

Dental students' biosafety knowledge and practices regarding COVID-19

Conhecimento e práticas de biossegurança de estudantes de Odontologia frente ao COVID-19

Conocimientos y prácticas de bioseguridad de estudiantes de Odontología en relación con el COVID-19

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Abstract

Objectives. To describe dental students' knowledge, regarding the COVID-19 pandemic in dental care as to biosafety rules and protocols in force. **Method.** This was a sectional, descriptive study. The sample was composed of dental students from 8 universities, public and private, located in the state of Rio de Janeiro. A structured questionnaire was applied on line with questions about demographic data, aspects associated with biosafety in dental practice and, finally, perceptions regarding COVID-19. Undergraduate students who were in the preclinical periods were excluded. **Results.** A total of 123 students, predominantly female (85.37%), participated. The mean age of the participants was 27.24 years, 69.92% with ages ranging from 19 to 26 years, most of them attending the last periods of Dentistry undergraduate studies (63.42%) in private universities (88.62%). All participants recognized the signs and symptoms of the disease, fever and shortness of breath being the most frequently mentioned symptoms. About 67.48% of the respondents do not feel safe to attend patients with minimal risk of contamination by COVID-19, even with knowledge of biosafety. **Conclusion.** The undergraduate students recognize the main signs and symptoms of COVID-19 and the biosafety aspects practiced by them are within the prerogatives for infection control in university clinics.

Keywords: Academics; Biosafety; COVID-19; Dentistry; Teaching; University.

Resumo

Objetivos. Descrever o conhecimento de acadêmicos de Odontologia frente a pandemia da COVID-19 no atendimento odontológico quanto as normas de biossegurança e protocolos vigentes. **Métodos.** Estudo seccional e descritivo. A amostra foi composta por alunos de Odontologia de 8 universidades, públicas e privadas, localizadas no estado do Rio de Janeiro. Um roteiro de perguntas estruturado foi aplicado *on line* com questões sobre dados demográficos, aspectos associados a biossegurança na prática odontológica e, por fim, percepções em relação a COVID-19. Os alunos de graduação que estavam nos períodos pré-clínica foram excluídos. **Resultados.** Participaram 123 alunos, predominantemente do sexo feminino (85,37%). A média de idade dos participantes foi de 27,24 anos, 69,92% com idade variando entre 19 e 26 anos, a maior parte cursando os últimos períodos da graduação de Odontologia (63,42%) em Universidades privadas (88,62%). Todos os participantes reconheceram os sinais e sintomas da doença, sendo febre e falta de ar os sintomas mais citados. Cerca de 67,48% dos respondentes não se sentem seguros para atender os pacientes com mínimo risco de contaminação pela COVID-19, mesmo com conhecimentos de biossegurança. **Conclusão.** Os alunos de graduação reconhecem os principais sinais e sintomas da COVID-19 e os aspectos de biossegurança praticados por eles estão dentro das prerrogativas para o controle da infecção nas clínicas universitárias.

Palavras-chave: Acadêmicos; Biossegurança; COVID-19; Ensino; Odontologia; Universidade.

Resumen

Objetivos: describir los conocimientos de los estudiantes de Odontología ante la pandemia de COVID-19 en la atención odontológica sobre los estándares y protocolos de bioseguridad vigentes. **Métodos:** estudio descriptivo y seccional. La muestra estuvo conformada por estudiantes de Odontología de 8 universidades, públicas y privadas, ubicadas en el estado de Río de Janeiro. Se aplicó un guión de preguntas estructurado en línea con preguntas sobre datos demográficos, aspectos asociados a la bioseguridad en la práctica odontológica y, finalmente, percepciones sobre el COVID-19. Se excluyeron los estudiantes de pregrado que se encontraban en periodos preclínicos. **Resultados:** participaron 123 estudiantes, predominantemente mujeres (85,37%). La edad promedio de los participantes fue de 27,24 años, 69,92% con edades comprendidas entre 19 y 26 años, la mayoría de ellos cursando los últimos periodos de Licenciatura en Odontología (63,42%) en universidades privadas (88,62%). Todos los participantes reconocieron los signos y síntomas de la enfermedad, siendo la fiebre y la dificultad para respirar los síntomas más citados. Aproximadamente el 67,48% de los encuestados no se sienten seguros para atender a pacientes con un riesgo mínimo de contaminación por COVID-19, incluso con conocimientos de bioseguridad. **Conclusión:** los estudiantes de pregrado reconocen los principales signos y síntomas del COVID-19 y los aspectos de bioseguridad que practican están dentro de las prerrogativas para el control de infecciones en las clínicas universitarias.

