

Impact of the coronavirus disease 2019 pandemic on periodontal practice: A questionnaire survey

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Abstract

Aim: This cross-sectional study sought to investigate the factors possibly related to the impact caused by the coronavirus disease 2019 pandemic in the practice of periodontists, in two countries.

Materials and methods: A total of 254 periodontists with active periodontics licensing in Brazil and the United States participated in the survey. Data were collected through an online questionnaire and the dependent variable was the perceived impact of the pandemic on periodontists' practice routines. Odds ratios were assessed by logistic regression analysis.

Results: Periodontists in private practice were 83% less likely to report a significant impact of the pandemic on their clinical routine as compared with professionals who work in the public sector or in academic institutions (CI 95%: 0.05–0.47). The financial impact of the pandemic was significantly associated with a perceived severe impact of the pandemic on their routines (OR: 1.36; CI 95%: 1.16–1.61). Professionals who have enhanced their hand-washing routine were more likely to report a significant impact of the pandemic by 3.41 times (CI 95%: 1.28–9.04) relative to those who have not altered their hand-washing protocols.

Conclusion: The pandemic is associated with a negative impact on the practice of periodontists, especially those working in public sectors and academic institutions.

KEYWORDS

coronavirus infection, COVID-19 pandemic, epidemiology, periodontal medicine, periodontics

1 | INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic, caused by the spread of infections by a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has generated a series of challenges for dental professionals to overcome and uncertainties regarding the future of the field in both public and private spheres (Ahmed et al., 2020; Goswami et al., 2020; Sharma et al., 2020).

The high rate of dissemination of the SARS-CoV-2 virus due to the inhalation of small airborne particles from aerosols and droplets is well-recognized (Chen, 2020). Therefore, among health professionals, dentists are at high risk of infection (Meng et al., 2020), including particularly periodontists, because of their frequent use of ultrasound and polishing devices and other surgical instruments that generate aerosols (Holloman et al., 2015).

In response to the rapid spread of COVID-19, dentists around the world were initially instructed to stop their activities in mid-March

2020 and to treat patients only in cases of urgency or emergency and to focus on increasing cross-contamination control measures (Ather et al., 2020). The return to elective activities has been carried out gradually since May 2020 and has been varied in its degree in the United States and Brazil, depending on the number of COVID-19 cases, hospital bed capacity levels, and COVID-19-related deaths in each country.

In this challenging scenario, health professionals have faced drastic changes in their clinical routines, including enacting strict practices against cross-infection, enhancing the management of minimally invasive procedures that generate less aerosols, reducing the number of patient visits (Jamal et al., 2020), and developing protocols for teleodontology services (Maret et al., 2020). Recent studies have indicated that the COVID-19 pandemic has had not only negative economic consequences (Ali et al., 2020; Nibali et al., 2020; Schwendicke et al., 2020) but also increased the levels of fear and anxiety among the dental workforce (Ahmed et al., 2020; Chaudhary et al., 2020; Sharma et al., 2020). In this context, periodontists have been forced to adapt their clinical practice in various ways to reduce the transmission of SARS-CoV-2 while, at the same time, figuring out how to manage the emotional and financial impacts related to their new professional routine.

Despite the rapid growth of the COVID-19 pandemic and the large number of publications covering this event, data on the impact of the pandemic on the clinical practice of periodontists remain scarce. Thus, the objective of this study was to investigate the possible factors associated with the perception of the impact of the COVID-19 pandemic on the clinical practice of periodontists in Brazil and the United States.

2 | MATERIALS AND METHODS

This was a cross-sectional study whose data were collected through a self-administered online questionnaire sent to periodontists living in Brazil and the United States. The survey was approved by the research ethics committees of the Federal University of Jequitinhonha and Mucuri Valleys (no. 4,079,814) in Brazil and the University of Florida (no. IRB202001643) in the United States.

The questionnaire was developed for this study by the authors involved and was divided into four domains as follows: the first included personal data (e.g. age, sex, dental degree, areas of living and working, working status); the second covered health conditions (comorbidities, COVID-19 status); the third included working conditions and personal protective equipment adopted following the start of the pandemic; and the fourth encompassed the knowledge about COVID-19 and the self-perceived risk of infection. Brazilian Portuguese and English language versions of the questionnaire were created. The topics included in the questionnaire to assess the impact of the COVID-19 pandemic on periodontal practice were established based on a literature review, recommendations released by the American Association of Periodontology (AAP) and Brazilian Society of Periodontology (BSP) for dental practices to consider in

Clinical Relevance

Scientific rationale for the study: Despite the rapid expansion of the coronavirus disease 2019 pandemic and the large number of publications covering this event, data on the impact of the pandemic on the clinical practice of periodontists remain scarce.

