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Knowledge about Coronavirus disease 19 (COVID-19) and its professional repercussions among Brazilian endodontists

George Táccio de Miranda CANDEIRO[a]
Giulio GAVINI[b]
Rodrigo Ricci VIVAN[c]
Bruna Marjorie Dias Frota CARVALHO[a]
Marco Antônio Húngaro DUARTE[c]
Camila Pontes FEIJÃO[a]
Anya Pimentel Gomes Fernandes VIEIRA-MEYER[a,d]

[a]Centro Universitário Christus, School of Dentistry, Post-graduation Program of Dental Sciences, Fortaleza, CE, Brazil.

[b]Universidade de São Paulo – USP, Faculty of Dentistry, Post-graduation Program in Dentistry, São Paulo, SP, Brazil.

[c]Universidade de São Paulo – USP, Faculty of Dentistry, Post-graduation Program in Applied Dental Sciences, Bauru, SP, Brazil.

[d]Fundação Oswaldo Cruz-Ceará – Fiocruz-CE, Department of Family Health, Fortaleza, CE, Brazil.

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Corresponding Author:
George Táccio de Miranda Candeiro
E-mail: georgecandeiro@hotmail.com

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Abstract: The aim of this study was to assess Brazilian endodontists' level of knowledge about the coronavirus disease (COVID-19) and examine its professional repercussions. The link to the online survey that was created for this study was shared with Brazilian endodontists through social networking applications. The questionnaire contained questions that pertained to COVID-19 and its impact on dental practice. The collected data were analyzed using t-test, chi-square analysis, and analysis of variance, and the level of significance was set at 0.05. A total of 2,135 participants responded to the questionnaire, and all five Brazilian regions were represented in the sample. A total of 98.50% of endodontists reported that dental procedures can transmit COVID-19. Complete social distancing was practiced by 96.68% of the participants, and approximately 25% knew someone who had COVID-19. Moreover, in their daily practice, 72.13% of them implemented biosecurity measures that are ineffective in preventing COVID-19. Furthermore, 91.7% of them reportedly suspended elective dental procedures. Only 55.69% of them reported that they performed only emergency procedures in their workplaces. Those who believed that COVID-19 cannot be transmitted during dental procedures were less knowledgeable about the symptoms of COVID-19 ($p = 0.0095$). Endodontists who believed that personal protective equipment cannot prevent contamination were more knowledgeable about the symptoms of COVID-19 than their counterparts ($p = 0.0003$). The participating Brazilian endodontists demonstrated adequate knowledge about the risk of contamination during dental procedures and the main symptoms of COVID-19. Only some professionals reported providing emergency dental care during the pandemic.

Keywords: Pandemics; Coronavirus; COVID-19; Endodontics.

Introduction

The outbreak of the coronavirus disease (COVID-19) in Wuhan, China, rapidly evolved into a public health crisis,[1] and the disease spread around the world very quickly.[2] The novel coronavirus (i.e. severe acute respiratory syndrome coronavirus 2; SARS-CoV-2) belongs to a family

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of single-stranded RNA viruses called *Coronaviridae* and zoonotic viruses,[3] which are transmitted from animals to humans. Zhou *et al.*[4] have reported that SARS-CoV-2 is similar to the coronavirus species found in bats and, potentially, pangolins, thereby confirming the zoonotic nature of this new cross-species viral-mediated disease.

In early 2020, the World Health Organization (WHO) declared the rampant spread of SARS-CoV-2 and the associated disease (*i.e.*, COVID-19) a public health emergency with a mortality rate of approximately 5%. According to the WHO Situation Report on COVID-19 published on June 13, 2020, there were more than 7 million reported cases and 423,000 deaths worldwide, approximately.[5] Therefore, effective prevention, identification, and management strategies should be implemented to curb further spread of COVID-19.