Palabras clave: Académicos; Bioseguridad; COVID-19; Enseñanza; Odontología; Universidad.

1. Introduction

On January 30, 2020, the World Health Organization (WHO) declared the spread of the SARS-CoV-2 virus and its association with the disease, known as “Coronavirus Disease” (COVID-19), an international public health emergency. Its mortality rate was up to 3.4% (Ather *et al.*, 2020; Ye *et al.*, 2020). On March 11, 2020 WHO declared the pandemic. On March 27, 2020, WHO reported there had been more than 500,000 confirmed cases and 23,000 deaths in the world (Ather *et al.*, 2020). Since then, the number has only been growing. In April 2021 close to 3.1 million people had lost their lives to the new coronavirus, while around 85 million individuals had recovered from the disease. At this time Brazil had the third highest number of cases, behind the United States of America and India (Jonhs Hopkins University & Medicine, 2020). The rapid spread of disease caused by SARS-CoV-2 represents the most significant public health emergency in a century (Santarpia *et al.*, 2020).

When an individual is infected, the virus is abundantly present in the nasopharyngeal mucosa and saliva of this person (Ather *et al.*, 2020; To *et al.*, 2020). Studies have suggested that the virus can be transported by aerosols formed during various types of procedures including dental (Ather *et al.*, 2020; Guo *et al.*, 2020b; Peng *et al.*, 2020; Santarpia *et al.*, 2020; Tuñas *et al.*, 2020). Thus, SARS-CoV-2 can spread through droplets and aerosols from affected patients in dental clinics (Peng *et al.*, 2020). Scientific evidence suggests that similar diseases caused by other coronaviruses (SARS and MERS) can be transmitted by air, in addition to direct contact and droplet transmission (Santarpia *et al.*, 2020). A study by Omrani *et al.* (2013) even suggests that individuals with mild or asymptomatic symptoms can transmit MERS-CoV.

All health professionals face a risk of infection and can become potential carriers of the disease (Ather *et al.*, 2020). Dental surgeons in specific face a high risk of infection by SARS-CoV-2 due to face-to-face communications and exposure to saliva, blood and other body fluids, in addition to the use of sharp instruments (Peng *et al.*, 2020). Thus, the high risk of cross-infection between the dentist and the patient may be due to the specific nature of dental clinics (Meng *et al.*, 2020). Consequently, the adoption of preventive protocols must be rigorous, as well as being especially necessary during this pandemic in dental clinics, in order to guarantee the safety of the professionals, assistants and patients.

Dental students are constantly exposed to infectious agents as they are in clinical training under supervision and are in direct contact with saliva, blood and other fluids. Furthermore, they are in direct contact with the patient's upper respiratory tract (nasopharynx). In addition the aerosols created by the high-speed dental instruments can disperse droplets throughout the office, creating a dispersion of any pathogens. The future professional must be able to recognize the signs and symptoms of COVID-19 and to identify suspected cases as well as to know how to proceed with patient guidance and care.

The Brazilian Association of Dental Education (ABENO) has developed guidelines on biosafety for Post-pandemic COVID-19 in dental education, with instructions and regulations for higher education institutions. The ABENO Consensus lays down several measures in order to make it safer for patients, professionals, academics and assistants in the clinical environment of undergraduate and graduate courses. These measures start with making an appointment and obtaining information on the patient's health status, greater distancing between the individual patients, as well as reducing the number of consultations per student, and whenever possible, with only one patient per shift. Guidelines regarding irrigation, continuous aspiration, and whenever possible, absolute isolation of the operative field, as well as avoiding the use of triple syringes are among the measures suggested in the manual (Associação Brasileira de Ensino Odontológico, 2020).