Principal findings: The impact of the pandemic on the clinical practice of periodontists was deemed to be larger in association with greater financial costs and more time spent adhering to hygiene procedures.

Practical implications: As the coronavirus disease 2019 pandemic has disturbed the clinical practice of periodontists, support strategies should be suggested and implemented to help periodontists move forward.

light of the COVID-19 pandemic, and the authors' experiences. The questionnaire was tested for face validity by two dentists not otherwise involved in the study. The questionnaire resulting from this expert analysis was tested by five participants not involved in dentistry to assess the organization of the tool and the layout in HTML style. The Google Forms platform was used to develop the layout of the tool, which was shared with the target audience via email with members of the BSP and AAP and with different institutional stakeholders from June to July 2020. In addition, the link to access the research was shared on social media (i.e. WhatsApp, Instagram, and Facebook).

Survey respondents were required to be dentist surgeons with postgraduation periodontics experience and active registration with either the Regional Councils of Dentistry (in Brazil) or the American Board of Periodontology (in the United States); all participants were also required to agree to participate in the survey by checking the box seen during the survey related to consent. Periodontists who had ceased their professional activities more than 1 year ago, who did not complete the survey, or did not sign the consent form and dentists who responded but who did not have a certificate in periodontics were excluded. A convenience sample was used, considering all the questionnaires answered within 1 month by clinicians who met the eligibility criteria of the study.

The interest-dependent variable was the perceived impact of the COVID-19 pandemic on periodontal clinical practice. Periodontists were instructed to use a numerical rating scale ranging from zero to 10 points to indicate their responses, where zero points represented "no impact" and 10 points represented the "maximum impact possible." During data analyses, the following ranges were arbitrarily determined by the research team, who made the decision based on a desired level of detail: 0 points, no impact; one to two points, very low impact; three to four points, low impact; five to six points, moderate impact; seven to eight points, significant impact; and nine to 10 points, very significant impact. Therefore, the analyses were conducted using the value of "seven points" as the cut-off point for a

TABLE 1 Personal and professional profiles of the periodontists included in the study ($n = 254$)

Characteristic	N (%)
Age, years, mean (\pm SD)	47.4 (\pm 12.8)
Sex	
Female	119 (46.9%)
Male	132 (52.2%)
Not reported	3 (1.2%)
Country	
Brazil	138 (54.3%)
USA	116 (45.7%)
Belonging to the COVID-19 risk group	
Yes	96 (37.8%)
No	157 (61.8%)
Current professional status	
Active periodontist only	204 (80.3%)
Periodontist plus general dentist	18 (7.1%)
Periodontist teaching in academic institution	60 (23.6%)
Unemployed	2 (0.8%)
Type of specialty training	
Specialization/residency	90 (35.4%)
Master's degree	45 (17.7%)
Doctorate degree	47 (18.5%)
Length of experience as a periodontist	
<1 year	5 (2.0%)
1–5 years	13 (5.1%)
>5 years	78 (30.7%)
Not reported	158 (62.2%)
Other specialty training than periodontics	
Yes	127 (50.0%)
No	112 (44.1%)
Not reported	15 (5.9%)
COVID-19 disease status	
Reported positive test for COVID-19	9 (3.5%)
Confirmed cases in the region where they reside	237 (93.3%)
Social isolation measures in their municipality of residence	
No social isolation measures enacted	13 (5.1%)
Vertical or horizontal isolation	191 (75.2%)
Lockdown	45 (17.7%)

Abbreviations: COVID-19 risk group include at least one following factor: elderly (≥ 60 years old), diabetic, hypertensive, pregnant women, patients with heart disease, patients with pulmonary/respiratory diseases, chronic kidney disease, immunosuppression, obese, smokers; COVID-19: coronavirus disease 2019.

