

The impact of the COVID-19 pandemic on dental practice in Brazil

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ABSTRACT

Introduction: Dentists are at high risk of contamination by COVID-19 due to the proximity to the patients' oral cavity and airways. **Objective:** To elucidate the behaviors and adversities experienced by dentists because of the COVID-19 pandemic. **Methods:** This descriptive study invited 1.811 dentists affiliated with professional associations, dental cooperatives, and health insurance providers from São Paulo State, Brazil, in 2020 of which 473 agreed to participate. The data collection, using Google Forms, included the variables: sociodemographic conditions; characteristics of dental work; level of healthcare and sources of information about the pandemic; changes in the work process, financial impact with personal protective equipment (PPE) and biosafety measures; and consequences of the pandemic in the professional practice. **Results:** The 473 dentists (40.36±13.44 years), were mostly women (52.22%), had a specialty (55.60%), and were self-employed professionals (73.36%). It was observed that 78.01% of professionals had a reduction in their monthly income. The average of patients treated daily decreased by 35.48%. It was found that 30.44% of professionals had difficulty with the use of PPE, 3.59% contracted COVID-19, and 53.03% decided to postpone the appointment if the patient with suspected or confirmed COVID-19 sought treatment, even in emergencies. The use of high-speed handpieces was reported by most professionals (n=428; 90.48%). **Conclusion:** Behaviors: dentists used PPE and assigned very high or high levels of precaution about COVID-19. Adversities: dentists reported an increase in operating costs, changes in the work process, a decrease in appointments, and a reduction in the monthly income.

Keywords: pandemics; COVID-19; dental offices; infectious disease transmission, patient-to-professional; occupational risks.

INTRODUCTION

Healthcare professionals who make up the population's front line of defense against the COVID-19 and, among these, the dentists stand out because their profession presents with extremely high risk for contamination owing to the requirement of proximity to the patients' oral cavity and airways. In addition, most dental procedures employ rotating equipment that generates aerosols, which increases the risk of infection¹.

Chinese authorities reported the occurrence of cases of pneumonia of unknown etiology in Wuhan, the capital of Hubei province, China to the World Health Organization². On January 03, 2020, 44 patients were reported to have this pneumonia, of whom, 11 were seriously ill. This pneumonia was shown to be caused by a new coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the disease caused

How to cite this article: Moimaz *et al.*
The impact of the COVID-19 pandemic on dental practice in Brazil. ABCs Health Sci. 2022;47:e022208 <https://doi.org/10.7322/abcshs.2021117.1845>

Received: May 20, 2021
Revised: Sep 14, 2021
Approved: Oct 14, 2021

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Declaration of interest: nothing to declare
Funding: CAPES (Finance Code 001)



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by this virus was called coronavirus disease 2019 (COVID-19)^{2,3}. The severe outbreak of this disease that quickly spread throughout the world surprised the health systems of all countries and most, if not all, were caught off guard without adequate defense mechanisms to deal with and control such a pandemic^{3,4}. The “new disease”, called COVID-19, is the third outbreak of a disease caused by coronaviruses, following severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), in the last twenty years⁵.

The epidemiological burden of COVID-19 is constantly evolving, with the number of infected people, hospitalizations, and deaths growing almost exponentially⁶. World Health Organization data indicate that, globally, as of August 31, 2021, there were 216.867.420 confirmed cases of COVID-19, including 4.507.837 deaths⁷. In Brazil, on that same date, there were 20.741.815 confirmed cases of the disease and 579.308 deaths, with 4.262.684 confirmed cases and 145.836 deaths occurring in the State of São Paulo^{7,8}.

The transmission of SARS-CoV-2 from human to human occurs through respiratory droplets, which are generated especially when an infected individual, even if asymptomatic, coughs or sneezes. In this context, the maintenance of adequate interpersonal distance and the use of protective masks in symptomatic and asymptomatic individuals are considered effective measures to prevent droplets from spreading from an infected individual to a healthy person⁹.

It is known that infection prevention and control measures must be implemented by professionals working in health services to prevent or reduce the transmission of microorganisms during health care as much as possible¹⁰. Currently, the most effective approach to preventing COVID-19 is by controlling the source of infection with the use of preventive measures to reduce the risk of transmission, as well as to facilitate early diagnosis, isolation, and care of the affected patients¹.