Thus, this study aimed to describe the knowledge of dental students facing the COVID-19 pandemic in dental care regarding biosafety standards and current protocols as well as whether they feel safe in carrying out the updated biosafety protocols and procedures.

2. Method

This study was submitted and approved by the Ethics and Research Committee of the Universidade Estácio de Sá (31688120.8000.5284).

A sectional and descriptive study was carried out in order to learn the effect that the COVID-19 pandemic has had on the routine of biosafety in dental care, and in addition to assess whether dental students feel safe and capable of carrying out these procedures. Participants were recruited using the snowball technique (the participating students were kindly asked to forward the questionnaire to their colleagues), which was started off at the main researcher's university. The inclusion criteria were: Dental students who were doing supervised internships in the public and/or private network in the State of Rio de Janeiro and students who attended university clinics as part of their clinical training were included in the study. Undergraduate students who were in pre-clinical periods were not included. In the end, 123 dental students participated in this study. The participants answered a semi-structured script of 21 open and closed questions, which was sent via SMS, WhatsApp and/or e-mail.

The free and informed consent form was digitally signed and the questionnaire filled out on the internet, through the Google Forms® platform (California, USA). The registration data collected included: gender, age, the period they were attending, their university and the internships in a public and/or private unit. After this initial information, the questions were about biosafety protocols, such as: procedures before and after dental care, use of personal protective equipment (PPE) and which ones are routinely used, as well as their personal classification in relation to biosafety at work before COVID-19.

After these questions, there were specific questions regarding the pandemic. Such as those referring to signs and symptoms of the disease, if the respondent felt safe using the personal protective equipment (PPE) available on the market, and if the respondent was part of a risk group. In addition, were patients asked to use antimicrobial mouthwashes before the dental procedure, and did the respondent feel safe in the procedures being done. Other general questions were whether the respondent had started to take more care after COVID-19; and did he feel safe and feel able to return the necessary biosafety care. Khader *et al.* (2020) and Duruk *et al.* (2020) aimed to assess the level of knowledge, awareness and attitude of dental professionals about COVID-19. The authors used an online questionnaire, sent for professionals to assess these informations. The methodology of these studies was used for the basis of this study.

The data received were generated through the conversion carried out in Google Forms®, which created a database that was adjusted for dental students. The Chi-square and Fisher's exact tests with a significance level of 5% ($p < 0.05$) were used in the analysis.

3. Results

The 123 participants were predominantly female (85.37%). The mean age of the participants was 27.24 years old [Standard deviation (SD): 8.02 years], with more than half being between 19 and 26 years old (69.92%). Most individuals were in the 7th and 8th period of their dental courses (63.42%), studied at private universities (109/88.62%) and had internships in private dental offices (64.23%) (Table 1).

Table 1 - Description of demographic data and related training of participants.

Categories / Variables	N	%
Gender		
Female	105	85.37
Male	18	14.63
AGE mean(standard deviation)	27.24 (8.02)	-
19-26 years old	86	69.92
27-34 years old	16	13
35-42 years old	9	7.32
43-50 years old	10	8.13
51-54 years old	2	1.63
Which period are you in		
3 rd	1	0.81
4 th	3	2.44
5 th *	20	16.26
6 th **	21	17.07
7 th	39	31.71
8 th	39	31.71
University where you are studying		
Private	109	88.62
Public	13	10.57
Not informed	1	0.81
Internship in a clinical unit:		
Private	79	64.23
Public	36	29.27
Private and Public	8	6.50

Legend: *One participant was attending the 4th and 5th periods;

**One participant was attending the 5th and 6th periods.

Source: Authors (2020).

All participants reported using personal protective equipment and 70.73% rated the biosafety of their practice before the COVID-19 pandemic as good or excellent. When asked about the use of some type of mouthwash prior to dental

procedures, 48.8% of the participants said they ask patients to rinse their mouths and 81.67% replied that they used 0.12% chlorhexidine (Table 2).

Table 2 - Aspects associated with biosafety in dental practice.

