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The Legacy of COVID-19 in Dentistry: Patient's Perception of Biosafety in Dental Offices: Cross-sectional Research

COVID-19'un Diş Hekimliğine Mirası: Dental Ofislerde Hastanın Biyogüvenlik Algısı: Kesitsel Çalışma

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ABSTRACT Objective: To assess the knowledge, attitudes and perspectives of patients about the pandemic coronavirus disease-2019 (COVID-19) and the prevention measures taken in dental offices and analyze what they expect from dentists considering the pandemic and post-pandemic scenarios. **Material and Methods:** To collect the information, an online questionnaire was sent to patients from all over Brazil, including men and women, older than 18, who have already undergone dental treatment and who were not dentists or dental students. Data were analyzed using chi-square, Fisher's exact or chi-square with Yates' correction tests (α=0.05). **Results:** There was a total of 2,557 volunteers patients, of whom 2,065 (80.8%) were female and 1,326 (51.9%) of them were aged 20-29 years. A total of 2,338 (91.4%) patients reported feeling more secure when the dentist uses personal protective equipment. Men (p<0.0001) and those over 50 years of age (p=0.01) have propensity to attend dental offices than woman, even if COVID-19 was suspected. Men were less afraid of visiting dental clinics (p<0.0001). **Conclusion:** Patients were aware of the preventive measures taken in dental offices and were able to request that dentists follow these measures and expect changes in dental care, even after the pandemic and with vaccination. Therefore, COVID-19 protection protocols should be carefully followed by professionals to increase patients' confidence.

Keywords: Coronavirus; pandemics; dental care; dentistry; biosecurity

ÖZET Amaç: Bu çalışmanın amacı, hastaların koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] pandemisi ve dental ofislerdeki korunma önlemleri hakkındaki bilgilerini, davranışlarını ve perspektiflerini değerlendirmek ve pandemi ve pandemi sonrası senaryolarda diş hekimlerinden neler beklediklerini analiz etmektir. **Gereç ve Yöntemler:** Bilgi toplamak amacıyla Brezilya'nın her yerinden kadın ve erkek dâhil, 18 yaş üzeri, hâlihazırda dental tedavi geçirmiş ve diş hekimi veya diş hekimliği öğrencisi olmayan hastalara çevrim içi anket gönderilmiştir. Veriler, ki-kare, Fisher exact veya ki-kare ile Yates'in düzeltme testleri (α=0,05) kullanılarak analiz edilmiştir. **Bulgular:** 2.065'i (%80,8) kadın ve 1.326'sı (%51,9) 20-29 yaş aralığında olan toplam hasta sayısı 2.557'dir. Toplam 2.338 (%91,4) hasta, diş hekimi kişisel koruma ekipmanı kullandığında daha güvende hissettiğini bildirmiştir. Erkekler (p<0,0001) ve 50 yaş üzerindekiler (p=0,01), COVID-19 şüphesi olsa bile dental ofislere gitmeye kadınlardan daha meyillidirler. Erkekler dental kliniklere gitmekten daha az korkmuşlardır (p<0,0001). **Sonuç:** Hastalar dental ofislerde alınan koruyucu önlemlerin bilincindedir ve diş hekimlerinin bu önlemleri almalarını talep edebilmişlerdir, pandemi ve aşılama sonrası bile dental bakımda değişiklik bekleyebildiler. Bu nedenle hastaların güvenini artırmak için COVID-19 koruma protokolleri profesyoneller tarafından dikkatle takip edilmelidir.

Anahtar Kelimeler: Koronavirüs; pandemi; dental bakım; diş hekimliği; biyogüvenlik

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The new coronavirus disease-2019 (COVID-19) caused by the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2), has led to the development of new variants that influence the severity of the disease due to genetic changes and can escape the immune system, including cases of reinfection and immunized people.[1] Several harmful post-COVID sequels are being identified as the post-acute coronavirus (COVID-19) syndrome. It commonly affects the respiratory, cardiovascular, and hematopoietic systems. Although to a lesser extent, the neuropsychiatric, renal, and endocrine systems are also involved.[2]

SARS-CoV-2 can be transmitted directly through nasal inhalation of aerosols expelled during speaking, breathing, and singing, or formed after aerosol-generating procedures, because saliva has a high viral load.[3,4] They can also be indirectly transmitted via the deposition of contaminated droplets on nearby surfaces.[3] Studies have demonstrated the presence of cell receptors (angiotensin-converting enzyme 2) for SARS-CoV-2 at sites in the oral cavity, and the existence of SARS-CoV-2 in the saliva of most infected individual.[5,6]