Taking into consideration the severity of the epidemiological, political, social, and economic situations arising from the COVID-19 pandemic, the need to implement measures that guarantee the safe professional practice of dentistry, and the ignorance of the difficulties experienced by dentists during the pandemic, the real impact of COVID-19 on the field of dentistry must be unraveled. Guidelines for dental care during the COVID-19 pandemic were prepared by the Brazilian Ministry of Health in partnership with the National Health Surveillance Agency, the Federal Council of Dentistry, and collaborating researchers¹¹. However, although these guidelines have been based on international recommendations of the American Dental Association, Center for Disease Control and Prevention, National Health Service, it is necessary to investigate the behavior and difficulties faced by professionals concerning the adoption of these practices.

Therefore, the objective of the present study was to elucidate the behaviors of dentists and difficulties experienced by them owing to the COVID-19 pandemic.

METHODS

The study protocol complied with the principles of the Declaration of Helsinki and Resolution 466/2012 of the Brazilian National Health Council. This study was approved by the Ethics Committee of São Paulo State University, School of Dentistry, Araçatuba, São Paulo, Brazil (CAAE: 36351720.3.0000.5420) whose opinion number is 4.425.185.

This was a cross-sectional, descriptive, survey-based study conducted among dental surgeons, from July 2020 to November 2020.

The survey involved 1,811 dentists having affiliations to professional associations, dental cooperatives, and agreements in municipalities of São Paulo, Brazil. A list of dental surgeons who registered at the referred institutions was obtained. A list of dental surgeons who registered at the referred institutions was obtained through contacts made by e-mail, letters, and phone calls to the managers of those institutions. All professionals who were no longer exercising their profession in 2020 because of retirement or temporary leave were excluded. A sample size calculation was carried out for a descriptive study, considering a population of 1,811 dentists registered in these institutions, assuming an unknown result and adopting a confidence level of 95% and a maximum acceptable error margin of 5%, resulting in a minimum sample size of 317 participants. All dentists from the institutions were invited to participate in the study and the final analyses included 473 participants who consented to participate in the study.

A pilot study involving 20 professionals from a municipality of the State of São Paulo, Brazil, who were not included in the study final sample was conducted, wherein a script was used with open questions to verify possible answers and adjust the items of the data collection instrument, as well as to evaluate procedures related to the online collection and data analyses. There was no need for adjustments to the collection instrument. The data collection instrument was developed by professors and researchers, specialists in the field of public health in dentistry and occupational risk, from a public university of the State of São Paulo, Brazil, especially for this study.

The questionnaire, designed to investigate the behaviors and adversities experienced by dentists due to the COVID-19 pandemic, evaluated the following variables: sociodemographic conditions (gender, age, and monthly income from dental practice); characteristics of dental work (time working as a dentist, type of activity, and type of work); level of attention and sources of information about the pandemic; changes in the work process during the pandemic (duration for which the clinic stayed closed, average number of patients treated daily, and number of employees working in your clinic) financial impact with personal protective

equipment and biosafety measures (personal protective equipment used during care, difficulty regarding the use of personal protective equipment, and methods and products used for disinfection in the clinic); and consequences of the pandemic in professional practice (decrease in monthly income, reduction in the workload of employees, increase in fees charged for clinical procedures, contact with someone who tested positive for COVID-19, infection for COVID-19, postponement of the treatments, and changes in materials and work environment). The questionnaire was administered using Google Forms. Each professional received the link by email or through messaging via social networks and was invited to participate in the research. The link provided access to the questionnaire as well as an explanation of the research objectives and an informed consent form. The data were analyzed by the researchers using descriptive statistics techniques and the results were expressed in tables. Data processing and analysis were performed using the EpiInfo software version 7.2.2.

RESULTS

As shown in Table 1, among the 473 respondents, most were women (52.22%); were between 21 and 39 years of age (53.28%;