Dental professionals, including endodontists, may come into contact with patients with a presumptive or confirmed diagnosis of SARS-CoV-2 infection. In such instances, appropriate measures should be adopted to prevent the spread of infection in the dental office when they provide dental care. These risks are attributable to the generation of aerosols and the use of sharp objects close to the oropharyngeal region[6]. In addition, if proper precautions are not taken, the dental office may render patients vulnerable to cross-contamination. Dental clinics should be adequately equipped to identify patients with COVID-19 and refer to those with a suspected or confirmed diagnosis or a history of COVID-19 to authorized treatment centers.

Recently, Ather et al.[7] published a brief overview of the epidemiology, symptoms, and routes of transmission of this new infection. In addition, specific recommendations for dental practice, including patient screening methods, infection control strategies, and patient management protocols, have been articulated.

Furthermore, the Brazilian Federal Council of Dentistry and the American Dental Association recommend that all elective dental treatments be suspended during the COVID-19 pandemic.[8,9] Therefore, according to these dental associations, only dental emergencies should be seen during the acute period of the COVID-19 pandemic. Endodontists are responsible for the treatment of pulp and periradicular diseases, the most common dental emergencies,[10] hence the necessity of understanding how these professionals are acting during this period in order to perform suitable and safe dental treatment.

The aim of this study was to assess Brazilian endodontists' level of knowledge about COVID-19 and its professional repercussions. The null hypothesis predicted that these professionals will be adequately knowledgeable to provide care to patients.

Methodology

The present research was approved by the Institutional Ethics Committee of (Protocol number: CAAE 30535020.5.0000.5049).

The link to an online survey, which was created using Google Forms (Google LLC, Montain View, CA) (Fig. 1 and 2), was shared with Brazilian endodontists through social networking applications such as WhatsApp, Instagram, and Facebook. Respondents were also encouraged to forward the survey to other dentists utilizing their personal network. Thus, the sampling methodology was based on the capillarity of the social media and the endodontics network.

Responses were accepted from March 28 to April 3, 2020 (i.e. 7 days). Using the sample size calculator available on the Survey Monkey website (www.surveymonkey.com), the required sample size was estimated based on the official number of endodontists who were registered with the Brazilian Federal Council of Dentistry (n = 14,419).[11] A minimum of 2,058 endodontists were required to generate results with a 95% confidence level and 2% margin of error. A strict confidence interval was employed to compensate for any bias that the sampling methodology could introduce.

To ensure unbiased responses from the participants, no identifying information was collected from them. The questionnaire, in Portuguese, included five questions regarding personal information (Figure 1) and 10 questions (Figure 2), which pertained to COVID-19, its repercussions in dental practice, dentists' knowledge of COVID-19 symptoms and biosecurity measures during dental care, and whether they performed elective and/or emergency procedures

during the social distancing period determined by the relevant local governments.

The collected data were analyzed using Stata/SE 14.2. Descriptive statistics were computed, and bivariate analyses were conducted. Means and standard deviations were calculated to examine continuous variables, and frequencies and percentages were computed to examine categorical variables. The extent to which the endodontists were knowledgeable about the main symptoms of COVID-19 (*i.e.*, headache, high fever, diarrhea, muscle pain, dry cough, sore throat, and shortness of breath) was determined. The number of correct answers provided by each participant was computed. With regard to bivariate analyses, the chi-square test, t-test, and one-way analysis of variance were conducted. The level of statistical significance was set at $p < 0.05$.

Results

A total of 2,135 endodontists responded to the questionnaire (women: 72.92%, men: 27.02%, transgender men: 0.06%). Endodontists from all five Brazilian regions (North, Northeast, South, Southeast, and Midwest) were significantly represented in accordance with prior sample size calculations (Table 1). The mean age of the respondents and mean length of their experience after dental degree are presented in Table 1. A majority of them had their own private practice (77.05%), and 25.81% worked in public primary or secondary healthcare institutions. Only 3.89% of them were pursuing professional dental practice in hospital settings, and 8.06% worked in dental colleges and universities (Table 1).

