%	

Captions: n = Sample; % = Percentage; SD = Standard Deviation; mg = milligram

The greatest predominance of denture rehabilitation time was 1 to 15 years, and their most used types were upper and lower removable partial dentures, followed by upper complete dentures (Table 2). The questionnaire aimed to diagnose possible oral problems with the question: "During the pandemic, did you have any mastication complaints?", to which the most often

response was that they had not had any mastication complaints during the pandemic. Concerning the severity of mandibular functional limitation assessed with MFIQ, there was a high prevalence of low severity in the sample, followed by a small portion with a moderate limitation. No individual in this research had a severe mandibular functional limitation.

Table 2. Time of denture use and distribution of the types of dentures worn by people with Parkinson's disease. Recife, Brazil, 2023

Variables (n=39)	Time of denture use		
	1 – 15 years	16 – 40 years	Total
Upper complete dentures	5	3	8
Upper and lower complete dentures	1	1	2
Upper complete and lower partial removable dentures	3	3	6
Upper removable partial dentures	3	3	6
Lower removable partial dentures	1	2	3
Upper and lower removable partial dentures	10	2	12
Upper fixed dentures	2	0	2
Total	25	14	39

Caption: n = Sample

The statistical analysis did not find significant associations ($p < 0.05$) between MFIQ and sex, age, marital status, denture use, daily levodopa dose, or

disease duration. Associations were made between the groups with low and moderate severity of mandibular functional limitation (Tables 3 and 4).

Table 3. Association between sociodemographic variables and denture use and the low and moderate severity of mandibular functional limitation (MFIQ) in people with Parkinson's disease. Recife, Brazil, 2023

Variables	MFIQ			p-value*
	Low Degree	Moderate Degree	Total	
Sex				
Males	34	4	38	0.71
Females	24	0	24	
Total	58	4	62	
Age				
< 60	12	1	13	0.97
> 60	46	3	49	
Total	58	4	62	
MS: single				
Yes	6	1	7	0.38
No	52	3	55	
Total	58	4	62	
MS: married				
Yes	42	3	45	1.00
No	16	1	17	
Total	58	4	62	

Variables	MFIQ			p-value*
	Low Degree	Moderate Degree	Total	
MS: widow(er)				
Yes	4	0	4	1.00
No	54	4	58	
Total	58	4	62	
MS: separated				
Yes	6	0	6	1.00
No	52	4	56	
Total	58	4	62	
Denture use				
Yes	37	2	39	0.62
No	21	2	23	
Total	58	4	62	

*Fisher's exact test ($p < 0.05$)

Captions: MFIQ = Mandibular Function Impairment Questionnaire; MS = marital status

Table 4. Association between the time with Parkinson's disease and daily levodopa intake and the low and moderate severity of mandibular functional limitation (MFIQ). Recife, Brazil, 2023

Variables	MFIQ			p-value*
	Low Degree	Moderate Degree	Total	
Duration (0-13 years)				
Yes	44	3	47	0.95
No	14	1	15	
Total	58	4	62	
Duration (14-26 years)				
Yes	14	1	15	0.95
No	44	3	47	
Total	58	4	62	
Levodopa (300-600 mg)				
Yes	32	2	34	1.00
No	26	2	28	
Total	58	4	62	
Levodopa (> 600 mg)				
Yes	26	2	28	1.00
No	32	2	34	
Total	58	4	62	

*Fisher's exact test ($p < 0.05$)

Captions: MFIQ = Mandibular Function Impairment Questionnaire; mg = Milligram

DISCUSSION

This study verified that most participants had low severity of mandibular function impairment and that the sociodemographic variables, PD duration, and daily levodopa dose were not associated with mandibular impairment in PD patients during social isolation due to COVID-19.

