Self-reported periodontal disease, dental loss and COVID-19 in older adults

Autorreporte de enfermedad periodontal, pérdida dentaria y COVID-19 en adultos mayores

Yamilé Baganet-Cobas[1] https://orcid.org/0000-0002-6956-3181

Alain-Manuel Chaple-Gil[1,2]* https://orcid.org/0000-0002-8571-4429

Yilian Caballero-Guerra[3] https://orcid.org/0000-0002-4000-7245

Dayana Chávez-Valdez[3] https://orcid.org/0000-0003-1391-1260

[1]Universidad de Ciencias Médicas de La Habana. ICBP "Victoria de Girón". Departamento Carrera de Estomatología. La Habana, Cuba.

[2]Universidad Autónoma de Chile. Facultad de Ciencias de la Salud. Temuco, Chile.

[3]Clínica Estomatológica "Ana Betancourt". La Habana, Cuba.

*Author for correspondence. Email: alain.chaple@uautonoma.cl

ABSTRACT

Introduction: Upon completion of this research, there was no evidence of studies addressing self-reported periodontal disease in Cuba, nor any antecedent of research relating it to COVID-19 in adults over 60.

Objective: To determine the relationship between self-reported periodontal disease, dental loss, and COVID-19 activity.

Methods: A descriptive cross-sectional investigation was carried out. The sample included 238 individuals aged over 60 who were infected with COVID-19, and survived. They gave their consent. The study was performed for over 1 year in Playa municipality of Havana, Cuba. Variables such as gender, age, COVID-19 evolutionary severity, comorbidities, and self-reported periodontal disease were used. A

validated 4-question survey was applied to identify the periodontal disease and all data were processed in a database. Some variables were dichotomized to perform the odds ratio and Pearson's Chi-squared test, and determine the relationship between possible risk factors and the evolutionary severity of COVID-19.

Results: As a result, the odds ratio values and confidence intervals for periodontal disease and advanced periodontal disease were 1.598 (0.261; 9.78) and 1.814 (0.296; 11.105) respectively, and the p-values were 0.609 and 0.514 respectively.

Conclusion: A relationship between periodontal disease and the evolutionary severity of COVID-19 cannot be established. However, a relationship was observed targeting dental loss and respiratory diseases as determinant risk factors in the severity of COVID-19.

Keywords: periodontal disease; self-report; COVID-19; patient acuity; aged.

RESUMEN

Introducción: Hasta el momento de culminada esta investigación no se encontró evidencia de estudios que aborden el autorreporte de enfermedad periodontal en Cuba, ni antecedentes de estudios que la relacionen con la COVID-19 en adultos mayores de 60 años.

Objetivo: Determinar la relación entre el autorreporte de enfermedad periodontal, la pérdida dentaria y características de la COVID-19.

Métodos: Se realizó una investigación descriptiva transversal. La muestra fue de 238 individuos mayores de 60 años, que contrajeron la COVID-19 y sobrevivieron. Todos dieron su consentimiento informado. El estudio fue realizado en el período de 1 año en el municipio Playa, La Habana, Cuba. Las variables estudiadas fueron, sexo, edad, gravedad evolutiva de la COVID-19, comorbilidades y autorreporte de enfermedad periodontal. Se les aplicó una encuesta validada de 4 preguntas, para identificar enfermedad periodontal y los datos fueron procesados en una base de datos. Algunas variables fueron dicotomizadas para realizar la prueba de *odds ratio* y *ji* cuadrado de Pearson, para determinar la relación entre posibles factores de riesgo y la gravedad evolutiva de la COVID-19.

Resultados: Los valores de *odds ratio* e intervalos de confianza de la enfermedad periodontal y la enfermedad periodontal avanzada fueron de 1,598 (0,261; 9,78) y 1,814 (0,296; 11,105) y los valores de p de 0,609 y 0,514 respectivamente.

Conclusiones: No se comprueba que exista relación entre la enfermedad periodontal y la gravedad evolutiva de la COVID-19. Sin embargo, existe una relación que señala a la pérdida dentaria y las enfermedades respiratorias como factores de riesgo determinante en la gravedad de la COVID-19.

Palabras clave: enfermedad periodontal; autorreporte; COVID-19; gravedad del paciente; anciano.

INTRODUCTION

In recent years, periodontal disease (PD) has been widely studied due to its significant relationship with health. It emerges as a manifestation of systemic disorders, influences the etiology of diverse general diseases, and shares risk factors with current major chronic illnesses, such as cardiovascular,[1] rheumatic, renal, and neurological diseases – including Alzheimer's and Parkinson's,[2,3] cancer, chronic respiratory diseases,[4,5] obesity[6] and diabetes,[7,8] among others.[9,10,11,12,13] As a result of this relationship, and the aging population, an increase in the prevalence of periodontopathies, which in turn are the main cause of dental loss, is expected. Several studies associate edentulism with negative effects at the systemic level.[14,15,16]

The self-reported periodontal disease (SPD) has acceptable validity when compared to clinical excellence standards. Regarding painful gums, dental mobility, and people's opinions about whether they have gum disease, it can be classified as moderately to highly valid, according to Nelson's validity classification.[17]