“significant impact” and the survey respondents were dichotomized into “low/moderate impact” and “high (significant) impact” groups. Thus, periodontists who scored seven points or more were categorized as perceiving a significant impact of the pandemic on their

clinical practice, while those who scored lower than seven points were classified as perceiving a low/moderate impact concerning the same.

In addition to information about professional performance, bio-safety measures, and adjustments in professional practice routines during the pandemic, sociodemographic variables were collected from the survey respondents to verify their influence on the dental clinical routines of periodontists.

2.1 | Statistical analysis

Descriptive analyses were used to describe the sociodemographic and pandemic features. Absolute and relative frequencies and mean and standard deviation values were used for the categorical independent variables. The Wilcoxon test was used to compare financial impacts between Brazil and the United States. The dependent variable was the impact value of the COVID-19 pandemic on periodontal clinical practice. Independent variables were initially screened by univariate analysis and those with a p -value of less than .20 were then included in the multivariate regression analysis concerning the perceived impact of COVID-19 on periodontists' professional routines. The stepwise method assisted in selecting the variables to be included in the final impact model using the Akaike information criterion. The fit of the model was assessed using the Hosmer-Lemeshow test. Thus, the odds ratios (ORs) and 95% confidence intervals (CIs) for the impact of the pandemic as perceived by periodontists were calculated. Collinearity statistics were used to assess the possible collinearity between covariates. The R software (R Foundation for Statistical Computing, Vienna, Austria) was used in the data analysis (readxl and car packages), and $p < .05$ was regarded as statistically significant.

3 | RESULTS

Data from 254 periodontists, including 138 from Brazil and 116 from the United States, were collected and analysed for this study. Table 1 summarizes the personal and professional profiles of periodontists included in this study. In all, 56.3% of respondents participated in training on measures aimed towards preventing the spread of SARS-CoV-2 and the frequency of this training was significantly higher among periodontists residing in the United States ($p = .039$).

The most commonly used personal protective equipment in periodontal care after the start of the pandemic were disposable procedure gloves (82.7%) and face shields (81.2%), while the least commonly used equipment were overalls (12.2%) and waterproof jackets (26.3%). A greater degree of difficulty than usual in purchasing this equipment due to the pandemic was reported by a majority of dentists (66.1%), with no significant difference in the level of difficulty found between Brazil and the United States ($p = .332$). The adjustments (and respective frequencies) made by periodontists in

TABLE 2 Frequency of adjustments made by periodontists in their clinical practice following the beginning of the pandemic ($n = 254$)

Characteristic	N (%)
Change in clinical routine	
Adjustments of the working environment	188 (74.0)
Disinfection of the working environment	188 (74.0)
Increased use of PPE	203 (79.9)
Incorporation of preliminary remote patient screening	182 (71.7)
Enhanced personal hygiene	185 (72.8)
Adjustments of clinical procedures	171 (67.3)
Reduction of working hours	2 (0.8)
Incorporation of teledentistry	31 (12.2)
Precautionary measures in sorting	
Use of a specific questionnaire for COVID-19 to screen patients in person	124 (48.8)
Use of a specific questionnaire for COVID-19 for remote patient screening	108 (42.5)
Temperature measurement at the dental clinic	148 (58.3)
Request for patients to check their temperature before going to the dental clinic	41 (16.1)
Mouthwash with antimicrobial use in the dental clinic	179 (70.5)
Mouthwash with antimicrobial use before arriving at the dental clinic	16 (6.3)
Change in periodontal procedures	
Pre- and postoperative mouthwash	175 (68.9)
Use of high-volume suction	168 (66.1)
Performance of minimally invasive and conservative procedures	121 (47.6)
Use of handpieces or other devices connected to the air/water lines only when indispensable	147 (57.9)
Use of reinforced disinfection, sterilization, and protection of all potentially contaminated surfaces and equipment	189 (74.4)
Replacement of intra-oral radiographic techniques by extraoral techniques	19 (7.5)
Implementation of sutures with resorbable threads	36 (14.2)
Remote assistance used during the pandemic	
WhatsApp	90 (35.4)
Email	27 (10.6)
Telephone call	94 (37.0)
Video conference	18 (7.1)

Abbreviations: COVID-19, coronavirus disease 2019; PPE, personal protective equipment.

their work routine after the beginning of the pandemic are described in Table 2.