Low MFIQ scores were also found in research that assessed the severity of the temporomandibular disorder and mandibular function in older adults with PD in times of COVID-19, in which 95% of subjects had

low severity of mandibular function impairment¹¹. These data can be justified by the telemonitored multidisciplinary follow-up they continued having even during social isolation¹². Telemonitoring is a rather useful way of ensuring continuous care for individuals who cannot attend treatment in person⁸. Moreover, muscle stiffness is known to be one of the main PD factors that contribute to limited mouth opening and mandibular functions⁷.

Most PD patients who participated in this study were above 60 years old and were classified as older adults¹³.

This also agrees with the findings of recent research, which analyzed the predictors of temporomandibular disorder in PD patients, verifying their associations with sociodemographic data and disease stages, in which 63% of the sample were above 60 years old¹⁴.

The present study found a greater incidence of males with PD, with percentages similar to those of another two studies. One of them approached older adults with PD who would be submitted to physical rehabilitation, of whom 55% were males¹⁵. The second one traced the epidemiologic profile of PD patients treated at the Teaching and Assistance Unit of Physical and Occupational Therapy at the Specialized Rehabilitation Center II of the State of Pará, in which 60% of the sample were males¹⁶. The lower incidence of women may be explained by the hormonal contribution, as estrogen indices may be a protective factor against the development of the disease¹⁶.

Studies that described the clinical-epidemiological profile of PD patients in Salvador, Brazil, verified a greater proportion of married participants (78%) in comparison with single, divorced, and widowed ones¹⁷ – which is similar to the data in the present study. Also, 58% of the present sample reported having children (mostly two); however, no such data were found in the literature to corroborate this result.

Large-scale COVID-19 diagnostic testing was essential during the pandemic, as it enabled the early diagnosis and quarantine of mild cases and those who had been in contact with them. It also enabled adequate care of more severe cases, which is pointed out as one of the most effective measures to control the pandemic in various countries¹⁸. Nevertheless, 87% of participants in this study reported not having contracted COVID-19, and only 8% of those who acquired the disease had tested to confirm the contamination.

Dentures were worn by 63% of participants, of whom 64% had worn them for 1 to 15 years. These data are similar to the findings of a study conducted in Minas Gerais that estimated the self-reported prevalence of completely toothless individuals among people 60 years or older registered in a Family Health Center. It found that almost half (46.3%) of the 1,750 participants were completely toothless and needed denture rehabilitation¹⁹. Also, the dentures most used in the present study were the upper and lower removable partial dentures, followed by complete dentures. It must be highlighted that inadequate oral health, such as unrehabilitated edentulism, can compromise older people's nutritional, physical, and mental status. Hence, dental

surgeons must be aware of such health conditions in older adults and be apt to rehabilitate them²⁰.

Most participants took the ideal PD drug maintenance dose²¹. Levodopa is one of the most effective drugs to treat motor symptoms in these people and can be taken along with carbidopa or benserazide, for instance. Doses also vary according to the need for controlling PD symptoms and are adjusted by the physician over time, possibly reaching 1,000 mg per day in the most severe cases, in whom the maintenance dose is no longer effective^{22,23}.

Lastly, no significant associations were found between MFIQ and sex, age, marital status, denture use, or daily levodopa dose. The researched scientific literature had no findings to compare those in this study. The limitations of the study include the few individuals who participated in the primary research. The study was conducted during the strictest social isolation when vaccines against SARS-COV-2 were not yet available, and people were encouraged to stay home. Consequently, there was a low adherence of PD patients to this study because of difficulties accessing the Internet or handling electronic devices at home.

CONCLUSION

This research found low severity of mandibular function impairment in PD patients. Study variables, such as sex, age, marital status, denture use, and daily levodopa dose, were not associated with worse mandibular function impairment in these individuals, during social isolation, due to COVID-19.

ACKNOWLEDGMENTS

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

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Author Contributions:

HGLF, CFS, TSS, RBT, LOL: data acquisition, analysis and interpretation of data;

JSO: critical review for relevant intellectual content and data analysis and interpretation;

MGWSC: data analysis and interpretation;

CCSAL: conception and design of the study, critical review for relevant intellectual content and final approval of the version to be submitted for publication.