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# Dental students' self-perception of security and biosafety measures in times of pandemic by COVID-19: a cross-sectional study in private Universities in Southern Brazil

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The study investigated the factors associated with the self-perception safety of dental students in clinical activities during the COVID-19 pandemic. This cross-sectional study was based on a semi-structured online (google forms) self-applied questionnaire, sent by e-mail to three private Dental Schools in Brazil. The variables were: 1) sociodemographic information; 2) questions about the measures adopted by dental schools before returning to clinical activities; 3) dental students' self-perception of security; 4) the General Health Questionnaire. Data were submitted to Fisher's exact test ($p<0.05$). Of the 294 eligible students, 97% were evaluated and 100% received previous specific biosafety training predominantly theoretical (72.16%) longer than one hour (51.55%). Most students (81.44%) felt secure performing clinical care during the COVID-19 pandemic. Students undergoing specific biosafety training for longer than one hour felt safer than those perfoming training for up to 1 hour ($p=0.004$). Students from schools where the aerosol-producing restriction was applied felt safer than those without restrictions ($p=0.016$). Women reported feeling less secure than men ($p=0.046$), and students who submitted to COVID-19 Specific Biosafety Training felt safer in clinical activities than those submitted to theoretical training only ($p=0.011$). Students from private universities presenting psychosomatic changes felt less secure in practicing clinical dental care activities ($p=0.006$). In conclusion, time-spent training in biosafety, restriction of the use of aerosol-producing procedures, and the gender of students were associated with the self-perception safety of students. Students with practical training felt safer in clinical activities for patients with COVID-19 than those who had only theoretical training.

**Keywords:** COVID-19. Students, dental. Pandemics.

## Introduction

Since December 2019, the world has been experiencing an unprecedented situation in public health due to the pandemic caused by the new coronavirus, the Sars-Cov-2. The disease was termed coronavirus disease 2019 (COVID-19)[1]. COVID-19 is an ss-RNA-enveloped virus with an average incubation period varying from 4 to 14 days and with the potential to lead to severe acute respiratory tract infection[2]. The virus typically transmits from person to person via saliva and nasal droplets (>5-10 μm in diameter)[3,4]. Thus, in February 2020, the first case of COVID-19 disease was confirmed in Brazil, and since then, the transmission and spread of SARS-CoV-2 have increased. With the introduction of vaccines, people who have completed the vaccination cycle have been at lower risk of developing complications compared to unvaccinated individuals[5]. However, dentists are exposed to occupational risk related to infections in the respiratory tract (such as COVID-19), due to constantly exposed to aerosols-generating procedures[6]. This condition worsens during pandemics, which are disposable increasing significantly the costs related to dental care[7] and affecting patients' behavior related to the demand for dental services[7-9].

Therefore, dental care in educational institutions was initially suspended[10] and, subsequently, readjusted to meet the necessary biosafety measures, keeping the minimum of damage to the development of activities[11]. Individuals involved with dental care adapted their clinical practices by including new personal protective equipment (PPE), such as N95/PFF2 masks and face shields[12]. Social distancing to protect students, staff, and patients were important strategies to ensure the continuity of dental education[11].

However, due to the contagious nature of COVID-19 and the high risk of dental professionals to be contaminated, students have low self-perception of safety showing frequently fear and anxiety, which are observed also in dental assistants and professors[13,14]. Corroborating, during the first months of pandemic, it has been shown that dental students reported several mental health issues including stress and depression[15]. A recent study observed that Brazilian undergraduate students presented elevated symptoms of anxiety being associated with alcohol abuse[16]. Although several biosafety measures have been adopted to protect students and professionals involved in dental care, no known study has investigated a possible relationship between the adoption of biosafety measures and the perception of safety by dental students in Southern Brazil.

Therefore, bearing in mind that dental students present as many risks as the professionals trained in the area to contract COVID-19 disease, the study aimed to investigate the factors associated with the safety self-perception of dental students from private universities in clinical activities during the COVID-19 pandemic.

## Materials and Methods

The present study complies with the STROBE Statement for observational studies[17].

## Ethical issues

The project was approved by the Research Ethics Committee of Blinded for peer review (CAAE: 44461221.9.0000.5310).

## Study design and Setting

This cross-sectional study was conducted with students from three private universities of Rio Grande do Sul State, in Southern Brazil. Of the three private Universities evaluated, one presents a community character. Data collection was performed for three months (1st February to 30th April 2021). The study was a census comprising all students from dentistry courses performing clinical dental activities during the period investigated at the respective universities. Thus, was applied an online self-administered survey consisting of questions regarding sociodemographic issues and biosafety measures adopted by dental schools before the return of students to practical activities during the COVID-19 pandemic. Besides, the student's self-perception of safe when performing clinical care in the context of a pandemic was evaluated, even in the General Health Questionnaire 12 (GHQ12).

A questionnaire pre-test was performed aim to evaluate the understanding and clarity of the questions. Thus, the questionnaire was randomicity sent to 10 students from institutions not eligible for the present study (public institutions). The questions were presented as well as a 5-score Likert scale [a) not at all clear b) difficult to understand c) understandable but confusing d) clear e) fully understandable where students should mark the clarity of the questions. The official questionnaire was improved after the pre-test.