Regarding the impact of COVID-19 on periodontists' professional routine, 50% of periodontists reported seeing a mean of 10 patients per day before the pandemic and a mean of five patients

after the start of the pandemic, for a difference that was statistically significant ($p < .001$). The financial impact assessed by professionals on a scale ranging from zero (no impact) to 10 (maximum impact) points averaged 7.97 (± 2.26) points, with 50% of participants rating the financial impact as greater than eight points. The level of financial impact ($p < .001$), the perceived impact on the current clinical routine ($p = .002$), and the perspective on the future of clinical practice ($p = .008$) were statistically higher among dentists residing in Brazil than those residing in the United States (Figure 1).

In the univariate analyses, the financial impact due to the pandemic and changes in the clinical routine, such as the need to alter the work environment, the intensification of hand-washing, and the need to modify clinical procedures, were significantly associated with periodontists perceiving the COVID-19 pandemic to have had a significant impact on their clinical practice (Table 3).

Table 4 shows the results of the multivariate logistic regression analysis performed after including the variables that were added to the final model. Dental professionals who work in the private sector showed an 83% lower chance of reporting a significant impact of the COVID-19 pandemic on their clinical routine as compared with those working in the public service sector or academic institutions. The impact of the pandemic on the finances of dental practices was significantly associated with a perceived significant impact of the pandemic (OR: 1.36; 95% CI: 1.16–1.61). Finally, professionals who enhanced their hand-washing routine were more likely to report a significant impact of the pandemic by 3.41 times (95% CI: 1.28–9.04) relative to those who have not changed their hygiene routine in this manner. The ORs for social isolation and clinical procedure adaptation were not statistically associated with the perception of a significant impact of the pandemic. The p -value for the Hosmer and Lemeshow test was .22.

4 | DISCUSSION

In light of the COVID-19 pandemic, health professionals, especially dentists, have adopted new approaches to patient care. Adjustments made by dental practices worldwide were necessary to contain the spread of the virus and protect both clinicians and patients alike from possible contamination in the workplace (Ather et al., 2020), leading to a significant impact on the routine of dentists. The present study clearly demonstrated that the perception of a significant impact reported by periodontists was associated with the number of changes that occurred in their clinical practice in response to the pandemic. The intensification of hand-washing and the financial effect suffered by periodontists as well as the type of sector to which the periodontist belongs were significantly associated with the perception of a significant impact of the COVID-19 pandemic.

It is important to mention that there has been no effective level of control of the spread of SARS-CoV-2 attained in either country examined here to date and that a long interruption of services could generate an imminent economic crisis for dental professionals (Farooq & Ali, 2020; Nicola et al., 2020) and inappropriate or

inadequate patient care. However, during the time of our survey, some states had resumed routine dental activities due to lessened case counts with special provisions in place. Thus, despite the worrying health crisis being experienced worldwide and the strict guidelines provided by the BSP and AAP, periodontists polled here did report a continuation of patient care, albeit to a reduced degree, with their service hours remaining unchanged during the pandemic. The high rate of confirmed cases of COVID-19 in the region of residence (93.3%), the inclusion of measures of social distancing, and the fear of contamination could lead to a reduced demand for dental care by the population and reduced working hours by professionals, negatively impacting both the short- and long-term financial stability of the dental practice and the quality of life of the health care workers.

To provide dental care safely until a vaccine is readily available and administered to an adequate degree, health professionals must be diligent about following new protocols, including the use of personal protective equipment, establishing changes in work routine, and intensifying biosecurity measures. The introduction of these practices was reported by most of the periodontists who responded to the survey in both countries (Tables 2 and 3). It is supposed that such measures may have financial implications, as was previously reported by a recent Brazilian study (Cavalcanti et al., 2020). Furthermore, the difficulty in acquiring common personal protective equipment due to its scarcity and exorbitant cost on the market, as demonstrated recently (Chamorro-Petronacci et al., 2020; Consolo et al., 2020) and reported by 66.1% of the periodontists in this study, is another negative factor to take into consideration in securing clinical practice after the pandemic.

In this context, the results of this study demonstrate that a financial impact was felt by periodontists in both countries, with a statistically significantly higher negative impact on the current routine and with consideration of the future of the clinical practice reported by those in Brazil. It was also concluded that the perception

of a significant impact of the COVID-19 pandemic in clinical practice was related to the financial impact suffered. The difference observed between Brazil and the United States may be linked to variations in economic stability and the cost of living between the two countries as well as to the average monthly salary of the survey respondents.