A total of 98.50% of the participants affirmed that COVID-19 can be transmitted during dental procedures, and 76.53% of them reported that the use of conventional personal protective equipment (PPE) is insufficient to prevent COVID-19 transmission. Moreover, in their daily practice, 72.13% of them implemented biosecurity measures that are ineffective in preventing COVID-19. Additionally, 91.7% of them had suspended elective dental procedures. Almost half of the participants (55.69%) reported performing only emergency procedures in their dental offices. While 9.32% of them considered endodontic treatments

Personal Questions

1. Region
( ) North ( ) Northeast ( ) Southeast ( ) South ( ) Midwest

2. Gender
( ) Man ( ) Woman ( ) Transgender man ( ) Transgender woman

3. Age
( ) 21-30 years ( ) 31-40 years
( ) 41-50 years ( ) 51-60 years
( ) 61-70 years ( ) 71 years and older

4. Duration since graduation
( ) Until 5 years ( ) 6-10 years
( ) 11-15 years ( ) 16-20 years
( ) 21-30 years ( ) More than 30 years

Figure 1. Questions regarding participants' basic information.

Specific Questions

1. Indicate the main symptoms of COVID-19. *(You can select more than 1)*

( ) Headache ( ) High fever ( ) Low fever
( ) Diarrhea ( ) Muscle aches ( ) Dry cough
( ) Runny nose ( ) Sore throat ( ) Sneezing
( ) Shortness of breath ( ) Vomiting

2. Can COVID-19 be transmitted through dental treatment?

( ) Yes ( ) No ( ) I have doubts

3. Do you think conventional PPE (gloves, hat, apron, mask, and goggles) is sufficient to prevent COVID-19 transmission?

( ) Yes ( ) No ( ) Maybe

4. Do you consider the biosafety measures implemented in your work sufficient to prevent COVID-19 transmission?

( ) Yes ( ) No ( ) I don't know

5. What procedures do you consider safe to perform during the COVID-19 pandemic?

( ) All procedures ( ) Surgical procedures
( ) Restorative and aesthetic procedures ( ) Endodontic treatments
( ) Urgent/emergency treatments ( ) None

6. Where do you provide dental treatment? *(You can select more than 1)*

( ) Private practice (own office)
( ) Private practice (franchised/popular clinic)
( ) Private practice (private hospital)
( ) Public health (primary/secondary healthcare)
( ) Public health (tertiary healthcare)
( ) Private university/faculty
( ) Public university/faculty

7. Are you performing elective dental procedures at your workplace during the pandemic period?

( ) Yes ( ) No

8. Are you performing emergency dental procedures at your workplace during the pandemic period?

( ) Yes ( ) No

9. Are you and your family members quarantined or practicing social isolation?

( ) Yes ( ) Yes, but 1 or more family members are still working
( ) No

10. Do you know anyone who has been or is sick with COVID-19?

( ) Yes ( ) No

Figure 2. Questions regarding COVID-19 and its repercussions in dental practice.

Table 1. Baseline questionnaire and answers.

Variables	n	Percentage (%)
Personal questions		
Country region		
North	78	3.65
Northeast	386	18.08
Southeast	1,249	58.50
South	194	9.09
Midwest	228	10.68
Total	2,135	100.00
Age		
21–30 years old	390	18.27
31–40 years old	714	33.44
41–50 years old	616	28.85
51–60 years old	324	15.18
61–70 years old	85	3.98
More than 70 years old	6	0.28
Total	2,135	100.00
Gender		
Male	577	27.02
Female	1,557	72.92
Male transgender	1	0.06
Female transgender	0	0.00
Total	2,135	100.00
Duration since graduation		
Up to 5 years	326	15.27
6–10 years	357	16.72
11–15 years	336	15.74
16–20 years	338	15.83
21–30 years	493	23.09
More than 30 years	285	13.35
Total	2,135	100.00
Specific questions		
Indicate the main symptoms of COVID-19. *(You can select more than 1)*		
Headache	1,194	55.93
High fever	1,721	80.61
Low fever	529	24.78
Diarrhea	614	28.76
Muscle pain	681	31.90
Dry cough	1,94	90.87
Running nose	785	36.77
Sore throat	1,242	58.17
Sneeze	541	25.34
Shortness of breath	1,974	92.46

