Brazilian dental students and COVID-19: A survey on knowledge and perceptions

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Abstract
Objective: This study evaluated the knowledge and perceptions of Brazilian dental students about COVID-19 and the undergraduate clinical practice during the COVID-19 outbreak by a self-administered Web-based questionnaire.

Methods: A social network campaign on Instagram was raised to approach the target population. The survey covered demographic and academic profile, general knowledge, preventive measures and perception about COVID-19. Descriptive statistics were used to identify frequencies and distributions of variables, which were compared by type of institution and current year of enrolment using the Chi-square or Fisher’s exact tests (α = 0.05).

Results: A total of 833 valid responses were received over 10 days. Students were able to identify the incubation period, main symptoms and contagious routes of the disease but struggled in recognising the name of the virus responsible for the pandemic. Hand washing before and after a dental appointment with a patient (97.7%) followed by the use of barriers to protect mucosa (97.2%) were the more frequently recognised measures to prevent COVID-19 spread in the dental office. As for the perception of COVID-19, 73.2% of the dental students perceived the disease as severe, whilst only 11.1% of them thought that COVID-19 is severe only for people presenting risk factors. Dental student’s knowledge and perception were associated with the type of institution and year of enrolment.

Conclusion: In summary, the dental students demonstrated an acceptable general knowledge about COVID-19, but dental schools will need to address gaps in knowledge, preventive measures, and perceptions to ensure a safer return to in person activities.

KEYWORDS
COVID-19, dental education, dental school, dental students, dentistry
INTRODUCTION

COVID-19 is a novel disease caused by SARS-CoV-2 and originated in Wuhan, Hubei, China, in December 2019. The disease has already affected 76 million people and caused more than 1.7 million deaths worldwide according to the World Health Organization (23 December 2020) (WHO). Brazil has become an epicentre of COVID-19 amongst Latin American countries. By December 2020, it ranked number 3 globally, accounting for more than 7 million cases of the disease and more than 188 thousand death episodes. Social/physical distancing, hand and respiratory hygiene, and use of face masks are still the most effective measures to avoid the virus spread whilst vaccination campaigns are still at the beginning.

The pandemic has imposed a heavy toll on basic human activities, strongly affecting healthcare professionals, who have been dealing with frequent exposure to a high risk of infection. Although dentists are not front-line workers, the clinical practice of such professionals has been strongly affected by the outbreak of COVID-19. Elective treatments were postponed, biosafety measures were strengthened, and a worldwide recess of dental health professionals was experienced. Even with the adoption of more rigid biosafety protocols, dentists are still frequently exposed to the high amount of aerosols generated by the use of rotary instruments during oral fluid and tissue manipulation. As the workflow of dental professionals has been impacted, so has the educational process of dental students been challenged. Approximately 350 institutions offer dentistry as a formal degree to 125 585 students in Brazil. During the COVID-19 pandemic, dental education has found a stumbling block in the delivery of a hands-on experience to dental students due to social/physical distancing and university lockdowns. Considering that COVID-19 might not recede soon, and that the world is once again experiencing an accelerating increase in cases, dental schools might face challenges adapting the dental students to a novel scenario of teaching and learning clinical practice.

Currently, the unpredictable course of the pandemic creates uncertainty about when dental schools will fully return to normal. Under this light, many institutions have issued protocols to mitigate the impact of COVID-19 pandemic on dental education whilst experts have spoken from an institutional perspective. Brazil is a leader in dental education and research. However, dental schools and students have been strongly impacted since the country is one of the epicentres of the pandemic. In this context, the dental student’s knowledge, awareness and attitudes towards COVID-19 must be taken into account as their knowledge and perceptions about the disease might affect their clinical practice. Thus, this study aimed to evaluate the knowledge and perception of Brazilian dental students about COVID-19 and the clinical practice in the context of the pandemic.

MATERIALS AND METHODS

Ethical aspects

This research protocol was approved by our research ethics committee (CAAE: 33608320.5.0000.5419). The study consists of a cross-sectional survey directed to a sample of undergraduate dental students.

Questionnaire preparation

A self-administered questionnaire about the awareness and knowledge of dental students of COVID-19 and its impact on the undergraduate dental practice was developed based on the Centers for Disease and Control (CDC) Guidance for Dental Settings and the Manual of Good Practices and Biosafety of the Brazilian Federal Board of Dentistry. The Clinical Management of COVID-19 Interim Guidance of the WHO was also consulted. The questionnaire was elaborated in Brazilian Portuguese and hosted online (Google Forms). The questionnaire was revised by experts, who qualitatively analysed the items regarding the clarity of wording, layout, style and likelihood that the target population would understand and be able to answer the questions. A final revision of the questionnaire was performed by the principal investigator of this research, who has more than 20 years of experience in dental education. Moreover, a pre-test was conducted with 10 undergraduate dental students to evaluate the validity of the research tool chosen and the content of the questions. In the pre-test, the students were asked to evaluate the questions regarding their clarity. The first and last questions of the pre-test were “What time is it?” so we could calculate the meantime the students took to answer the questionnaire. In the pre-test, the students scored the clarity of each question on a scale of 1 (not clear) to 5 (very clear). To access the level of concordance amongst respondents regarding the items of the questionnaire, we calculated the content validity index by summing the relative frequencies of the scores 4 and 5. A 0.8 index was set as the minimum level of concordance accepted. We obtained an index of 1, with a mean score ± standard deviation (SD) of 4.9 ± 0.26, meaning that high concordance was found regarding the clarity of the questions. Thus, we did not change the way the questionnaire was organised. The mean time to complete the survey ± standard deviation (SD) was 9 ± 3 min. Those who participated in the pre-test were excluded from the main study to avoid response bias.