Table 1: Stratification of dental surgeons according to their sociodemographic conditions, characteristics of dental work, and changes in the work process during the COVID-19 pandemic. São Paulo, Brazil, 2020

| Variables | n | % |
|----------------------------------|-----|--------|
| Gender | | |
| Female | 247 | 52.22 |
| Male | 226 | 47.78 |
| Total | 473 | 100.00 |
| Age (years) | | |
| 21–29 | 146 | 30.87 |
| 30–39 | 106 | 22.41 |
| 40–49 | 78 | 16.49 |
| 50–59 | 84 | 17.76 |
| 60–71 | 59 | 12.47 |
| Total | 473 | 100.00 |
| Time working as a dentist | | |
| Up to one year | 33 | 6.98 |
| 1–5 years | 123 | 26.00 |
| 6–10 years | 64 | 13.53 |
| 11–15 years | 38 | 8.03 |
| 16–20 years | 41 | 8.67 |
| >20 years | 174 | 36.79 |
| Total | 473 | 100.00 |
| Type of activity | | |
| Specialist | 263 | 55.60 |
| General practitioner | 197 | 41.65 |
| Professor | 9 | 1.91 |
| Master | 2 | 0.42 |
| Ph.D. | 2 | 0.42 |
| Total | 473 | 100.00 |

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average age, 40.36±13.44 years); had been in the profession for more than 10 years (53.49%); worked as self-employed professionals (73.36%), and had a specialty (55.60%).

The average number of patients treated before the pandemic was 10.46/day while during the pandemic, the number decreased to 6.75 patients/day. It was found that only 19.24% of dental surgeons kept their clinics open during the entire pandemic, and among the professionals who postponed their clinics, 5.76% did not reopen them. More than one-third of the dentists (34.04%) did not keep any employees working in their clinics (Table 1).

Table 1: Continuation

| Variables | n | % |
|---|-----|--------|
| Type of work | | |
| Self-employed | 347 | 73.36 |
| Self-employed and private employee | 28 | 5.92 |
| Self-employed and public service | 42 | 8.88 |
| Private employee | 34 | 7.19 |
| Public service | 21 | 4.43 |
| Private employee and public service | 1 | 0.22 |
| Total | 473 | 100.00 |
| Monthly income from dental practice (in Brazilian Real) | | |
| Up to 5,000.00 | 144 | 30.44 |
| 5,001.00–10,000.00 | 138 | 29.18 |
| 10,001.00–15,000.00 | 72 | 15.22 |
| >15,000.00 | 50 | 10.57 |
| I do not want to answer | 69 | 14.59 |
| Total | 473 | 100.00 |
| Duration for which the clinic stayed closed during the pandemic | | |
| Did not close the clinic | 91 | 19.24 |
| 1–10 days | 81 | 17.12 |
| 11–30 days | 158 | 33.41 |
| 31–60 days | 83 | 17.55 |
| 61–90 days | 38 | 8.03 |
| Did not reopen the clinic | 22 | 4.65 |
| Total | 473 | 100.00 |
| The average number of patients treated daily before the pandemic | | |
| 0–5 | 72 | 15.22 |
| 6–10 | 249 | 52.64 |
| 11–20 | 127 | 26.85 |
| 21–35 | 20 | 4.23 |
| >35 | 5 | 1.06 |
| Total | 473 | 100.00 |
| The average number of patients treated daily during the pandemic | | |
| 0–5 | 245 | 51.80 |
| 6–10 | 168 | 35.52 |
| 11–15 | 31 | 6.55 |
| 16–20 | 21 | 4.44 |
| 21–35 | 5 | 1.06 |
| >35 | 3 | 0.63 |
| Total | 473 | 100.00 |
| Number of employees working in your clinic | | |
| 0 | 161 | 34.04 |
| 1 | 145 | 30.66 |
| 2 | 75 | 15.85 |
| >2 | 92 | 19.45 |
| Total | 473 | 100.00 |

It was found that most professionals (90.70%) paid very high or high attention to the COVID-19 pandemic obtained information about the pandemic through news applications (56.26%) and assessed the financial impact of the adoption of PPE and biosafety as high or very high (76.32%) (Table 2).

Table 2: Stratification of dental surgeons according to the level of attention, sources of information about the COVID-19 pandemic, personal protective equipment used, financial impact after the adoption of personal protective equipment, and biosafety measures and practices for disinfecting their clinics during the COVID-19 pandemic. São Paulo, Brazil, 2020