Continue

Continuation

Variables	n	Percentage (%)
Vomiting	146	6.84
I don't know	26	1.22
Where do you provide dental treatment? *(You can select more than 1)*		
Private practice (own office)	1,645	77.05
Private practice (franchised/popular clinic)	444	20.80
Private practice (private hospital)	38	1.78
Public health (primary/secondary healthcare)	551	25.81
Public health (tertiary healthcare/public hospital)	45	2.11
Private university/faculty	121	5.67
Public university/faculty	51	2.39
What procedures do you consider safe to perform during the COVID-19 pandemic?		
None	1,271	59.53
Restorative and aesthetic procedures	49	2.30
Surgical procedures	62	2.90
Endodontic treatment	199	9.32
Urgent/emergency treatments	697	32.65
All procedures	135	6.32
Can COVID-19 be transmitted through dental treatment?		
Yes	2,103	98.50
No	6	0.28
I still have doubts	26	1.22
Do you think conventional PPE (gloves, hat, apron, mask, and goggles) is sufficient to prevent COVID-19 transmission?		
Yes	182	8.52
No	1,634	76.53
Maybe	319	14.94
Do you consider the biosecurity measures implemented in your work sufficient to prevent COVID-19 transmission?		
Yes	346	16.21
No	1,54	72.13
I don't know	249	11.66
Are you performing elective dental procedures at your workplace during the pandemic period?		
Yes	188	8.83
No	1,941	91.17
Are you performing emergency dental procedures at your workplace during the pandemic period?		
Yes	1,189	55.69
No	946	44.31
Are you and your family members quarantined or practicing social distancing?		
Yes	1,332	62.39
No	71	3.33
Yes, but 1 or more family members are still working	732	34.29
Do you know anyone who has been or is sick with COVID-19?		
Yes	544	25.48
No	1,591	74.52

to be safe, 32.65% considered it safe to treat dental emergencies amid a pandemic (Table 1).

Complete social distancing, which has been recommended by the local government, was practiced by 96.67% of the participants. Approximately 25% of them knew someone who had contracted COVID-19. Descriptive statistics for all study variables are presented in Table 1.

On average, the participants correctly reported 4.26 (± 1.50) COVID-19 symptoms. The most commonly reported COVID-19 symptoms were shortness of breath (92.46%), dry cough (90.87%), high fever (80.61%), sore throat (58.17%), and headache (55.93%) (Table 1). Their level of knowledge about COVID-19 symptoms was significantly influenced by factors such as age, years of dental experience, and the perceived impact of COVID-19 on their professional practice (Table 2). Those who believed that this disease could not be transmitted during dental procedures were less knowledgeable about the symptoms of COVID-19 (p=0.0095). Endodontists who believed that PPE cannot prevent contamination were more knowledgeable about the symptoms of COVID-19 than their counterparts (p=0.0003). The results of statistical analyses, which were conducted to examine the participants' level of knowledge about COVID-19 symptoms, are presented in Table 2.

Discussion

On June 2020, Brazil presents a substantial increase in COVID-19 contamination with more than 800,000 confirmed cases.[5] However, the local public health system presents no adequate structure to treat people at the same time, and social distancing is recommended by local governments. Thus, dental professionals (dentists, dental hygienists, assistants, technicians, and others) may be severely affected by the COVID-19 pandemic.[12,13]

The present survey examined awareness about, perceptions of, and attitudes toward the prevention of COVID-19 transmission among Brazilian endodontists during the pandemic period in 2020. Women were overrepresented in the sample. This indicates that female endodontists outnumber male endodontists in Brazil. A similar observation was reported in a study conducted among Jordanian dentists.[14]

Brazil is divided into five large regions (North, Northeast, South, Southeast, and Midwest). In this study, the highest number of participants belonged to the southeastern region. This may be attributable to the fact that a higher number of professionals have been assigned to the southeastern region. A vast majority of them were private practitioners, and the lowest percentage of them were faculty members at public universities.