Questionnaire design and content

The participant had to click “Yes” after the question “Do you agree to participate in the study?” The questionnaire contained 20 mandatory
close-ended items, divided into four sections: demographic and academic profile (n = 6); general knowledge about COVID-19 (n = 4); knowledge about the preventive measures to avoid SARS-CoV-2 spread on the undergraduate dental practice (n = 2); and perception about the COVID-19 impacts on the undergraduate dental courses (n = 8). The options “I’d rather not say” and “I don’t know how to answer” were treated as missing data. This manuscript does not cover the entire questionnaire once one question was not addressed. Such question covered the student’s main information sources about COVID-19. The student’s information-seeking behaviour will be addressed elsewhere.

2.4 | Online survey

We used the data from the last Brazilian Tertiary Education Census\(^2\)\(^1\) to know the size of our source population. According to this census, there are 125,585 undergraduate students enrolled in dentistry courses in Brazil considering public and private institutions. All these students were eligible to participate in the research. Considering the target population of 125,585 dental students, we estimated that 693 responses would be necessary to ensure a 95% confidence interval and a 3% margin of error. To recruit the participants, we created an Instagram\(^®\) social networking campaign targeting dental students in Brazil (Facebook, Menlo Park, CA). We followed the strategy described by Moraes et al., 2020,\(^15\) who performed a national survey directed to Brazilian dentists. Thus, an Instagram professional account was created (@covid.forp) with a website link to the questionnaire on its bio page. Firstly, we posted a text image containing only the title of the research. In the post description, we provided the main objectives of the project, called for participants, and asked them to share our publication. Dental students with professional Instagram accounts were asked to share our posts on their stories to increase the reach to the target population and to assist in disseminating the campaign. Five days later, we made a second post with a different visual aspect. In this second post, we included the title of the research project and a phrase asking people to share our post on their stories. Brazilian dental students, professors and Instagram profiles of dental schools shared our posts. The campaign started on July 4 and lasted until July 14.

2.5 | Data analysis

The data collected were extracted from Google Forms and converted to Excel (Microsoft, USA) sheets. Descriptive statistics were used to identify frequencies and distributions of variables. The frequency distribution for the students’ general knowledge of COVID-19 and preventive measures to avoid SARS-CoV-2 spread on the undergraduate dental practice, as well as their perception about the disease, were compared by type of institution (public versus private) and by current year of enrolment (first to the fifth year) using the Chi-square or Fisher’s exact tests with a significance level set at 5%. All statistical tests were performed using the 7.0 GraphPad Prism\(^®\) software (California, USA). All data are available upon reasonable request to the corresponding author.

3 | RESULTS

A total of 833 valid responses were received over 10 days from participants from all Brazilian states and the Federal District. Participants were mostly female (80.1%), ageing between 18 and 25 years (85.1%) and studying dentistry at institutions located in the South-east of Brazil (54.7%). Moreover, 51% of the respondents studied dentistry at private institutions and most of them were enrolled in the fourth (24.8%) and fifth (25.3%) years of the undergraduate course (Table 1).

Regarding general knowledge about COVID-19, 50.1% of the participants chose the option SARS-CoV-2 (Table 2) as the name of the COVID-19 aetiological agent. Students from public dental schools recognised the right name of the virus more frequently (64.9%), whilst 52% of students from private institutions chose the
### TABLE 2  Students' general knowledge and perception about COVID-19, Brazil, 2020 (N = 833)