| Variables | n | % |
|---|-----|--------|
| Level of attention to the COVID-19 pandemic | | |
| Very high | 196 | 41.44 |
| High | 233 | 49.26 |
| Neutral | 39 | 8.25 |
| Low | 4 | 0.84 |
| Very low | 1 | 0.21 |
| Total | 473 | 100.00 |
| Means by which the professional obtained information about the pandemic* | | |
| News app | 266 | 56.24 |
| Television or radio | 201 | 42.49 |
| Family members/friends | 92 | 19.45 |
| Websites | 208 | 43.97 |
| Short video apps | 54 | 11.42 |
| Short Message Service (SMS) | 16 | 3.38 |
| Print media (newspaper/magazine/others) | 126 | 26.64 |
| Personal protective equipment used during care * | | |
| N95 or FFP2 mask | 405 | 85.62 |
| Overcoat or apron with long sleeves, knitted or elastic cuff | 326 | 68.92 |
| Plastic apron | 70 | 14.8 |
| Protective safety goggles | 381 | 80.55 |
| Face shield | 414 | 87.53 |
| Disposable cap | 431 | 91.12 |
| Closed footwear | 376 | 79.49 |
| Others (protective equipment for shoes, triple mask, or fabric coat) | 55 | 11.63 |
| Financial impact after the adoption of personal protective equipment and biosafety measures | | |
| Very high | 155 | 32.77 |
| High | 206 | 43.55 |
| Average | 98 | 20.72 |
| Low | 6 | 1.27 |
| None | 8 | 1.69 |
| Total | 473 | 100.00 |
| Difficulty regarding the use of personal protective equipment | | |
| Yes | 144 | 30.44 |
| No | 329 | 69.56 |
| Total | 473 | 100 |
| Performed concurrent disinfection in the clinic | | |
| Yes | 465 | 98.31 |
| No | 8 | 1.69 |
| Total | 473 | 100 |

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Among the PPE used by dentists, the most commonly cited were the disposable cap (91.12%) and face shield (87.53%). No PPE was mentioned by all respondents. Difficulty with the use of PPE was reported by approximately one-third of dental surgeons (30.44%) (Table 2). Most professionals performed concurrent (98.31%), terminal (96.61%), and immediate disinfection (94.71%). Isopropyl alcohol 70% was the most commonly used disinfecting product (86.68%) while the ultraviolet germicidal lamp was used by 16.91% of the professionals.

As described in Table 3, the monthly income of most dentists (78.01%) decreased during the pandemic, with the dental practice being their only source of income (70.61%). Around 53.07% of dentists were without an assistant or technician in oral health, while 47.36% had to reduce the workload of their employees. It was found that most professionals (68.07%) felt safe and prepared to practice their profession during the COVID-19 pandemic. While 90.48% had modified their work process due to the disease, most did not increase the fees charged for clinical procedures (75.69%).

Of the total respondents, only 3.59% reported contracting COVID-19 while 40.59% had a patient with a positive diagnosis of COVID-19. When asked about attendance in case a patient without suspected COVID-19 came to the office for elective treatment, 288 (60.89%) of the dental surgeons replied that they would not postpone the treatment. However, if it was a patient with suspected COVID-19, 265 (53.03%) dental surgeons would postpone treatment even though it was urgent (Table 3).

It was found that most dental surgeons asked the patient to brush their teeth and/or rinse with antiseptic before the start of treatment (75.90%) and maintained a ventilated environment

Table 2: Continuation

| Variables | n | % |
|---|-----|--------|
| Performed immediate disinfection in the clinic | | |
| Yes | 448 | 94.71 |
| No | 25 | 5.29 |
| Total | 473 | 100 |
| Performed terminal disinfection in the clinic | | |
| Yes | 457 | 96.62 |
| No | 16 | 3.38 |
| Total | 473 | 100 |
| Products used for disinfecting the clinic* | | |
| Sodium hypochlorite 0.1% | 180 | 38.05 |
| Hydrogen peroxide 0.5% | 64 | 13.53 |
| Isopropyl alcohol 70% | 410 | 86.68 |
| Disinfectant standardized by the health service | 141 | 29.81 |
| Others (quaternary ammonium, chlorhexidine, etc.) | 33 | 6.98 |
| Performed microbial decontamination of furniture, equipment, and floors with an ultraviolet germicidal lamp | | |
| Yes | 80 | 16.91 |
| No | 393 | 83.09 |
| Total | 473 | 100.00 |

*It was possible to answer more than one option.