Most of them did not know or have contact with anyone with COVID-19. With regard to their knowledge of COVID-19 symptoms, several professionals reported dry cough, high fever, and respiratory problems as symptoms, and fewer participants reported sore throat and headache. These findings demonstrate that most of them were aware of the main symptoms of COVID-19,[3,7] and are consistent with the results of another study conducted among dental professionals in Jordan,[14] in which most of the participants reported playing the role of a teacher. Nevertheless, the participants of both studies demonstrated similar levels of knowledge. Thus, it can be concluded that dental professionals have assimilated pertinent information disseminated through the media and scholarly publications.[1,4,6,7] However, their levels of knowledge about symptoms significantly differed between groups made on the basis of age and time since graduation; while differences between the genders were not significant. This difference may be due to the fact that older dentists, and those who graduated longer, have had the opportunity to undergo postgraduate studies that better prepare them for this type of situation. In addition, more mature dentists may be more prone to seek information regarding COVID-19 than their counterparts. Independent of the cause, these results agree with those of a multinational study that included Asians, Europeans, Americans, and Australians, and evaluated COVID-19 knowledge and clinical practices during the pandemic. The authors emphasized the association of knowledge about COVID-19 with longer duration of practice and higher qualifications among professionals.[15] It is important for dental professionals to be knowledgeable about COVID-19 symptoms so that they refrain from performing elective dental

Table 2. Number of COVID-19 symptoms correctly identified and its relationships with personal and practice-specific questions.

Variables	COVID-19 symptoms knowledge	SD	Range	p-value
Age				
21–30 years old	4.08	1.38	0–7	0.0063*
31–40 years old	4.19	1.51	0–7	
41–50 years old	4.39	1.52	0–7	
51–60 years old	4.33	1.55	0–7	
61–70 years old	4.49	1.50	0–7	
More than 70 years old	5.16	1.83	3–7	
Gender				
Male	4.19	1.51	0–7	0.2416*
Female	4.29	1.50	0–7	
Male transgender	3.00	0.00	3	
Female transgender	0.00	0.00	-	
Duration since graduation				
Up to 5 years	4.05	1.50	0–7	0.0118*
6–10 years	4.14	1.41	0–7	
11–15 years	4.24	1.48	0–7	
16–20 years	4.39	1.57	0–7	
21–30 years	4.36	1.56	0–7	
More than 30 years	4.37	1.46	0–7	
Country region				
North	4.44	1.53	0–7	0.0873*
Northeast	4.29	1.46	0–7	
Southeast	4.29	1.54	0–7	
South	4.28	1.56	0–7	
Midwest	4.01	1.27	0–7	
Can COVID-19 be transmitted through dental treatment?				
Yes	4.27	1.50	0–7	0.0095*
No	2.66	1.86	0–5	
I still have doubts	3.80	1.74	0–7	
Do you think conventional PPE (gloves, hat, apron, mask, and goggles) is sufficient to prevent COVID-19 transmission?				
Yes	4.00	1.62	0–7	0.0003*
No	4.34	1.48	0–7	
Maybe	4.04	1.52	0–7	
Do you consider the biosecurity measures implemented in your work sufficient to prevent COVID-19 transmission?				
Yes	4.16	1.48	0–7	0.0857*
No	4.31	1.49	0–7	
I don't know	4.13	1.63	0–7	
Are you performing elective dental procedures at your workplace during the pandemic period?				
Yes	4.25	1.55	0–7	0.8626**
No	4.26	1.50	0–7	

Continue

Continuation

Variables	COVID-19 symptoms knowledge	SD	Range	p-value
Are you performing emergency dental procedures at your workplace during the pandemic period?				
Yes	4.24	1.48	0–7	0.3845**
No	4.30	1.53	0–7	
Are you and your family members quarantined or practicing social distancing?				
Yes	4.20	1.52	0–7	0.0280*
No	4.59	1.53	1–7	
Yes, but 1 or more family members are still working	4.34	1.46	0–7	

*Anova; **t-test

procedures in patients with active disease and know how to perform urgent dental treatment when necessary. The present study noted that professionals who believed that COVID-19 cannot be transmitted during dental procedures were less knowledgeable about the symptoms of COVID-19. Thus, it can be inferred that these professionals are less likely to be prepared to deal with the necessary biosecurity to treat patients, increasing the transmission risk for patients and dental professionals.