| Variable/category                                                                 | n   | %    | 95% CI       |
|-----------------------------------------------------------------------------------|-----|------|--------------|
| **What is the name of the virus responsible for the pandemic we are facing in 2020?** |     |      |              |
| 2019-nCoV                                                                         | 11  | 1.3  | 1.2; 1.4     |
| Coronavirus                                                                       | 65  | 7.8  | 7.6; 8       |
| COVID-19                                                                          | 340 | 40.8 | 40.3; 41.4   |
| SARS-CoV-2                                                                        | 417 | 50.2 | 49.4; 50.7   |
| **What is the incubation period of the virus?**                                    |     |      |              |
| 1–7 days                                                                          | 161 | 19.3 | 19; 19.7     |
| 7–10 days                                                                         | 59  | 7.1  | 6.9; 7.2     |
| 7–14 days                                                                         | 560 | 67.2 | 66.5; 68.1   |
| 14–21 days                                                                        | 53  | 6.4  | 6.6; 6.9     |
| **What are the main contagious routes of COVID-19?**                                |     |      |              |
| Handshake with infected person                                                    | 447 | 53.7 | 52.9; 54.4   |
| Sexual intercourse with infected person                                            | 56  | 6.7  | 6.6; 6.9     |
| Contact with air droplets from an infected person                                  | 793 | 95.2 | 94.2; 96.2   |
| Contact with infected surfaces                                                    | 586 | 70.3 | 69.5; 71.2   |
| Exposure to aerosol                                                               | 494 | 59.3 | 58.5; 60.1   |
| Contact with blood of an infected person                                          | 48  | 5.8  | 5.6; 5.9     |
| Accidents with contaminated sharp objects                                          | 14  | 1.7  | 1.6; 1.7     |
| **What are the main symptoms of the disease?**                                     |     |      |              |
| Fever                                                                             | 791 | 95.0 | 93.9; 96     |
| Dry cough                                                                         | 682 | 81.9 | 80.9; 82.8   |
| Diarrhoea                                                                         | 206 | 24.7 | 24.3; 25.1   |
| Fatigue                                                                           | 299 | 35.9 | 35.4; 36.4   |
| Sore throat                                                                        | 312 | 37.5 | 36.6; 38     |
| Nausea and vomiting                                                               | 36  | 4.3  | 4.2; 4.4     |
| Difficulty breathing                                                              | 804 | 96.5 | 95.5; 97.6   |
| Headache                                                                          | 441 | 52.9 | 52.2; 53.7   |
| Running nose                                                                       | 297 | 35.7 | 35.1; 36.2   |
| **Measures to prevent the risk of COVID-19 spread that should be adopted in the dental practice** |     |      |              |
| Hand wash before and after an appointment                                         | 811 | 97.7 | 96.7; 98.7   |
| Use of barriers to protect mucosae                                                | 807 | 97.2 | 96.2; 98.3   |
| Use of disposable coat apron                                                      | 727 | 87.6 | 86.6; 88.6   |
| Use of rubber dam                                                                 | 266 | 32.0 | 31.6; 32.5   |
| Use of manual instruments when possible                                           | 400 | 48.2 | 47.5; 48.9   |
| Use of mouthwashes by patients before the clinical examination                    | 253 | 30.5 | 30; 31       |
| Use of high vacuum suction                                                       | 316 | 38.1 | 37.5; 38.6   |
| Temperature assessment of the patients                                            | 704 | 84.8 | 83.8; 85.8   |
| Cleansing and disinfection of surfaces                                            | 787 | 94.8 | 93.8; 95.8   |
| **Have you ever been trained regarding biosafety measures to prevent the spread of COVID-19 in the dental practice?** |     |      |              |
| I have never been trained                                                          | 348 | 42.3 | 41.7; 42.9   |
| I have received general information without practice                              | 440 | 53.5 | 52.8; 54.2   |
| I have received practical training                                                | 34  | 4.1  | 4.0; 4.3     |

What do you think about COVID-19?
name of the disease instead (Table 3). Additionally, second-year students were the ones who correctly identified the aetiological agent of COVID-19 more frequently (52.9%) (Table 4). Moreover, 67.2% of respondents considered 7-14 days to be the SARS-CoV-2 incubation period (Table 1). No statistical difference was observed regarding type of institution or year of enrolment (Table 4).

Hand washing before and after a dental appointment with a patient (97.7%) followed by use of barriers to protect mucosa (97.2%) was the more frequently recognised measures to prevent SARS-CoV-2 spread in the dental office (Table 2). Additionally, 38.6% of students from public dental schools also recognised the use of manual instruments as a measure to prevent SARS-CoV-2 spread, an option that was chosen only by 24% of students from private institutions (Table 3). No statistical difference was found when these data were analysed by year of enrolment (Table 4).

Concerning the dental student’s perception of the COVID-19 impacts on the undergraduate dental courses, we found that only 4.1% of the respondents had received practical training (Table 2). In this regard, whilst 6.9% of students from private institutions had received practical training, the same was observed only for 1.3% of

| Variable/category | n   | %    | 95% CI       |
|-------------------|-----|------|--------------|
| It is not severe  | 4   | 0.5  | 0.45; 0.51   |
| It is moderately severe | 126 | 15.2 | 14.9; 15.5   |
| It is a severe disease | 605 | 73.2 | 72.2; 74.0   |
| It is severe only for people from the risk group | 92  | 11.1 | 11.0; 11.4   |

| How do you classify the risk of infection and transmission of COVID-19 in the clinical practice at dental school? | 817² |
|-----------------------------------------------|------|
| Low                                           | 6    | 0.7  | 0.7; 0.8    |
| Moderate                                      | 96   | 11.8 | 11.5; 12    |
| High                                          | 715  | 87.5 | 86.5; 88.5  |

| How do you classify the impact of the pandemics on the dental school? | 828² |
|---------------------------------------------------------------------|------|
| Low impact                                                         | 2    | 0.2  | 0.2; 0.3    |
| Moderate impact                                                    | 23   | 2.8  | 2.7; 2.9    |
| Strong impact                                                      | 214  | 25.8 | 25.5; 26.3  |
| Very strong impact                                                 | 589  | 71.1 | 70.2; 72.0  |

| How do you feel about the returning to the clinical activities at dental school? | 812² |
|-------------------------------------------------------------------------------|------|
| I am not worried                                                              | 56   | 6.9  | 6.7; 7.1    |
| I am worried                                                                  | 255  | 31.4 | 30.9; 31.9  |
| I am very worried                                                             | 236  | 29.1 | 28.6; 29.5  |
| I am completely worried                                                       | 265  | 32.6 | 32.1; 33.1  |

| Have you considered changing your degree? | 823² |
|------------------------------------------|------|
| No                                       | 763  | 92.7 | 91.7; 93.7  |
| Yes                                      | 60   | 7.3  | 7.1; 7.5    |

| Have you ever been suspected or diagnosed with COVID-19? | 830³ |
|----------------------------------------------------------|------|
| No                                                       | 647  | 78.0 | 77; 78.9    |
| Only suspect                                             | 125  | 15.1 | 14.8; 15.3  |
| Suspect, but tested negative                            | 31   | 3.7  | 3.6; 3.8    |
| Tested positive                                          | 27   | 3.3  | 3.2; 3.4    |

| Do you present any risk factor for COVID-19? | 830³ |
|---------------------------------------------|------|
| No                                          | 642  | 77.3 | 76.4; 78.3  |
| Yes                                         | 136  | 16.4 | 16.1; 16.7  |
| I do not know it                            | 52   | 6.1  | 6.1; 6.4    |