On March 11th, 2020, the World Health Organization declared the COVID-19 pandemic,[18] caused by a novel coronavirus SARS-COV-2. It produces pulmonary damage and other organ failures, and like PD, features an exacerbated immune-inflammatory response, resulting in an excessive host immune reaction

with cytokine storming, which is closely related to severity in the presence of chronic non-communicable diseases.[6,10,18,19,20]

The severity spectrum of COVID-19 ranges from asymptomatic to severe. While a significant proportion of SARS-CoV-2 positive individuals do not manifest symptoms or have only mild ones, some become seriously ill and develop a hyperinflammatory response leading to dysregulation of the involved organ metabolism, with potentially life-threatening consequences. Overall, the severity of COVID-19 increases with pre-existing comorbidities.[21] In this context, several hypothetical mechanisms may explain the strong associations observed between PD and COVID-19 severity.[20,22,23,24,25]

Up to the completion date of this research, there was no scientific evidence of SDP studies in Cuba, nor any antecedents of studies related to COVID-19 in adults over 60. For this reason, this research aims to determine the relationship between SDP, dental loss, and COVID-19 activity.

This research aims to determine the relationship between self-reported periodontal disease, dental loss, and COVID-19 activity.

METHODS

Type of study: A cross-sectional descriptive research was conducted from April to September 2021. It was approved by the Ethics Committee of the Faculty of Stomatology at University of Medical Sciences of Havana as the main subject of the master's studies of one of the authors.

Inclusion and sample criteria: The sample consisted of 238 individuals aged over 60, who were infected with COVID-19 and survived it, from March 11th, 2020 to March 11th, 2021, and lived in Playa municipality in Havana, Cuba. They were all confirmed positive cases for COVID-19 according to the PCR test (Polymerase Chain Reaction).

Variables: The study variables were defined by gender (male/female), age groups (60-75 and 76-100), evolutionary severity of COVID-19 (asymptomatic, symptomatic, and severe), comorbidities (hypertension, diabetes mellitus, heart disease, chronic respiratory disease, and morbid obesity), dental

loss (teeth and edentulous), and SPD (absence and presence of PD and presence of advanced periodontal disease (APD)).

Techniques and procedures: Credentials were submitted to governmental institutions to access the data required to develop the research. Then, personal data were collected from patients confirmed as COVID-19 positive. Individuals were presented with a 4-question survey to identify the presence of periodontal disease. This survey was validated in New Zealand,[26] and translated into Spanish for its usage. First, the absence of PD was determined when all four answers were negative; then, the presence of PD was determined in cases with two positive answers and if only the fourth one was also positive. Finally, the presence of SPD was determined when answers 2,3, and 4 were positive.

All data were collected through a Google form and stored in a database. General information, personal pathological background, and edentulous or dentate status were also recorded. All participants were visited and surveyed at their homes. All health protocol measures required by the relevant health organizations were followed, and the required protective equipment was used.

Data processing and analyses: Data regarding the evolutionary severity of COVID-19, the PD, and the SPD were dichotomized to process all variables and perform Pearson's odds ratio and the chi-square test. It aimed to determine the connection between their relationship (as possible risk factors) and the evolutionary severity of COVID-19. There was a 95 % confidence interval defined to establish this relation; besides, the p-value had to be less than 0.05 or equal to it to show any significance. All data were processed using Excel databases and imported into IBM SPSS® Statistics 25 for Windows. All statistical tests applied to the primary endpoints were assessed with a 95 % confidence interval. Similarly, this database is available in the Zenodo repository based on the principles of open sciences.[27]

Ethical aspects: The mediating institutions authorized using patient data through the official research document. All individuals received the informed consent document as per the Helsinki principles, which they signed voluntarily, and their identity and privacy were protected. They were informed of receiving information about the research results after its publication.

RESULTS

The population studied showed a slight predominance of female participants, and 72.3 % belonged to the early old age group. Among the comorbidities, there was a high prevalence of arterial hypertension (70.6 %), followed by diabetes mellitus and obesity. More than half of the total (58.4 %) had COVID-19 clinical symptoms, and a significant percentage of patients (81.9 % of the total) preserved their teeth despite their age (table 1).

Table 1 - Baseline characteristics of the patients studied

Baseline characteristics		n = 238	%
Gender	Female	124	52.1
Age group	60- 75	172	72.3
Comorbidities	Arterial hypertension	168	70.6
	Diabetes mellitus	59	24.8
	Morbid obesity	37	15.5
Symptomatic COVID-19 behavior	Symptomatic	139	58.4
Dental los	Toothed	195	81.94

The self-reported results of periodontal disease, even advanced periodontal disease, were high (between 48.7 % and 45.6 %) and did not have a statistically significant relationship regarding the evolutionary severity of COVID-19. This was evidenced by the ODDS ratio values and their confidence intervals 1.598 (0.261; 9.78) and 1.814 (0.296; 11.105) respectively, as well as the *p*-value of 0.609 and 0.514 for each of them. Besides, more than half of all of people affected by SPD presented clinical symptoms derived from COVID-19.