Most of the professionals were aware that COVID-19 can be transmitted during dental procedures. Nevertheless, the participants of the present study demonstrated similar levels of knowledge to those reported by a previous study with Jordanian dentists.[14] Recently, Xu et al.[16] found that the salivary glands may be a potential target for COVID-19, especially in asymptomatic patients.

With regard to protective measures, there were significant differences, and most of the participants reported that conventional PPE (e.g. gloves, hat, apron, mask, goggles) is not sufficient to prevent the transmission of COVID-19. Moreover, most of them reported that their work environments did not implement adequate biosecurity measures to permit them to provide safe care to patients with COVID-19. Therefore, adequate training should be provided to dentists to equip them to implement biosecurity measures in their offices and outpatient clinics.[6,7,17] Recent findings suggest that saliva is an important mode of transmission of COVID-19.[6,16] The use of half-mask filtering facepiece respirators (FFRs), as N95 respirators, is essential to prevent aerosol and droplet transmission, thereby providing better protection than surgical masks.[18]

Participants reported that no dental procedure carries a low risk of transmission. Thus, they were aware of the high risk of transmission involved in all dental procedures.[6] In addition, most of them reported that they primarily only performed emergency procedures and refrained from performing elective procedures in accordance with the recommendations of health agencies and dental associations.[7,19,20] With regard to social distancing, most of the participating professionals reported adhering to global guidelines that pertain to pandemic control. In Brazil, the term social distancing is being used to indicate avoidance from all elective activities that may agroup people, such as non-essential work, parties, shopping centers, academies, and beauty salons. However, essential and basic services, such as emergency dental care, were authorized by local governments.

It has been recommended that elective dental procedures should not be performed during the COVID-19 pandemic, and patients should be informed about this guideline.[21] Past findings suggest that the most common dental emergencies involve diseases of the pulp and periapical tissues.[22,23,24] Accordingly, endodontists should be able to provide safe dental services to treat dental pain and acute periapical infection. Professionals can prescribe systemic medications to manage some of the dental emergencies. However, in some of the other cases, a clinical approach that permits access to the pulp chamber and manipulation of the root canal is necessary.

A rubber dam and a powerful suction pump should be used to minimize the risk of contamination.[7,25]

A recent study found that the rate of oral and dental infections had increased by 20% since the start of the pandemic. Evidently, this increase has influenced the utilization of emergency dental services.[10] Therefore, endodontists can play an important role on the front lines to prevent patients with dental pain from going to hospitals with high risk of COVID-19 contamination.[25]

During and after the acute COVID-19 pandemic period, all dentists in the world should revise their dental office routine, increase their use of PPE, and improve biosecurity procedures to effectively prevent contamination. Rigorous measures should be adopted in accordance with excellent dental practices to offer the best and safest treatments.

The sampling methodology could be perceived as a limitation of the study, as it may introduce bias to the endodontics answering the survey – those more familiar with social media. However, in a world where social media usage is increasing, it is a viable method to obtain information in a fast and reliable manner. In one week, almost 15% of all endodontics working in Brazil answered the survey, which gives us confidence in the representativeness of the present study.

Conclusion

Based on the present findings, it is concluded that Brazilian endodontists are knowledgeable about the signs and symptoms of COVID-19. They practice social distancing and treat only dental emergencies and patients who require urgent care. A majority of the participating endodontists believed that conventional PPE cannot prevent COVID-19 transmission.

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