²Varies from total N due to missing data for different questions.
| Variables                                                                 | Type of institution | p-value |
|--------------------------------------------------------------------------|---------------------|---------|
|                                                                         | Public n (%)        | Private n (%) |         |
| What is the name of the virus responsible for the pandemic we are facing in 2020? | 402 (1.2)           | 6 (1.4) | <.05<sup>b</sup> |
| 2019-nCoV                                                                | 20 (5.0)            | 45 (10.4) |         |
| Coronavirus                                                              | 116 (28.9)          | 224 (52.0) |         |
| SARS-CoV-2                                                               | 261 (64.9)          | 156 (36.2) |         |
| What is the incubation period of the virus?                              | 402 (1.7)           | 30 (7.0) | >.05<sup>b</sup> |
| 1–7 days                                                                 | 71 (17.7)           | 90 (20.9) |         |
| 7–10 days                                                                | 29 (7.2)            | 30 (7.0) |         |
| 7–14 days                                                                | 279 (69.4)          | 281 (65.2) |         |
| 14–21 days                                                               | 23 (5.7)            | 30 (7.0) |         |
| What are the main contagious routes of COVID-19?                          | 402 (1.7)           | 30 (7.0) | <.05<sup>b</sup> |
| Handshake with infected person                                          | 201 (50.0)          | 246 (57.1) |         |
| Sexual intercourse with infected person                                  | 16 (4.0)            | 36 (8.4) |         |
| Contact with air droplets from an infected person                        | 383 (95.3)          | 399 (92.6) |         |
| Contact with infected surfaces                                          | 291 (72.4)          | 301 (69.8) |         |
| Exposure to aerosol                                                     | 288 (71.6)          | 244 (56.6) |         |
| Contact with blood of an infected person                                 | 20 (5.0)            | 28 (6.5) |         |
| Accidents with contaminated sharp objects                                | 7 (1.7)             | 5 (1.2) |         |
| What are the main symptoms of the disease?                               | 402 (1.7)           | 30 (7.0) | >.05<sup>b</sup> |
| Fever                                                                    | 389 (96.8)          | 402 (93.3) |         |
| Dry cough                                                                | 337 (83.8)          | 345 (80.0) |         |
| Diarrhoea                                                                | 74 (18.4)           | 100 (23.2) |         |
| Fatigue                                                                  | 101 (25.1)          | 102 (23.7) |         |
| Sore throat                                                              | 152 (37.8)          | 162 (37.6) |         |
| Nausea and vomiting                                                      | 12 (3.0)            | 21 (4.9) |         |
| Difficulty breathing                                                     | 393 (97.8)          | 410 (95.1) |         |
| Headache                                                                 | 169 (42.0)          | 207 (48.0) |         |
| Running nose                                                             | 110 (27.4)          | 125 (29.0) |         |
| Measures to prevent the risk of COVID-19 spread that should be adapted in the dental practice | 402 (100)           | 409 (100) | <.05<sup>b</sup> |
| Hand wash before and after an appointment                                 | 402 (100)           | 409 (100) |         |
| Use of barriers to protect mucosae                                       | 398 (99)            | 409 (100) |         |
| Use of disposable coat apron                                             | 357 (88.8)          | 373 (91)  |         |
| Use of rubber dam                                                        | 162 (40.3)          | 106 (26)  |         |
| Use of manual instruments when possible                                  | 155 (38.6)          | 97 (24)   |         |
| Use of mouthwashes by patients before the clinical examination           | 231 (57.5)          | 231 (56)  |         |
| Use of high vacuum suction                                               | 196 (48.8)          | 121 (30)  |         |
| Temperature assessment of the patients                                   | 368 (91.5)          | 372 (91)  |         |
| Cleansing and disinfection of surfaces                                   | 396 (98.5)          | 409 (100) |         |
| Have you ever been trained regarding biosafety measures to prevent the spread of COVID-19 in the dental practice? | 399<sup>a</sup> | 423<sup>a</sup> | <.05<sup>b</sup> |
| I have never been trained                                                | 193 (48.4)          | 155 (36.6) |         |
| I have received general information without practice                     | 201 (50.4)          | 239 (56.5) |         |

(Continues)
students from public universities (Table 3). No statistical difference was found when these data were analysed by year of enrolment (Table 4).