Owing to the importance of oral health and its association with several systemic conditions, dental care is indispensable.[7] Additionally, dental care could provide an elevated risk of contamination and infection by SARS-CoV-2 because dental procedures demand proximity between professionals and patients and can generate a large amount of aerosols with the use of high-speed handpieces, ultrasonic scalers and air-water syringes.[8,9] After contact with saliva and blood fluids, aerosols are characterized as bioaerosols capable of carrying microorganisms, contaminating surfaces (when large droplets are sedimented), and being inhaled by dentists and patients (when smaller particles remain in the air).[10] Protocols for preventing disease transmission are indispensable in dental office.[11]

Hand washing before and after dental care using N95, PFF2 and face shield masks, natural ventilation of the clinic, telephone and face-to-face screening with body temperature measurement, and detailed anamnesis are fundamental measures recommended by most health authorities and must be followed by professionals to minimize the transmission of SARS-CoV-2 in dental offices.[12-14]

The Brazilian National Immunization Program has always been a reference in public health; however, with misinformation circulating on the internet, the rate of adherence of the Brazilian population to vaccination still has limitations, including for COVID-19 vaccines.[15,16] Based on data and scientific evidence regarding the frequent mutations of the virus, health authorities have predicted a long-lasting future for COVID-19.[17] Therefore, effective measures are necessary to prevent disease transmission in dental clinics.

It is necessary for professionals and the population to be aware of and strictly follow the preventive measures recommended by health authorities, since both can be sources of cross-infection in dental clinics. In addition, patients must be able to demand that professionals implement these measures.[12,13] Studies have assessed the awareness of dental professionals regarding COVID-19 in dental clinics.[18,19] However, few studies have evaluated these aspects from a patient' point of view. No studies assessed the prospects of patients in dental care after the pandemic, and these studies are important parameters that can help professionals adapt to patients' expectations and thus encourage them to look for secure dental treatments.

This study aimed to assess the perceptions of COVID-19 patients and the prevention measures taken in dental offices.

MATERIAL AND METHODS

STUDY POPULATION AND ETHICAL ASPECTS

This study was approved by the Local Research Ethics Committee (no: CAAE 35582920.1.0000.5419/2020-2021) and consisted of a cross-sectional survey directed to a sample of the Brazilian population. The sample comprised adult patients of both sexes from 5 regions of Brazil, with different levels of education. The study was conducted in full compliance with the ethical principles of research involving humans, followed by the Declaration of Helsinki World Medical Association (version 2008)

and was reported as an observational study following the Strengthening the Reporting of Observational Studies in Epidemiology guidelines. Participants signed an informed consent form before answering the questionnaire.

QUESTIONNAIRE

A self-administered original survey was created by dental specialists using Google Forms (Google LLC, Menlo Park, CA, USA). The questions were elaborated based on the recommendations found after searching the literature and international guidelines, such as those from the Centers for Disease Control and Prevention, World Health Organization (WHO), and American Dental Association.

Before being made available to the public, a pilot study was conducted with 20 participants (who were posteriorly excluded from the main study) to evaluate the validty of each question and analyze the question flow. The questionnaire was revised by experts and a pre-test was conducted. The language of the questionnaire was appropriate for the lay public's understanding of biosafety. After data acquisition, Cronbach's alpha test was applied to evaluate the reliability and consistency of the questionnaire. An acceptable value was found (α=0.7), thus validating the questionnaire.[20]

The 11 multiple-choice questionnaire addressed the following subjects: sociodemographic characteristics (four questions), knowledge about preventive measures against COVID-19 in dental offices and measures taken to prevent the transmission of COVID-19 in dental offices (7 questions). The answers were considered correct based on scientific articles and guidelines provided by health agencies.

STUDY SIZE

According to the Brazilian Institute of Geography and Statistics, the Brazilian population reached 211.8 million in 2020, of whom approximately 134 million have internet access. Thus, for this study, a 2% margin of error and a 95% confidence level were considered, of which a sample number of 2,500 participants were estimated. The Software PASS (Power Analysis and Sample Size) (NCSS, Statistical Software, USA) was used for the calculations.

ONLINE SURVEY

The inclusion criteria were men and women, who were not dentists or dental students, aged over 18 years and who had already undergone dental treatments. The questionnaire was available for 18 days. Patients were recruited via the divulgation of the survey through social media: Instagram (Facebook Inc., Menlo Park, CA, USA), Facebook (Facebook Inc., Menlo Park, CA, USA), and WhatsApp (Facebook Inc., Menlo Park, CA, USA). We also contacted dentists from the public health services and asked them to send a survey link to their patients. Additionally, we used WhatsApp to recruit patients directly from a public school of dentistry.

Each volunteer answered the questionnaire only once and answering all the questions was mandatory. All patients gave their consent electronically after reading informed consent forms.