Table 3: Stratification of dental surgeons according to their answers regarding the consequences of the COVID-19 pandemic in professional practice, use of personal protective equipment, financial and health. São Paulo, Brazil, 2020

| Variables* | Yes | | No | |
|---|-----|-------|-----|-------|
| | n | % | n | % |
| Monthly income decreased during the pandemic period | 369 | 78.01 | 104 | 21.99 |
| Has other financial income besides dentistry | 139 | 29.39 | 334 | 70.61 |
| Attends with an assistant or technician in oral health | 222 | 46.93 | 251 | 53.07 |
| Had to reduce the workload of employees during the pandemic period | 224 | 47.36 | 249 | 52.64 |
| Had to lay off employees during the pandemic period | 60 | 12.68 | 413 | 87.32 |
| Felt safe and prepared to respond during the pandemic | 322 | 68.08 | 151 | 31.92 |
| Changed the work process due to the pandemic | 428 | 90.49 | 45 | 9.51 |
| Increased fees charged for clinical procedures because of measures taken during the pandemic period | 115 | 24.31 | 358 | 75.69 |
| Was or is in contact with someone who tested positive for COVID-19 | 175 | 37.00 | 298 | 63.00 |
| Contracted COVID-19 | 17 | 3.59 | 456 | 96.41 |
| Had a case of COVID-19 in the family | 109 | 23.04 | 364 | 76.96 |
| Had a patient with a positive diagnosis for COVID-19 | 192 | 40.59 | 281 | 59.41 |
| Postponed treatment if the patient came without suspicion of COVID-19 for elective treatment | 185 | 39.11 | 288 | 60.89 |
| Postponed treatment if the patient came without suspicion of COVID-19 for urgent/emergency treatment | 74 | 15.64 | 399 | 84.36 |
| Postponed treatment if the patient came with suspected COVID-19 for elective treatment | 446 | 94.29 | 27 | 5.71 |
| Postponed treatment if the patient came with suspected COVID-19 for urgent/emergency treatment | 265 | 53.03 | 208 | 46.97 |
| Checked the patients' temperature | 214 | 45.24 | 259 | 54.76 |
| Asked the patient to clean the mouth by brushing or rinsing with antiseptic before starting the treatment | 359 | 75.90 | 114 | 24.10 |
| Used non-surgical procedure gloves when in contact with the patients suspected or diagnosed with COVID-19 | 400 | 84.57 | 73 | 15.43 |
| Used high-speed handpiece | 428 | 90.49 | 45 | 9.51 |
| Used rubber dam whenever the procedure allowed | 225 | 47.57 | 248 | 52.43 |
| Used high-powered suction device | 348 | 73.57 | 125 | 26.43 |
| Kept the environment ventilated with the windows open during the service | 338 | 71.46 | 135 | 28.54 |

*473 dental surgeons answered all the questions.

with windows open during the service (71.46%). However, recording the patients' body temperature was not routine for 259 (54.76%) professionals. Although most respondents used a high-speed handpiece (90.49%) and a high-powered suction device (73.57%), less than half used a rubber dam (47.57%) when the procedure was allowed (Table 3).

DISCUSSION

Dentists reported behavior of adherence to the use of PPE and attributed very high or high levels of precaution about COVID-19, however, these professionals are facing a series of adversities, which include the increase in operating costs, changes in the care process, work decreased patient care and reduced monthly income during the pandemic. This highlights the vulnerability of health professionals during the pandemic, especially those who make up the front line in providing health care to the population. In the dental field, health institutions and authorities such as the National Health Surveillance Agency of the Ministry of Health of Brazil and the Brazilian Federal Council of Dentistry (CFO), follow the measures and protocols of international organizations and have proposed regulations and recommendations for dental clinical practice in times of pandemic^{12,13}.

In the present study, which investigated the behaviors of dentists and adversities experienced by them about the COVID-19

pandemic, it was noted that in addition to the decrease in the number of treated patients, dental professionals suffered great financial losses because of the need to adapt to the measures of biosafety and the institutional changes in the work process, both of which contributed to the reduction in professional fees. These findings agree with data from a national survey carried out with 3.122 dentists from all Brazilian states, which showed that 84% of professionals considered the impact of the COVID-19 pandemic on clinical routine as high/very high, involving several changes in infrastructure the clinic, use of personal protective equipment, reduction of patients seen weekly, and increased operating costs¹⁴.

Additionally, many professionals were found to have closed the clinic during some period of the pandemic and had to reduce the workload of their employees or even dismiss them from their duties. Similar findings were reported in a study conducted with dentists who graduated from Columbia University College of Dental Medicine, which found that 51.80% of professionals expressed fear of permanent closure, 70.92% had dismissed at least one staff member, and 79.43% requested a financial loan for small business administration¹⁵.