As for the student’s perception of the COVID-19 impacts on the undergraduate dental courses, 73.2% of the respondents perceived the disease as severe (Table 2). Such perception was associated with the type of institution (Table 3), yet it was not associated with the year of enrolment (Table 4). The students (86.2%) also considered that there is a high risk of infection and transmission of COVID-19 in the clinical practice at the dental schools (Table 2), a perception associated with the type of institution (Table 3) but not associated with the year of enrolment (Table 4). Moreover, 71.1% of students considered that the pandemics strongly impacted the dental school routine (Table 2). Such perception was more associated with students from public dental schools (Table 3) enrolled in the fourth (79%) and fifth year (73%) of the dental undergraduate course (Table 4). Likewise, 32.6% of the students reported that they were completely worried about returning to dental school practices (Table 2). This feeling was
### TABLE 4  Students' general knowledge and perceptions about COVID-19 by year of enrolment, Brazil, 2020 (N = 833)

| Variable                                                                 | Year of enrolment | p-value |
|--------------------------------------------------------------------------|-------------------|---------|
|                                                                          | First n (%)       | Second n (%) | Third n (%) | Fourth n (%) | Fifth n (%) |       |
| **What is the name of the virus responsible for the pandemic we are facing in 2020?** | 107 (1.9)         | 133 (1.8)  | 175 (1.0)  | 207 (1.4)    | 211 (1.4)   | <.05<sup>c</sup> |
| 2019-nCoV                                                                | 2 (1.0)           | 1 (0.8)    | 2 (1.1)    | 3 (1.4)      | 3 (1.4)     |        |
| Coronavirus                                                               | 6 (5.6)           | 11 (8.3)   | 12 (6.9)   | 16 (7.7)     | 20 (9.5)    |        |
| COVID-19                                                                 | 42 (39.3)         | 42 (31.6)  | 78 (44.6)  | 88 (42.5)    | 90 (42.7)   |        |
| SARS-CoV-2                                                                | 57 (53.3)         | 79 (59.4)  | 83 (47.4)  | 100 (48.3)   | 98 (46.4))  |        |
| **What is the incubation period of the virus?**                           | 107 (18.7)        | 35 (26.3)  | 37 (21.1)  | 34 (16.4)    | 35 (16.6)   | >.05<sup>b</sup> |
| 1–7 days                                                                  | 20 (18.7)         | 35 (26.3)  | 37 (21.1)  | 34 (16.4)    | 35 (16.6)   |        |
| 7–10 days                                                                 | 7 (6.5)           | 2 (1.5)    | 10 (5.7)   | 15 (7.2)     | 19 (9.0)    |        |
| 7–14 days                                                                 | 76 (71.0)         | 85 (63.9)  | 114 (65.1) | 144 (69.6)   | 141 (66.8)  |        |
| 14–21 days                                                                | 4 (3.7)           | 11 (8.3)   | 14 (8.0)   | 14 (6.8)     | 16 (7.6)    |        |
| **What are the main contagious routes of COVID-19?**                      | 66 (61.7)         | 68 (51.1)  | 104 (59.4) | 102 (49.3)   | 100 (47.4)  | >.05<sup>c</sup> |
| Handshake with infected person                                           | 1 (0.9)           | 8 (6.0)    | 11 (6.3)   | 15 (7.2)     | 10 (4.7)    |        |
| Sexual intercourse with infected person                                   | 126 (94.7)        | 167 (95.4) | 196 (94.7) | 195 (92.4)   |            |        |
| Contact with air droplets from an infected person                        | 129 (73.7)        | 143 (69.1) | 138 (65.4) |            |            |        |
| Contact with infected surfaces                                           | 74 (55.6)         | 131 (74.9) | 145 (70.0) | 132 (62.6)   |            |        |
| Exposure to aerosol                                                       | 6 (3.0)           | 11 (6.3)   | 14 (6.8)   | 13 (6.2)     |            |        |
| Contact with blood of an infected person                                  | 1 (0.9)           | 1 (0.8)    | 4 (2.3)    | 2 (1.0)      | 4 (1.9)     |        |
| **What are the main symptoms of the disease?**                           | 107 (100)         | 133 (100)  | 175 (100)  | 207 (100)    | 211 (100)   | <.05<sup>c</sup> |
| Fever                                                                    | 107 (100)         | 133 (100)  | 175 (100)  | 207 (100)    | 211 (100)   |        |
| Dry cough                                                                | 85 (79.4)         | 105 (78.9) | 147 (84.0) | 172 (83.1)   | 173 (82)    |        |
| Diarrhoea                                                                | 18 (16.8)         | 38 (28.6)  | 24 (13.7)  | 34 (16.4)    | 56 (26.5)   |        |
| Fatigue                                                                  | 32 (29.9)         | 33 (24.8)  | 41 (23.4)  | 48 (23.2)    | 56 (26.5)   |        |
| Sore throat                                                              | 31 (29.0)         | 61 (45.9)  | 56 (32.0)  | 81 (39.1)    | 88 (41.7)   |        |
| Nausea and vomiting                                                      | 3 (2.8)           | 10 (7.5)   | 4 (2.3)    | 8 (3.9)      | 11 (5.2)    |        |
| Difficulty breathing                                                     | 101 (94.4)        | 128 (96.2) | 168 (96.0) | 200 (96.6)   | 205 (97.2)  |        |
| Headache                                                                 | 47 (43.9)         | 64 (48.1)  | 60 (34.3)  | 96 (46.4)    | 101 (47.9)  |        |
| Running nose                                                             | 40 (37.4)         | 49 (36.8)  | 54 (30.9)  | 78 (37.7)    | 75 (35.5)   |        |
| **Measures to prevent the risk of COVID-19 spread that should be adapted in the dental practice** | 107 (98.1)        | 131 (91.6) | 170 (97.1) | 199 (96.1)   | 206 (97.6)  | <.05<sup>b</sup> |
| Hand wash before and after an appointment                                | 105 (98.1)        | 131 (91.6) | 170 (97.1) | 199 (96.1)   | 206 (97.6)  |        |
| Use of barriers to protect mucosae                                       | 102 (95.3)        | 127 (91.0) | 172 (98.3) | 204 (98.6)   | 202 (95.7)  |        |
| Use of disposable coat apron                                             | 88 (82.2)         | 113 (82.0) | 150 (85.7) | 192 (92.8)   | 184 (87.2)  |        |
| Use of rubber dam                                                        | 11 (10.3)         | 20 (3.0)   | 68 (38.9)  | 80 (38.6)    | 88 (41.7)   |        |
| Use of manual instruments when possible                                  | 18 (16.8)         | 36 (5.4)   | 92 (54.6)  | 142 (68.6)   | 117 (117)   |        |
| Use of mouthwashes by patients before the clinical examination           | 21 (19.6)         | 44 (6.6)   | 80 (45.7)  | 112 (54.1)   | 98 (46.4)   |        |
| Use of high vacuum suction                                               | 16 (15.0)         | 34 (5.1)   | 67 (38.3)  | 99 (47.8)    | 97 (46.0)   |        |
| Temperature assessment of the patients                                   | 91 (85.0)         | 107 (16)   | 152 (86.9) | 170 (82.1)   | 185 (87.7)  |        |
| Cleansing and disinfection of surfaces                                   | 101 (94.4)        | 129 (19.3) | 172 (98.3) | 202 (97.6)   | 202 (95.7)  |        |
| **Have you ever been trained regarding biosafety measures to prevent the spread of COVID-19 in the dental practice?** | 104<sup>a</sup>   | 131<sup>a</sup> | 174<sup>a</sup> | 206<sup>a</sup> | 207<sup>a</sup> | >.05<sup>b</sup> |