Categories / Variables	N	%
In your practice, you usually:		
Wash hands before and after procedures	117	95.12
Decontaminate clinical instruments after use	113	91.87
Discard piercing-cutting material in a rigid container (Descarpack®)	118	95.93
Use personal protective equipment		
Yes	123	100
No	0	0
Ask the patient to rinse with antimicrobials before any procedures		
Yes	60	48.8
No	63	51.2
If you answer “yes” above, which mouthwash do you use?		
1% hydrogen peroxide and 0.12% chlorhexidine	2	3.33
Chlorhexidine 0.12% and others	1	1.67
1% hydrogen peroxide	3	5.00
Chlorhexidine 0.12%	49	81.67
Others	5	8.33
How would you rate biosafety in your practice before COVID -19?		
Regular	33	26.83
Bad	3	2.44
Good	69	56.10
Excellent	18	14.63

Source: Authors (2020).

When specifically asked about COVID-19, most students (85.37%) did not belong to a risk group and all responded that they recognized the signs and symptoms of the disease. Fever and shortness of breath were the symptoms most recognized by the students (99.19%), as the symptoms of the disease caused by the new coronavirus, followed by fatigue (86.18%) and headache (69.11%) (Table 3).

Table 3 - Perceptions of Dental students regarding COVID-19.

Are you in a risk group for COVID-19		
Yes	18	14.63
No	105	85.37
Do you know the signs and symptoms of COVID-19		
Yes	123	100
No	0	0
Signs and symptoms that you recognize from COVID-19		
Fever	122	99.19
Myalgia	31	25.20
Fatigue	106	86.18
Shortness of breathe	122	99.19
Diarrhea	68	55.28
Headache	85	69.11
Hemoptysis	10	8.13
Mucus production	42	34.15
Do you feel safe using the PPE available on the market for the prevention of COVID-19 in dental care?		
Yes	64	52.03
No	59	47.97
Do you feel safe in the procedures you have been carrying out during the pandemic?		
Yes	42	34.15
No	81	65.85
Have you been taking more care about biosafety since the pandemic?		
Yes	122	99.19
No	1	0.81
Do you feel able to treat patients safely and with minimal risk of contamination by COVID-19?		
Yes	83	67.48
No	40	32.52

Source: Authors (2020).

Regarding the dental appointments that they have carried out during the SARS-CoV-2 pandemic, 65.85% of the students said they did not feel safe. Most of the students from the sixth period onwards, who were insecure (68/69.39%), felt less safe at the dental appointments they had been performing during the pandemic compared to the previous periods; however, this difference was not statistically significant (chi-square test; $p= 0.102$).

Only one participant (0.81%) replied that they had not increased care in relation to biosafety since the beginning of the pandemic; however, the majority (67.48%) felt able to attend to their patients safely with a minimal risk of contamination by COVID-19 (Table 3). Even with the high frequency of students between 19 and 26 years old who described taking more care with biosafety since the start of the pandemic, compared to those of other ages, this difference was not statistically significant (Fisher's exact test; $p= 1.00$). And yet the majority of students between 19 and 26 years (58/62.74%) described feeling capable of treating patients safely and with a minimum risk of contamination by COVID-19, compared to those of other ages, but this difference again was not statistically significant (Chi-Square Tests; $p=0.98$).

4. Discussion

This study aimed to understand the level of knowledge of undergraduate dental students from universities in the State of Rio de Janeiro in relation to COVID-19 and thus assess whether they feel safe and are able, within biosafety standards, to provide appropriate care in university clinics. Dentistry is among the professions with the highest risk of contamination (Bastos & Bastos, 2020; Meng *et al.*, 2020), so this research provides us with data in order to minimize the risk both for undergraduate students and for patients

The 123 participants answered a semi-structured online questionnaire on the Google Forms® platform. The predominant age group was between 19 and 26 years old. This age range of undergraduate students is in agreement with the study by Aragão *et al.* (2020) carried out in Brazilian universities. Students still in the basic level of their Dentistry course, who did not attend clinical practice, did not participate in the present sample, unlike the study by Ozverel *et al.* (2020). This research carried out in Cyprus had an equivalent distribution between the genders (48.99% female and 51.02% male), diverging from the present study and from Aragão *et al.* (2020). However, the predominant age group of students was the same, from 18 to 25 years old (94.5%).