Taken together, these findings reveal the severe impact of the disease on the practice of dentistry and all professionals involved in the work process. These data are corroborated by a study that analyzed the financial restrictions faced by dentists worldwide and the possible strategies to overcome these difficulties; it was found

that limiting dental practice to the provision of emergency treatments is important to reduce the dissemination of COVID-19. However, doing so has resulted in huge financial losses by dental care providers worldwide. Thus, government assistance to provide dental professionals with financial aid or loans is important so that the dental industry does not collapse¹⁶⁻¹⁸. Developed countries are adopting these measures and more countries should also consider implementing them¹⁹.

In addition to financial loss, attention should be paid to the impact of changes in the work process on the mental health of dental professionals during the COVID-19 pandemic. In this study, it was found that most dentists paid a high or very high level of attention to the pandemic by updating themselves constantly through various means of communication. These results are consistent with the findings of studies conducted among dentists in the United Kingdom and Turkey, which demonstrated a high prevalence of symptoms related to stress and anxiety^{20,21}. It was also observed that professionals who worked independently had more symptoms compared to those working in the public sector, and this may be because public officials are more financially stable during the pandemic²⁰. It is possible to suggest that this situation of financial instability and austerity generated by the COVID-19 pandemic may have important consequences in the dental care scenario, with a decrease in job vacancies for employees in private dental clinics, an increase in the fees of provision of dental services, decreased access of the population to private dental services and consequent increase in demand for public services.

Regarding the conduct of dental consults during the pandemic, the American Dental Association, the Brazilian Association of Intensive Care Medicine, and the Brazilian CFO recommend the postponement of elective treatments in patients without suspected COVID-19, while dental care is recommended in cases of urgent and emergency treatments in patients with suspected or confirmed COVID-19^{13,22,23}. In the present study, it was noted that in the two aforementioned situations, most professionals did not follow the guidelines. This suggests that dental professionals are at risk of getting infected with COVID-19, especially through consults with asymptomatic patients. This finding highlights the need to implement and reinforce educational and awareness-raising actions on the prevention of COVID-19 aimed at professionals in the dental field, especially considering the current epidemiological scenario, in which Brazil is one of the countries with the highest number of cases of the disease and that the State of São Paulo has the largest number of confirmed cases in the country^{7,8}.

In this context, one of the most important methods for minimizing the risk of contamination and reducing the spread of the disease among health professionals is the systematic use of PPE. The importance of PPE was emphasized by the European Center

for Disease Prevention and Control to avoid infection by SARS-CoV-2²⁴. Some of the PPEs that should be used for the treatment of patients are a surgical mask or if available, a properly-fitting FFP2 respirator, protective goggles, a face shield, a long-sleeved apron, and gloves²⁴. In the present study, it was found that a considerable proportion of dentists had difficulty with the use of PPE and that none of the PPEs was used by all respondents, highlighting the need to implement awareness-raising strategies and immediate adaptation of PPE use among the professionals. The main difficulties reported were discomfort and impaired visibility with the use of face shields and difficulty breathing with the FFP2 respirator. It is emphasized that every patient should be considered potentially contagious and that there should be no lenience with preventive measures owing to the possibility of consulting asymptomatic patients²⁴. Dental professionals face several difficulties regarding the use of PPE during the COVID-19 pandemic, including the management of PPE supplies, the increase in PPE costs, the provision of these materials to all employees of the dental clinics, and the need to adapt to PPE, such as facial protection devices, as well as methods of donning and doffing PPE²⁵⁻²⁷. This highlights the importance of proper training of professionals in the dental field so that it is possible to carry out their work safely.

Another important aspect to consider about the high risk of COVID-19 infection during dental care is the unique characteristics of the equipment used. When performing dental procedures with a high-speed handpiece, the friction between the tooth and the drill creates excessive heat and without a coolant, the heat can cause damage to the dental tissue and lead to pathological changes in the dental pulp²⁸. The liquid released from refrigeration, however, can generate aerosols that when combined with body fluids in the oral cavity, such as blood and saliva, create a biological aerosol. This is commonly contaminated with bacteria, fungi, and viruses, and has the potential to float in the air for a considerable time and be inhaled by professionals and other patients²⁹. The use of high-powered suction devices can reduce the formation and range of the contaminating aerosol³⁰. In the present study, it was found that most professionals used high-speed handpieces and that, although not in the same proportion, most of them also used high-powered suction devices. Moreover, it was also found that the use of a rubber dam was not common among most dentists. This material provides barrier protection against the primary source of secretions in the oral cavity and if used correctly, may decrease the exposure to pathogens emerging from respiratory secretions³¹.