(Continues)
associated with the type of institution (Table 3) but not associated with the student’s year of enrolment.

Even being worried about returning to the dental school activities, 92.7% of students would not have changed their degrees. This opinion was more frequently found amongst students from private dental schools (96%) than in students from public universities (89.1%) (Table 3), regardless of the year of enrolment (Table 4). Moreover, most of the students (78%) have never been suspected or diagnosed

| Variable | First n (%) | Second n (%) | Third n (%) | Fourth n (%) | Fifth n (%) | p-value |
|----------|-------------|--------------|-------------|--------------|-------------|---------|
| I have never been trained | 49 (47.1) | 60 (45.8) | 75 (43.1) | 77 (37.4) | 87 (42.0) |          |
| I have received general information without practice | 52 (50.0) | 65 (49.6) | 92 (52.9) | 123 (59.7) | 108 (52.2) |          |
| I have received practical training | 3 (2.9) | 6 (4.6) | 7 (4.0) | 6 (2.9) | 12 (5.8) |          |
| What do you think about COVID-19? | 106a | 131a | 174a | 207a | 209a | >.05a |
| It is not severe | - | 2 (1.5) | - | 2 (1) | 2 (0.9) |          |
| It is moderately severe | 17 (16.0) | 22 (16.8) | 30 (17.0) | 25 (12.2) | 32 (15.0) |          |
| It is a severe disease | 76 (72.0) | 93 (70.9) | 129 (74.0) | 159 (77.6) | 148 (70.0) |          |
| It is severe only for people from the risk group | 13 (12.0) | 15 (11.4) | 15 (9.0) | 22 (10.7) | 27 (13.0) |          |
| How do you classify the risk of infection and transmission of COVID-19 in the clinical practice at dental school | 100a | 130a | 173 | 206a | 208 | >.05a |
| Low | - | 2 (1.5) | - | 2 (1) | 2 (0.9) |          |
| Moderate | 15 (15.0) | 15 (11.5) | 19 (11) | 18 (9) | 29 (13.9) |          |
| High | 85 (85.0) | 113 (87.0) | 154 (88) | 186 (91.0) | 177 (85.0) |          |
| How do you classify the impact of the pandemics on the dental school | 106a | 132a | 175 | 206a | 209 | <.05a |
| Low impact | 1 (1.0) | - | - | 1 (0.48) |          |
| Moderate impact | 2 (2.0) | 2 (1.5) | 10 (3.4) | 3 (1.45) | 6 (2.8) |          |
| Strong impact | 45 (42) | 34 (25.7) | 47 (26.8) | 41 (20) | 47 (22.4) |          |
| Very strong impact | 58 (55) | 96 (55.3) | 118 (67.7) | 162 (79.0) | 155 (74.1) |          |
| How do you feel about the returning to the clinical activities at dental school? | 101a | 127a | 174a | 203a | 207a | >.05a |
| I am not worried | 4 (4) | 12 (9.4) | 11 (6.0) | 13 (6.4) | 16 (7.7) |          |
| I am worried | 46 (46) | 39 (30.7) | 52 (30.0) | 52 (25.6) | 66 (31.8) |          |
| I am very worried | 25 (25) | 38 (30.0) | 61 (35.0) | 60 (29.5) | 52 (25.1) |          |
| I am completely worried | 26 (26) | 38 (30.0) | 50 (29.0) | 78 (38.4) | 73 (35.2) |          |
| Have you considered changing your degree? | 103a | 131a | 174a | 206a | 209a | >.05a |
| No | 94 (91) | 120 (91.6) | 160 (92.0) | 191 (93.0) | 198 (95.0) |          |
| Yes | 9 (9) | 11 (83.9) | 14 (8.0) | 15 | 11 |          |
| Have you ever been suspected or diagnosed with COVID-19? | 107 | 131a | 175 | 206a | 211 | >.05a |
| No | 84 (79) | 102 (78.0) | 141 (81.0) | 168 (81.5) | 152 (72.0) |          |
| Only suspect | 16 (15) | 18 (14.0) | 22 (13.0) | 29 (14.0) | 40 (19.0) |          |
| Suspect, but tested negative | 4 (4) | 7 (5.0) | 6 (3.0) | 6 (3.0%) | 8 (4.0) |          |
| Tested positive | 3 (3) | 4 (5.0) | 6 (3.0) | 3 (1.45) | 11 (5.0) |          |
| Do you present any risk factor for COVID-19? | 107 | 132a | 175 | 206a | 210 | >.05a |
| No | 77 (72) | 105 (80.0) | 135 (77.0) | 164 (80.0) | 161 (76.6) |          |
| Yes | 30 (21) | 17 (13.0) | 28 (16.0) | 31 (15.0) | 37 (18.0) |          |