Dental loss *p*-values results were less than 0.05, and edentulous patients were statistically significant, suggesting the teeth loss as a risk factor for the evolutionary severity of COVID-19 with an ODDS ratio of 3.897 and confidence intervals between 1.001 and 15.173; supported by the *p*-value equal to 0.036 (table 2).

Likewise, there was a significant relationship between respiratory diseases and the severity of COVID-19, with an odds ratio of 6,833 and confidence intervals between 1,717 and 27,192 (table 2).

Table 2 - Self-reported Periodontal Disease, dental loss, comorbidities and evolutionary severity of COVID-19

Variables	Total n= 238	Severe n= 9	Not severe n= 229	OR (IC 95%)	p
SPD	95 (48.7)	5 (5.26)	90 (94.38)	1.598 (0.261; 9.78)	0.609
SPD (advanced)	89 (45.6)	3 (3.37)	86 (96.6)	1.814 (0.296; 11.105)	0.514
Toothed patients	195 (81.9)	5 (2.5)	190 (97.5)	0.257 (0.066; 0.999)	0.036
Edentulous patients	43 (18.1)	4 (9.3)	39 (90.7)	3.897 (1.001; 15.173)	0.036
Arterial hypertension	168 (70.5 %)	8 (88.9 %)	160 (69.9)	3.45 (0.423; 28.115)	0.219
Diabetes mellitus	59 (24.8)	4 (44.4)	55 (24.0)	2.531 (0.657; 9.756)	0.164
Heart diseases	31 (13.0 %)	1 (11.1)	30 (13.1)	0.826 (0.100; 6.867)	0.862
Respiratory diseases	28 (11.8)	4 (44.4)	24 (10.5)	6.833 (1.717; 27.192)	0.002
Morbid obesity	37 (15.5)	3 (33.3)	34 (14.8)	2.868 (0.684; 12.019)	0.133

DISCUSSION

Dental loss might represent a risk factor contributing to the severity of COVID-19; however, there is no documented evidence in other articles connecting both situations. Recent studies suggest an association between edentulous diagnosed patients and lower respiratory capacity, a high incidence of chronic obstructive pulmonary diseases, greater susceptibility to hospitalizations due to pulmonary conditions, and even a higher risk of mortality derived from pneumonia, than toothed patients.[16,28,29,30,31] The biological mechanism relating the periodontal disease, dental loss, and edentulism to chronic diseases involves a local and systemic inflammation due to endothelial dysfunction, together with micro and macro-vascular impairment. In general, people with systemic diseases, elderly or not, have a weakened immune response.[14,28,32,33]

The relationship between the presence of respiratory diseases and the severity of COVID-19 was reaffirmed. It has been seen that, while suffering from COVID-19, patients with pre-existing respiratory illnesses have had an increased risk of serious complications and some have even died.[34,35,36,37] The underdiagnosis of all chronic respiratory diseases has been a universal characteristic, and despite

reporting low prevalence among all chronic non-communicable diseases, according to *Signes-Costa* et al.[38] is the one with the greatest statistical relevance.[34]

Although the expected association between SPD and COVID-19 was not detected, recent studies from Qatar and England suggest an increased risk of severity, hospitalization, and death from COVID-19 when patients have periodontal disease.[39,40] This can be attributed to the lack of traditional procedures used for diagnosis, a limitation that all self-reported measures share when compared to the results of periodontal probing and radiographic examinations. Self-reported methods had a desirable use considering the epidemiological situation. Besides, the relationship among high blood pressure, diabetes mellitus, obesity, cardiovascular diseases, and the severity of COVID-19 were significant in this study, which differs from other results of several studies carried on in Cuba and the world.[41,42,43,44,45] This can be attributable to the low percentage of critically ill patients who made up the sample.

Self-reported diagnostic methods stated the presence of PD and can be used for epidemiological purposes. There is no relationship between SPD and the evolutionary severity of COVID-19 in the population studied. However, a relationship is observed targeting dental loss and respiratory diseases as determinant risk factors in the severity of COVID-19.

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Conflict of interests

The authors declare that they have no conflict of interests.

Authorship contribution

Conceptualization: *Yamilé Baganet Cobas, Alain Manuel Chaple Gil.*

Data curation: *Alain Manuel Chaple Gil.*

Formal analysis: *Alain Manuel Chaple Gil.*

Investigation: *Yilian Caballero Guerra, Dayana Chávez Valdez.*

Methodology: *Yamilé Baganet Cobas, Alain Manuel Chaple Gil.*

Project administration: *Yamilé Baganet Cobas.*

Supervision: *Yamilé Baganet Cobas, Alain Manuel Chaple Gil.*

Visualization: *Yamilé Baganet Cobas, Alain Manuel Chaple Gil.*

Writing - original draft: *Yamilé Baganet Cobas, Alain Manuel Chaple Gil, Yilian Caballero Guerra, Dayana Chávez Valdez.*

Writing – review and editing: *Yamilé Baganet Cobas, Alain Manuel Chaple Gil, Yilian Caballero Guerra, Dayana Chávez Valdez.*