Another factor associated with the perception of a significant impact of the pandemic in clinical practice was related to changes in the clinical routine adopted by periodontists after the spread of SARS-CoV-2 began. According to our results, adjustments made by periodontists to their routine after the start of the pandemic were consistent with those reported by other studies (Ather et al., 2020; Farooq & Ali, 2020) and followed the guidelines proposed by health organizations (Barabari & Moharamzadeh, 2020) to avoid the spread of the disease and minimize the risk of contamination of health professionals and patients. It is noteworthy that the majority of periodontists from both countries reported following most of the COVID-19-related recommendations for dental practices released by the AAP and BSP, which took into consideration the guidance from the Centers for Disease Control and Prevention, the World Health Organization, and the American Dental Association (Tables 2 and 3). Such recommendations include conducting screenings of patients and visitors, focusing on a history of international travel and symptoms of acute respiratory illness (e.g. fever, cough, having difficulty with breathing), performing temperature readings, adopting proper use of PPE, inventorying available PPE, use of high-speed evacuation equipment by all dental procedures producing aerosols, having patients rinse with 1% hydrogen peroxide before each appointment, encouraging sick employees to stay home, implementing strategies to prevent patients who can be cared for at home from coming to the dental facility (e.g. use of telephone systems, telemedicine technologies, self-assessment tools, or the dental practice's website or social media pages (Jamal et al., 2020; Maret et al., 2020).

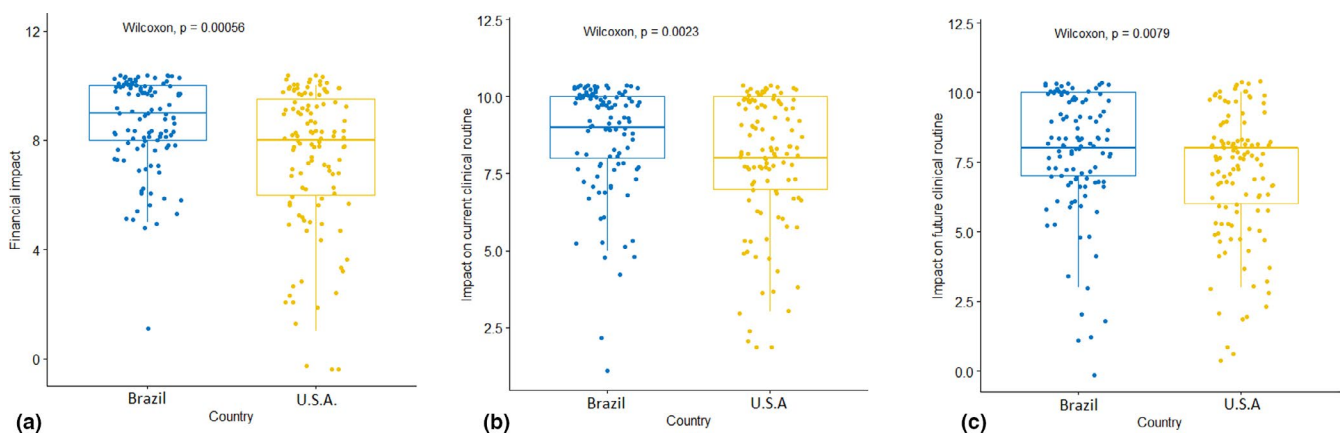


FIGURE 1 Comparison of periodontists' perceptions of the impact of the COVID-19 pandemic between Brazil and the United States. (a) Perceived impact of the pandemic on the routine financial costs of periodontists in Brazil and the United States. (b) Perceived impact of the pandemic on the current routine of periodontists in Brazil and the United States. (c) Perceived impact of the pandemic on the daily future practice of periodontists in Brazil and the United States. Analysis was performed by Wilcoxon's non-parametric test and *p*-values of less than .05 indicated statistical differences in the impacts observed by periodontists between countries

TABLE 3 Univariate analysis of factors related to periodontists' perceptions of the impact of the COVID-19 pandemic on professional practice (n = 254)