DATA ANALYSES

The data were tabulated in Microsoft® Excel (USA) and analyzed using IBM SPSS Statistics 21 (USA) and GraphPad Prism 7.0 (USA). Descriptive analyse were performed using the absolute and relative frequencies of the different variables. The hypotheses were tested using chi-square, Fisher's exact or chi-square with Yates' correction tests. Odds ratio (Baptista-Pike) with their respective confidence intervals were used to assess the association measures. The significance level for all the statistical tests was set at 5%.

Groupings were made for data analysis on the predisposition to attend dental appointments after exposure to SARS-CoV-2 or the presence of symptoms of COVID-19 according to age, education and sex.

RESULTS

SOCIODEMOGRAPHIC CHARACTERISTICS

A total of 2,557 valid responses were obtained from people in all Brazilian states and the Federal District. Most participants were female (80.8%), aged 20-29 years (51.9%), lived in the Southeast (49.8%) and had complete or incomplete higher education, such as in universities, colleges, and polytechnics (51.4%) (Table 1).

TABLE 1: Sociodemographic characteristics of patients compared to the Brazilian population (Instituto Brasileiro de Geografia e Estatística, 2020).

Variable/category	n	Patients (%)	Brazilian population (%)
Sex			
Male	489	19.1	-
Female	2.065	80.8	-
Did not declare	3	0.1	-
Age			
18-19	175	6.8	-
20-29	1.326	51.9	-
30-39	429	16.8	-
40-49	290	11.3	-
≥50	337	13.2	-
Brazilian region			
North	190	7.4	8.8
Northeast	550	21.5	27.1
Mid-west	257	10.0	7.8
Southwest	1.273	49.8	42.0
South	287	11.3	14.3
Scholar level			
Basic education	27	1.1	-
High school	341	13.3	-
Higher education	1.314	51.4	-
Post-graduation	875	34.2	-

KNOWLEDGE ABOUT THE PREVENTIVE MEASURES AGAINST COVID-19 IN DENTAL OFFICES

Regarding preventive measures that dentists should take in dental clinics, most patients answered that the professionals should wash their hands before and after dental care (99.2%), use N95 or PFF2 masks (76.9%), use face shields together with masks and goggles (83.2%), avoid high-speed instruments (39.5%), and keep the doors and windows open to facilitate air circulation in the office (87.3%) (Table 2).

Approximately 97% believe that it is important to record the patient's temperature and ask them about the symptoms or recent contact with SARS-CoV-2 infected people and 89.2% of the participants recognized the importance of telephone screening before face-to-face assistance (Table 2). More than 90% (2,338/2,557) reported feeling more protected against COVID-19 when dentists use personal protective equipment (PPE).

Men and older people were more likely to attend appointments in cases of suspected COVID-19 than women and younger people ($p<0.05$) (Table 3).

DISCUSSION

By January 2023, Brazil was ranked fifth in the world in terms of COVID-19 cases and deaths.[21] Despite this, it is one of the countries that has not adopted the most severe restrictive measures for international travelers; therefore, the cases and transmission rates in Brazil could have a worldwide effect.[22] Despite advances in vaccination, health agencies and experts in the field continue to recommend strict measures to prevent the COVID-19 spread in those environments which must be followed by professionals and patients.[12,14] This study aimed to evaluate the knowledge, attitudes and perspectives of patients about the COVID-19 and the preventive measures taken in dental offices.

Among the limitations of this study, women's adherence to the survey was higher than that of men, possibly because of their greater concern for health issues, as observed in other studies.[13,23,24] The predominant age group was 20-29 years old, coinciding with the age group with greater access to the internet.[25]

In 2020, the population of the Southeast region was 42%, followed by the Northeast region (27.1%), South (14.3%), North (8.8%) and Midwest (7.8%).[26] Thus, the irregular regional distribution of patients follow the regional distribution of the Brazilian population.[26]

As observed in other studies conducted in Brazil during the pandemic, a vast majority of patients had higher education or post-graduate qualifications, which may have influenced the positive results obtained.[27] The low incidence of patients with less schooling can be explained by the fact that internet access for this group tends to be limited, especially in Brazil.[27]

Most patients were well-informed about measures to reduce the risk of COVID-19 transmission in dental offices, corroborating the finding of a previous study.[13] Fundamental measures are recommended by most health authorities and must be

TABLE 2: Knowledge about COVID-19 prevention measures that must be adopted by dentists.