aVaries from total N due to missing data for different questions.
bChi-square test.
cFisher’s exact test.
with COVID-19 (Table 2) or have risk factors for COVID-19 (77.3%). Finally, COVID-19 suspect was significantly more common amongst students from public dental schools (82.3%) than from private (74.6%) (Table 3), regardless of the year of enrolment (Table 4).

4 | DISCUSSION

COVID-19 has strongly impacted the continuity of education worldwide. Healthcare professionals and students have been strongly affected by the need for social distancing and university lockdowns. Given the high exposure to aerosols and potential risk of SARS-CoV-2 spread, dental schools have migrated to online teaching, which has challenged the delivery of practical training. Some universities have attempted a partial return to in-person activities, yet the new rise in cases and deaths has made them step back in their plans to reopen dental schools. In Brazil, returning to direct patient care will be a huge challenge for 350 institutions that offer dentistry degrees to over 125,585 students as the country has become one of the epicentres of the disease. In this scenario, the transition will require organisation and preparedness from schools, professors, staff and students to deal with a novel patient care routine. Addressing the students’ basic understanding of the disease might be a starting point for dental schools to plan their return. Therefore, here, we investigated the knowledge and perceptions of Brazilian dental students about the clinical practice in the COVID-19 outbreak context.

To reach dental students, we made an Instagram campaign, following the methods described by Moraes et al. (2020). After the 10-day campaign, we received 833 valid responses, and, to the extent of our knowledge, this is the first study in Brazil to recruit such a large sample of dental students in a Web-based survey about COVID-19 knowledge and perceptions. In Brazil, Instagram is a largely used social media. In July 2020, Brazil figured as number 4 country in the rank of countries with higher numbers of social media access and audience. Moreover, Instagram is highly used by dentists and dental students in Brazil, which might have facilitated our recruitment. For instance, on July 20 there were 6.9 million posts using #odontologia, 2.8 million using #odonto, and 40.6 thousand posts using #estudante-edeodontologia (The first two are the Portuguese words for dentistry and the last one is the Portuguese word for dental students). Thus, in our study, Instagram was a resourceful tool for the survey spread and divulgation.

In terms of the representativeness of our sample compared with the source population, we observed a proportion of women (80.1%) comparable to the overall gender distribution of dental students in Brazil (=75% of women), where dentistry is amongst the ten undergraduate courses with higher proportions of women. The mean age of the respondents (25 years old) also resembled the age of Brazilian undergraduate students (25.6 years old). As for participation by the Brazilian regional division, half of our responses were obtained from students studying at south-eastern dental schools, which is the Brazilian region with the highest proportion of dental students, concentrating 43.8% of the total. Lastly, dentistry undergraduate courses in Brazil are mostly offered by private institutions, which supports the slightly higher participation of students from private dental schools in our study. As it is known, the use of online surveys presents some limitations in terms of sampling. However, given the conditions imposed by the pandemics, Web-based surveys allow for data collection without disrespecting sanitary measures. Such a method also presents low costs and broad access to subjects, allowing large-scale data collection and processing in a relatively small amount of time.

Regarding the dental students’ general knowledge about COVID-19, our results show that whilst students were able to identify the incubation period, main symptoms and contagious routes of the disease, they struggled in recognising the name of the virus responsible for the pandemics we are facing in 2020. As it is shown in Table 2, more than 40% of the participants confused the name of the virus with the name of the disease. This misunderstanding sheds light on the necessity of schools to prepare their educational materials to provide the students with reliable information. Other investigations performed with students from Iran, Nigeria, Turkey, Pakistan and Jordan have also identified gaps in the dental students’ knowledge about COVID-19. These studies stress that the lack of basic knowledge about infectious diseases such as COVID-19 might place the students and their patients at high risk and lead to functional impairment of the patient care routine at dental schools. Therefore, proper education and mentoring will be paramount for students before reopening the university campuses. To aid in this task, Elsevier and the Food and Drug Administration (FDA) have created an online platform with COVID-19 Health Education resource centres, where they have launched a range of educational materials to support the learning of healthcare students about COVID-19.