Variable	Low/moderate impact (n = 64)	High impact (n = 191)	p-value	OR (CI 95%)
Sex				
Female	33 (27.7%)	86 (72.3%)	.327	1
Male	31 (23.5%)	99 (76.5%)		1.31 (0.76–2.28)
Age group				
22–59 years	51 (25.5%)	149 (74.5%)	.943	1
60–78 years	12 (24.0%)	38 (76.0%)		1.02 (0.50–2.19)
Country				
Brazil	40 (29.0%)	98 (71.0%)	.151 [*]	1
USA	24 (20.7%)	92 (79.3%)		0.65 (0.36–1.16)
Confirmed cases of COVID-19 in the municipality of residence				
No	1 (10.0%)	9 (90.0%)	.271	1
Yes	62 (26.2%)	173 (73.8%)		0.31 (0.01–1.69)
Social isolation measures in the municipality of residence				
None	5 (38.5%)	8 (61.5%)	.124 [*]	1
Isolation	48 (25.1%)	143 (74.9%)		1.83 (0.53–5.77)
Lockdown	8 (17.8%)	37 (82.2%)		2.89 (0.71–11.28)
Acting as a periodontist in				
Academic institution or public service	22 (47.8%)	24 (52.2%)	<.001 ^{a,*}	1
Private clinic	31 (23.0%)	104 (77.0%)		3.01 (1.49–6.13)
Two or more services	9 (13.0%)	60 (87.0%)		6.11 (2.53–15.82)
Difficulty in purchasing PPE				
No	7 (13.5%)	45 (86.5%)	.627	1
Yes	27 (16.1%)	141 (83.9%)		0.80 (0.30–1.87)
Remote prescription				
No	13 (13.5%)	83 (86.5%)	.506	1
Yes	21 (16.5%)	106 (83.5%)		0.77 (0.35–1.62)
Changes in clinical routine				
No alterations to the work environment	10 (29.4%)	24 (70.6%)	.017 ^{a,*}	1
Alterations in the work environment	24 (12.8%)	162 (87.2%)		2.81 (1.16–6.50)
No change in the disinfection routine of the work environment	7 (20.6%)	27 (79.4%)	.370	1
Intensification of the disinfection of the work environment	27 (14.4%)	161 (85.6%)		1.52 (0.56–3.70)
No change in/routine use of PPE	4 (21.1%)	15 (78.9%)	.482	1
Increased use of PPE	30 (14.8%)	173 (85.2%)		1.52 (0.41–4.53)
No change in patient screening	7 (17.5%)	33 (82.5%)	.692	1
Remote patient screening	27 (14.8%)	152 (85.2%)		1.20 (0.45–2.86)
Service hours unchanged	33 (15.0%)	187 (85.0%)	.227	1
Alteration of the service hours	1 (50.0%)	1 (50.0%)		0.17 (0.00–4.58)
Maintenance of the same hand-washing routine	13 (35.1%)	24 (64.9%)	<.001 ^{a,*}	1
Intensified hand-washing routine	21 (11.4%)	164 (88.6%)		4.17 (1.82–9.40)
Maintenance of the same clinical procedures	13 (25.5%)	38 (74.5%)	.026 ^{a,*}	1
Alteration of the clinical procedures	21 (12.3%)	150 (87.7%)		2.41 (1.08–5.21)
Financial impact (±SD)	6.38 (± 2.45)	8.25 (± 2.12)	<.001 ^{a,*}	1.34 (1.16–1.56)

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease 2019; OR, odds ratio; PPE, personal protective equipment.

^aLower case numbers drove statistical differences in the perception of a significant impact between the variables reported by periodontists ($p < .05$).

* $p < .20$ included in the multivariate regression analysis.

TABLE 4 Multiple logistic analysis of factors related to periodontists' perceptions of the impact of the COVID-19 pandemic on professional practice (n = 254)

Variable	b	SE(b)	p-value	OR	95% CI
Social isolation	0.36	0.46	.428	1.44	0.56–3.52
Professional practice in sector private	-1.75	0.55	.001*	0.17	0.05–0.47
Financial impact of the pandemic	0.31	0.08	<.001*	1.36	1.16–1.61
Intensification of hand-washing habits	1.22	0.49	.012*	3.41	1.28–9.04
Alteration of clinical procedures	0.46	0.47	.319	1.59	0.61–3.98

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease 2019; OR, odds ratio; SE, standard error.