Most of the volunteers in this study were female (105/85.37%), were studying at private universities (109/88.62%) and were doing internships in private dental offices (79/64.23%). In Brazil, there has been a considerable increase in the presence of women in healthcare professions. This increase took place after the 1970s, and is partly justified by feminist movements, by changes in cultural standards and in the values of the social role of women in society (Baldissera *et al.*, 2010; Costa *et al.*, 2010). One of the factors that helps make women opt for a dental career is the possibility of exercising the profession autonomously, allowing her to exercise the profession and take care of the family (Baldissera *et al.*, 2010). Thus, in Brazil, as in other countries, the number of students entering courses in the health area, including Dentistry, is predominantly female, which may partially explain the results mentioned above. These rates are in agreement with the study recently published by Aragão *et al.* (2020).

When asked about aspects associated with biosafety in dental practice, the majority claimed to wash their hands before and after a dental appointment, to decontaminate clinical instruments after use and to dispose of needles and sharps in a rigid container (DESCARPACK®). Among the main recommendations for preventing the spread of infection by SARS-CoV-2, hand washing before and after treatment is essential in combating and preventing communicable diseases or cross infections (Ahmed *et al.*, 2020; Faria *et al.*, 2020., 2020; Meng *et al.*, 2020; Peng *et al.*, 2020; Shi *et al.*, 2020). All participants reported using PPE. These answers are in agreement with the study by Ozverel *et al.* (2020) with a similar methodology. In relation to PPE, it is recommended that, in addition to the use of personal protective equipment for routine use (mask, gloves, cap and goggles), a disposable coat with long sleeves, shoe covers, face shield and masks of type N95, PFF2 or PFF3 be added (Faria *et al.*, 2020). Only 60 students (48.8%) requested their patients to rinse with mouthwash before any dental procedures. Of these 60, only 3 (5%) used 1% hydrogen peroxide and 49 (81.67%) used 0.12% chlorhexidine. Chlorhexidine is a broad-spectrum antiseptic that acts against bacteria and fungi by increasing the permeability of the bacterial cell wall, leading to its lysis. It is used in dentistry to reduce the amount of bacterial plaque and control periodontal diseases. Despite having an effect against some types of lipid-enveloped viruses such as SARS-CoV-2, 0.12% chlorhexidine gluconate has little or no effect against coronaviruses when compared to other mouthwashes such as 1% hydrogen peroxide or 0.23% povidone-iodine (Vergara-Buenaventura & Castro-Ruiz, 2020).

However, Yoon *et al.* (2020) suggested that the chlorhexidine-based mouthwash may be beneficial, reducing the viral load in saliva for a short period of time and suggested that its use may be positive in controlling the transmission of COVID-19. However, the new coronavirus is more vulnerable to oxidation and 1% hydrogen peroxide significantly reduces the microbial load of fluids in the oral cavity, and therefore is more recommended (Machado *et al.*, 2020; Vergara-Buenaventura & Castro-Ruiz, 2020). An “in vivo” randomized-controlled clinical trial to evaluate the virucidal efficacy of chlorhexidine and povidone-iodine mouthwashes against salivary SARS-CoV-2 suggest that 0,2% chlorhexidine and 1% Povidone-Iodine oral solutions are effective preprocedural mouthwashes against the virus (Elzein *et al.* 2021). Fernandez *et al.* (2021) aimed to systematically review the literature on the virucidal efficacy of chlorhexidine compared with other substances used in the oral cavity. Concluded that rinsing with chlorhexidine may reduce the viral load of SARS-CoV-2 in patients with COVID-19.

The number of clinical trials examining the effect of mouthwash on the reduction of COVID-19 in saliva is very limited, so more standard sample size clinical trial studies are needed to evaluate the impact of mouthwash on SARS-COV-2 virus (Z. Mohebbi *et al.*, 2021)

When asked about the application of biosafety before the COVID-19 pandemic, most respondents replied that it was good or excellent (87/70.73%) and only 3 (2.44%) rated it as bad. According to recently published papers in the literature, an appropriate disinfection of the dental office, use of personal protective equipment, preoperative mouthwash, as well as the correct handling of infected waste and hand washing, are all very important measures to help prevent the spread of COVID-19 in a dental environment (Ather *et al.*, 2020; Center for Disease Control, 2020; Peng *et al.*, 2020; Tuñas *et al.*, 2020; Wu *et al.*, 2020).