The human coronaviruses, namely SARS and MERS viruses as well as the endemic human coronaviruses (HCoV), can persist on inanimate surfaces such as metal, glass, and plastic for up to 9 days, but can be effectively inactivated by surface disinfection procedures with ethanol 62%–71%, hydrogen peroxide 0.5%, or

sodium hypochlorite 0.1% in 1 min, while other agents, such as 0.05%–0.2% benzalkonium chloride and 0.02% chlorhexidine digluconate, are less effective³². In this context, it was found that disinfecting and sanitizing clinic facilities using these solvents were common among the professionals interviewed in the present study. Ultraviolet irradiation has a microbiocidal effect if used with sufficient intensity and exposure time, and can have diverse applications such as air sterilization and sterilization of equipment surfaces as well as food packaging³³. In this study, the germicidal lamp for decontamination was seldom mentioned, possibly because there has been no study on its effectiveness in the control of infections in the dental environment before the COVID-19 pandemic.

Some recommendations on the management of patients and the clinical environment can contribute to reducing the SARS-CoV-2 infection. The use of a mouth rinse with chlorhexidine, essential oils, and cetylpyridinium chloride before the procedures significantly reduced the number of microorganisms in the dental aerosols. It is recommended to use a pre-procedure mouth rinse containing hydrogen peroxide 1.5% to 3.0% or povidone-iodine 0.5% to 1.5%, which can be effective due to their oxidizing action³⁴⁻³⁷. In this study, it was found that most dentists asked the patients to brush or rinse their mouth with antiseptic before starting the treatment. On the contrary, it was found that recording the patients' body temperature was not a common practice for most professionals, which reveals an important flaw in the process of preventing COVID-19 and causes dentists to be unnecessarily exposed to symptomatic patients. Another important aspect is the maintenance of a properly ventilated clinical environment because studies suggest that environmental ventilation measures and open space can effectively limit the concentration of SARS-CoV-2 RNA in aerosols³⁸. In the present study, it was found that most dentists opened their clinic windows, thus promoting a greater circulation of air in the clinical environment. The current epidemiological scenario regarding the COVID-19 pandemic leads to the understanding that living with the disease will remain for a long time, however, the population's dental care cannot be interrupted. Thus, the need for the systematic implementation of preventive measures to contain the infection is evident, including the standardization of an infrastructural model

of the clinical environment that will help to control the transmission of the disease.

The percentage of respondents to the questionnaire can be considered a limitation of this study. The lack of adherence of the professionals selected to answer the electronic questionnaire may be due to the lack of a culture of participation in research of this nature. Health survey-type studies administered through electronic questionnaires have low response rates of approximately 30%^{39,40}. It is also possible to suggest that the percentage of respondents can be influenced by the professionals' forgetfulness, by the workload, which can lead them to prioritize their clinical activity and postpone other activities, such as checking email or answering surveys, or by lack of recognition of the importance of incorporating information and communication technologies into work practices.

The spread of COVID-19 poses a significant challenge for dentists in all countries affected by the disease. Special attention and efforts to protect or reduce the transmission of the virus during dental practice must be applied. For this purpose, professional associations and health institutions should make joint efforts to provide information and guidance to dentists to reduce their risk of contracting COVID-19. It is expected that the findings of this study can contribute to the understanding of the difficulties faced by Brazilian dentists in the exercise of their profession during the COVID-19 pandemic, helping the planning and implementation of public health policies and support for professionals so that they can overcome this critical period that affects all areas involved in providing dental services. Future studies should be carried out to verify the effects of adjustments to biosafety protocols on operating costs, access, and demand for public and private dental services.

Conclusion

The findings of this study show that most dentists have a behavior of adherence to PPE and preparation to serve patients, with very high or high levels of attention to the COVID-19 pandemic. As adversities, it was verified that dentists reported an increase in operating costs, changes in the work process, a decrease in appointments, and a reduction in the monthly income.

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