*Variables statistically associated with periodontists' perceptions of the COVID-19 having a significant impact on clinical practice ($p < .05$).

The univariate analyses in the present study demonstrated that there were differences in the perception of impact by the periodontists who adapted their work environment in an attempt to make it safer and those who adapted clinical procedures to reduce aerosol generation when compared with those who did not ($p = .017$ and $p = .026$, respectively). However, in the multivariate analysis, the perception of a significant impact of the COVID-19 pandemic on clinical practice was not related to the adjustment of periodontal clinical procedures. Therefore, it seems that most periodontists did not consider altering procedures to minimize the dispersion of aerosols as a priority in the pandemic period.

On the other hand, those periodontists who intensified their hand-washing habits demonstrated a greater chance of reporting a significant impact of COVID-19 on their clinical practice. In fact, more frequent and thorough hand-washing and disinfection have become imperative practices during the COVID-10 pandemic for inactivation of the SARS-CoV-2 virus and the reduction of contamination. Therefore, the enhancement of hand-washing protocols during the work routine was the most immediate and noticeable change in clinical practice noted by the periodontists of both countries after the start of the COVID-19 pandemic.

Moreover, this study identified that periodontists who work only in the private sector are more likely to report a smaller impact of the pandemic on the clinical practice as compared with those who work in the public sector, an academic institution, or in two or more service sectors. As many academic institutions have adopted remote education measures (Elangovan et al., 2020) and public sectors have developed teleconsultation guidelines (Maret et al., 2020), the greater impact reported among those in the public and academic sectors here may be due to the smaller number of patients and non-urgent procedures seen in these locations as a result of restrictions imposed by governments and organizations like the BSP and AAP. Contrary to the findings of this study, recent studies (Barabari & Moharamzadeh, 2020; Consolo et al., 2020) have reported a greater impact of the COVID-19 pandemic on the private sector and showed that about 100% of the periodontists interviewed closed their practices at the time of the initial outbreak, experiencing a negative impact on their work routine. Therefore, the actual short- and long-term effects of the COVID-19

pandemic on periodontists working in the public and private sectors need to be better elucidated by future studies focusing on this topic.

Despite the relevance of the findings in this study, some limitations should be highlighted. Since this was a cross-sectional study, no causal relationship can be evaluated here; instead, only associations between individual factors and the perception of the impact of the pandemic on clinical practice may be assessed. Another limitation is the use of a self-applied online questionnaire and a possible degree of bias in the recruitment of participants. Despite the ease of dissemination of the questionnaire due to the current benefits of virtual technology, the response rate was incredibly low and our convenience sample was smaller than expected. However, important factors related to the COVID-19 impact on the clinical practice of periodontists in the United States and Brazil were identified, despite our small study sample size. Moreover, high and low perceptions of the impact of the pandemic were grouped according to an arbitrary cut-off point established by the study team. Finally, considering the broad way in which the questionnaire was distributed, unfortunately, there was no control over how many periodontists were approached. Likewise, it is not known whether the demographic data of the population that responded to the survey is representative of the general population of periodontists from both countries.

5 | CONCLUSIONS

The COVID-19 pandemic has driven significant changes to occur in the routine of periodontists in both Brazil and the United States. The main factors associated to the perception of periodontists of the impact of the COVID-19 pandemic on clinical practice were the financial effect of the pandemic and the intensification of hand-washing habits. Such consequences were more impactful among periodontists working in the public sector and academic institutions.

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CONFLICT OF INTEREST

The authors state that there are no conflicts of interest to report in connection with this article.

AUTHOR CONTRIBUTIONS

Gabriela Rocha-Gomes: conceived and designed the study, acquired the data, drafted the article, and provided final approval of the manuscript. **Olga D Flecha:** conceived and designed the study, revised the article critically for important intellectual content, and provided final approval of the manuscript. **Tamires S Miranda, Poliana M Duarte, and Luciana M Shaddox:** acquired the data, revised the article critically for important intellectual content, and provided final approval of the manuscript. **Endi L Galvão:** conceived and designed the study, analysis and interpretation of data, drafted the article and revised it critically for important intellectual content, and provided final approval of the manuscript. **Patricia F Gonçalves:** conceived and designed the study, analysed and interpreted the data, revised the article critically for important intellectual content, and provided final approval of the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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