The participants' knowledge regarding the signs and symptoms of COVID-19 was also part of the study's investigation. Fever and shortness of breath were the symptoms most reported and most students were well informed about the topic. This information is in line with what was seen in the literature. In addition to the symptoms mentioned above, dry cough was reported by the students (Aragão *et al.*, 2020; Ozverel *et al.*, 2020).

At dental appointments during the pandemic, the use of PPE made available for protection against COVID-19 was considered safe by about half of the participants (52.03%). Biosafety has also become a more important topic: the vast majority (122/99.19%) responded that care in biosafety has increased. When asked if they felt able to provide care safely and with a minimal risk of contamination, 83 students (67.48%) felt they could. However, during the pandemic, according to the orientation of the American Dental Association (ADA), consultations should be restricted to emergencies, postponing elective care to reduce the spread of COVID-19 (American Dental Association, 2020). However, as dental students are in the training process and need the knowledge and learning provided by the university, ABENO (2020) prepared a joint work between professors and directors of Brazilian Dentistry courses, to discuss viable measures, according to the proposed sanitary definitions by the government, as well as those proposed by the local and institutional authorities. Thus, the academic activities could be resumed with safe practices for teaching Dentistry, with technical excellence and promoting health for the society as a whole.

According to a recent work, the demand for dental care, after the pandemic, is expected to increase (Guo *et al.*, 2020a). Thus, dental offices must be prepared to treat patients with all the necessary care and also, due to the anxiety generated when returning to activities in schools of dentistry, there will possibly be a lot of apprehension among students and staff. Therefore, these educational institutions should provide monitoring and psychological support to students and staff so that they feel more secure and confident on their return (Almeida *et al.*, 2020; Machado *et al.*, 2020).

Undergraduate students must be prepared to carry out appropriate care at consultations in accordance with the proposed biosafety protocols and university clinics must be prepared to return to having consultations despite COVID-19 (Brazilian Association of Dental Education, 2020). The return of face-to-face activities at dental clinics of the universities requires a lot of preparation and success will be related to preparing students for the new routines of patient care. Furthermore, students' understanding of the disease is an important point for planning their return to clinical practice (Aragão *et al.* 2020).

Dental students from universities located in the State of Rio de Janeiro demonstrated awareness of the importance of biosafety during the pandemic, they know how to recognize signs and symptoms of the disease, but approximately one third (40/32.52%) of the participants in this study did not feel safe and capable of providing patients without some small risk of contamination. This data is in agreement with the study by Aragão *et al.* (2020), in which 32.6% of students said they were afraid of returning to university.

This study has some limitations: firstly in relation to the representativeness of the sample, as we did not consider ethnicity or levels of income (Aragão *et al.*, 2020). The results cannot be generalized but represent a part of the target

population. The knowledge of students during the pandemic has been modified and more information and knowledge has been acquired. Some universities, both public and private, held training courses before returning to clinical activities. Thus, as it is a sectional study, it may not capture this change in knowledge and thus it may underestimate the level of knowledge of respondents over time (Almeida *et al.*, 2020; Ammar *et al.*, 2020). However, as it is a convenience sample, it can reduce statistical representativeness (Ammar *et al.*, 2020). The low enrollment of students from public universities can also be considered a limitation and can be justified by the longer interruption of academic activities that were suspended in the first semester of 2020 and, in some, only returning in the second semester of the same year.

5. Conclusion

The undergraduate students who participated in this investigation recognize the main signs and symptoms of COVID-19 and the aspects related to biosafety practiced by them are within the protocols for infection control in university clinics. However, many undergraduates still do not feel safe and able to provide appropriate care with a minimal risk of contamination by COVID-19. Thus, dental schools should promote training courses so that students have more knowledge about aspects of the disease and infection control measures in order to provide more security and comfort when returning to face-to-face activities.

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