Question	n	%
When should the dentist wash their hands?		
Before and after the dental care	2.536	99.2
Only after the dental care	2	0.1
Only before the dental care	12	0.5
I don't know	7	0.2
Which mask should the dentist wear during the dental care?		
PPF2 ou N95	1.967	76.9
Cloth mask	22	0.9
Disposable mask	334	13.1
I don't know	234	9.1
The dentist should wear face-shield:		
Only if she/he are not wearing protective glasses	256	10.0
Only if she/he are not wearing masks	36	1.4
With masks and protective glasses	2.128	83.2
The dentist doesn't need to use face shield	28	1.1
I don't know	109	4.3
During the pandemic, the use of high-speed-instruments ("drills"):		
Should be avoided	1.011	39.5
Should not be avoided	828	32.4
I don't know	718	28.1
The dentist should keep the air circulation in the dental offices:		
Only through the air conditioning	198	7.8
Opening totally the doors and windows	2.233	87.3
I don't know	126	4.9
Should the dentist take the temperature of patients and ask them about feeling any symptoms or close contact with contaminated people?		
Yes	2.485	97.2
No	52	2.0
Should the dentist call to the patients before the dental appointment to ask them about feeling any COVID-19 symptoms?		
Yes	2.282	89.2
No	224	8.8
I don't know	51	2.0

TABLE 3: Influence of sex, education and age on the predisposition to attend dental appointments after exposure to the SARS-CoV-2 virus or presence of symptoms of COVID-19.

Variable	Description	(%)	p value	OR*	95% IC*
Sex	Male	49.6	<0.0001*	1.83	1.38 a 2.42
	Female	34.9			
Education	Basic/high	39.7	0.64	1.08	0.77 a 1.50
	Higher/post-graduation	37.9			
Age-years	18 a 19	41.6	0.01*	---------	---------
	20 a 29	38.1			
	30 a 39	32.2			
	40 a 49	33.0			
	≥50	48.5			

OR: Odds ratio; IC: Confidence interval.

The symbol "*" in the table represents a statistically significant difference (p<0.05). Men and older people were more likely to attend appointments in cases of suspected COVID-19 than women and younger people.

followed by professionals to minimize the transmission of SARS-CoV-2 in dental offices.[14] For instance, routine hand washing before and after dental care limits the spread of the virus originating from an infected person among people in the dentist's workflow.[12,14]

The use of PPE, such as N95, PFF2 and face shield masks, protects dentists from contamination in the proximity of the patient's face. N95 and PFF2 masks have been shown to be more effective than surgical masks in preventing infectious diseases.[13,14]

During dental procedures, droplets of different sizes are generated, which form aerosols that can carry microorganisms for several meters and increase the risk of airborne transmission of SARS-CoV-2. This can be reduced using natural or planned mechanical ventilation.[13]

In addition, screening patients with signs of respiratory infection compatible with COVID-19 can prevent the spread of the virus through temporary cancellation of dental care. Both face-to-face screening with body temperature measurement and detailed anamnesis, and telephone screening can prevent contamination by other patients and dental professionals.[14]

However, when asked if dentists should avoid high-speed instruments ("drills") during the pandemic, the responses were contradictory. Although most participants believed that it should be avoided (39.5%), 32.4% thought it was unnecessary, and 28.1% did not know the answer. These recommendations are also contradictory in the literature. Although some authors have suggested that the aerosols generated during dental procedures do not pose a high risk compared to the non-aerosol procedure, other studies have demonstrated that aerosol reduction is significant in disease transmission during dental procedures, despite methodological limitations.[28,29] However, it is recommended that all patients be treated for potential SARS-CoV-2 infection once the infection can be asymptomatic or pre-symptomatic.[14] Therefore we recommend that dentists be careful when performing aerosol generating procedures, and avoid them whenever possible until there is further evidence on this matter.

Most patients reported feeling more protected from COVID-19 when their dentist uses PPE, reinforcing the importance of using PPE to build a relationship of trust with patients.

Hand hygiene is essential to reduce the risk of COVID-19 and most participants reported the use of alcoholic hand sanitizer because of their ease of handling and quick access.[12,14] Most participants answered that the ideal time was to arrive punctually for a dental appointment, which shows that patients are aware that avoiding agglomerations is essential.[30]

The present study showed that patients believed that biosafety measures should be maintained after the pandemic, even with the advancement of vaccination. Therefore, adhering to biosafety recommendations is essential to prevent contamination because new diseases can develop in the population, such as the WHO's warning about monkeypox in 2022, which is an example of how quickly diseases can spread and become relevant to public health. Thus, the learning and practice of biosafety in dental offices during the COVID-19 period is also useful for the prevention of other diseases.[31,32]

The online survey methodology has unquestionable advantages, especially during the pandemic, as it is possible to quickly collect information without any risks, providing subsidies to guide authorities and health professionals to outline strategies to control pandemics and plan the return of the activities. However, the results can only be applied to people who have electronic equipment, internet access, use social media, can read and write, and are worried about the disease.

CONCLUSION

Within the limitations of the study, it was concluded that the patients were aware of the preventive measures that should be adopted in dental offices, and they were able to request that dentists follow that these measures. Changes in dental appointments are expected in the future due to the permanent employment of preventive measures established during the pandemic, reinforcing the necessity for dental staff to strictly follow the recommended biosafety measures.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

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