As for the students’ knowledge about measures to prevent the risk of SARS-CoV-2 spread, we observed consistency between some of their choices with the recommendations of the already published COVID-19 guidelines on biosafety. Similarly to other studies, we observed that the students were familiarised with pre-operative preventive measures, such as hand washing and the use of protective equipment. On the other hand, operatory measures to prevent or diminish aerosol generation, such as the use of manual instruments, rubber dam and high vacuum suction were less recognised as preventive measures to avoid SARS-CoV-2 spread on the dental settings. In this regard, attention must be directed to the changes that COVID-19 has brought to patient care and operative dentistry. Due to possible aerosol transmission of SARS-CoV-2, the use of high-speed dental pieces must be avoided and manual instruments must be chosen when appropriate. Moreover, preventive and minimally invasive dentistry should be preferred, and the use of rubber dam must be mandatory when high-speed pieces are used. Therefore, as other investigations have also stressed, guidelines on COVID-19 from reliable health authorities should be revised by dental schools and disseminated to the students to suit their clinical practice.
The participants of our research did not show positive perceptions about COVID-19, mainly the ones from public dental schools and the ones enrolled in the last years of the undergraduate course. Participants mostly perceived COVID-19 as a severe disease, classified the risk of infection as high and considered the pandemics to have strongly impacted dental schools. In this regard, studies performed in China\(^{48}\) and Italy\(^{49}\) have reported increased levels of stress and anxiety in dental professionals during the COVID-19 outbreak. Fear of contracting the disease was one of the main sources of stress. A survey with dental students from 28 different countries found that fear of contracting the infection and restricted mobility due to lockdowns were factors positively correlated with stress level.\(^{50}\) This study also showed that students from countries where the mortality rates are high present worse perceptions about COVID-19 and higher levels of COVID-19 induced stress. Brazil was experiencing a peak in COVID-19 cases and deaths when the data collection of our study was performed, which might explain the negative perceptions about the disease we found. Such perception about COVID-19 might be associated with the student’s insecurities regarding their graduation date, the novel policies for the dental practice, and the risk of SARS-CoV-2 contamination and transmission. Thus, given the new rise of COVID-19 cases and deaths worldwide, dental schools will need to consider the students’ general anxiety and safety concerns before fully returning to in-person activities.

Our results also showed that few respondents have received practical training regarding preventive measures, which emphasises the need for workshops and hands-on activities before returning to activities at dental schools.\(^{38}\) As most universities are still closed or only partially open, hands-on training about COVID-19 might not have happened yet. In this scenario, it would be important to know if students present risk factors for COVID-19 or have ever been suspect or diagnosed with the disease.\(^{46}\) In our study, most respondents have never been suspected nor diagnosed with COVID-19, as well as most of them did not present risk factors. This information is valuable when planning the return to in-person activities once dental clinics need to have a standard screening protocol during COVID-19 outbreak.\(^{38,46,47}\) Thus, to ensure the continuity of dental education with a low risk of SARS-CoV-2 spread, the schools will need to implement efficient reporting systems and information records for easier tracking of potentially infected students, professors, patients, and staff.\(^{48}\)

The findings of our study also address the need for providing information and support for Brazilian dental students to guarantee a safer return to hands-on training. As their knowledge and perceptions about the disease are now known, more discussion can be raised about what dental schools will need to address in terms of policies and guidelines. However, the results we found might not be generalised to dental students from other countries, yet they are representative of the source population. As for the limitations of our study, we point out that rejection and losses cannot be estimated. Moreover, as this is a self-reported study, responses might present bias. One example is the social desirability bias, which refers to the tendency of respondents to choose answers they believe are more socially desirable and acceptable.\(^{51}\) We also point to the critical event and recency bias, which happens because recent events are easier to remember and can be weighed more heavily than past or potential future events.\(^{52}\) The recency effect is increased when too much information is presented too quickly, as we are experiencing with the current pandemic situation. In this context, the recency effect might have negatively affected the perception of dental students about the clinical practice during the COVID-19 outbreak.

As for the strengths of our investigation, we demonstrated the use of social media as an innovative recruitment method, which allowed us to perform a broad and fast data collection, reaching all Brazilian regional divisions in a short time frame. Moreover, our study highlights the knowledge and perceptions of COVID-19 of dental students from the biggest country of South America, data that have not been assessed by other investigations. Given the important contributions Brazil gives to dental education and research,\(^{29,30}\) our report aids in providing material for the international community to discuss the future of dental education in a country that is one of the epicentres of COVID-19.

### 5 CONCLUSIONS

Although dental students demonstrate an acceptable general knowledge about COVID-19, some aspects of the disease and its preventive measures need to be better addressed by dental schools to ensure a safer return to in-person activities. Moreover, as dental students did not present positive perceptions about COVID-19, their concerns and anxieties need to be also consulted and considered when returning to in-person practice. Thus, as a final remark, we suggest that our questionnaire could be a tool for dental schools to assess the scenario they are going to face when students are back to practice and on which aspect they will have to focus.

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### CONFLICT OF INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

### DATA AVAILABILITY STATEMENT

All data are available upon reasonable request to the corresponding author.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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