## Participants

Were considered eligible students who resumed clinical activities during the COVID-19 pandemic. Thus, before the beginning of the questionnaire, the students were asked if they were in clinical activities. If they were not, the questionnaire was closed and the student would not be part of the study sample. Such students were from three (Blinded to peer review) private universities in the Rio Grande do Sul. The institutions were selected by convenience.

Thus, the population universe of the present study was 294 (n=294) and it was obtained through contact with the coordination of each course/institution. Students were contacted three times by institutional e-mail and by social media (Instagram, WhatsApp, and Facebook). Data were collected through a semi-structured self-applied questionnaire, formulated using the Google Forms platform. Students who were not involved in academic clinical activities were not considered eligible for the study.

## Variables

The dependent variables provided data about the dental students' self-perception of security related to dental clinical care. Thus, the students were asked: "Did you feel safe to perform clinical care during pandemics? (Yes/No)" and "Did you felt prepared to provide clinical care for a patient with COVID-19 symptoms?" (Yes/No).

Independent variables related to students comprised age, sex, undergraduate semester, and COVID-19 diagnoses (**Appendix 1**). Additional biosafety measures adopted by Dental Schools were also investigated. In such a context, the students were asked whether the educational institution offered any type of COVID-19 Specific Biosafety Training (CSBT) before resuming clinical activities. Besides, the nature of received CSBT, theoretical or practical was collected. In the theoretical CSBT category, were included, those activities carried out in person and those virtualized; the category "practical" included any training performed in the clinical environment. In the same way, the time spent during the received CSBT has been collected continuously and then categorized into "up to one hour of training" and "more than one hour of training". Regarding personal protective equipment, students were asked about the use of N95/PPF2 masks, both when acting as operators and assistants. In addition, they were also asked whether the aforementioned equipment was being subsidized by dental schools.

The last part of the questionnaire contained the *General Health Questionnaire 12 (GHQ12)*. The instrument investigates whether the respondent has experienced a particular symptom or behavior and is composed of 12 questions presented on a 4-point Likert-type scale[18]. Each item is accompanied by four possible responses, typically being "not at all", "no more than usual", "rather more than usual" and "much more than usual", scoring from 0 to 3, respectively. The scores are summed and the greater the score value, the greater the level of psychological disturbances[19]. To carry out the analysis of possible associations, the binary scoring method was applied, being the two least symptomatic (0 and 1) responses scoring "0" and the two most symptomatic (2 and 3) responses scoring "1". Any score that exceeded the threshold value of 3 was considered symptomatic for common mental disorders (CMD)[19]. Such scores were categorized as follows:

0 - 3: no psychosomatic changes (asymptomatic).

4 - 12: the presence of psychosomatic changes (symptomatic)

### Statistical methods

Records were tabulated in an excel spreadsheet and then uploaded into Stata 14.0 (Stata Corp, College Station, TX, USA) software package to perform analysis. Data were submitted to Fisher"s exact test considering a level of significance of $p \leq 0.05$ and a confidence interval of 95%.

## Results

From 294 eligible students, ninety-seven (33.0%) signed the consent term and participated in the study. The interviewed students were mostly female (83.5%), aging on average 23.1(±5.16) years old. Most respondents attended the seventh (23.7%), eighth (19.6%), and ninth (35.1%) undergraduate semesters. Besides, 72.2% responded not have received a positive diagnosis for COVID until the date of this research (Table 1).

Before the clinic started, 100% of students reported having received previous CSBT, which was predominantly theoretical (72.2%) and longer than one hour (51.5%). More-

over, most students (81.4%), reported to felt secure performing clinical care during the COVID-19 pandemic. On the other hand, 61.9% of students reported not feeling secure to provide dental care for patients with COVID-19 symptoms. Most students (55.7%) reported their professors' restricted aerosol-producing procedures. Concerning the *GHQ-12* instrument, 48.4% of students were classified as symptomatic, presenting some symptoms of common mental disorders.

**Table 1.** Number of observations and frequencies for independent and dependent variables regarding students' self-perception of safety related to biosafety measures adopted by dental schools (n=97).

| Variables | n* | (%) |
|---|---|---|
| *Age* | | |
| 19 | 5 | 5.2 |
| 20 | 14 | 14.4 |
| 21 | 25 | 25.8 |
| 22 | 19 | 19.6 |
| 23 | 15 | 15.5 |
| 24 | 4 | 4.1 |
| 25 | 5 | 5.2 |
| 26 | 2 | 2.1 |
| 27 | 1 | 1.0 |
| 30 | 1 | 1.0 |
| 32 | 1 | 1.0 |
| 33 | 1 | 1.0 |
| 37 | 1 | 1.0 |
| 43 | 1 | 1.0 |
| 49 | 2 | 2.1 |
| *Sex* | | |
| Male | 16 | 16.5 |
| Female | 81 | 83.5 |
| *Undergraduate Semester* | | |
| Fifth | 12 | 12.4 |
| Sixth | 4 | 4.1 |
| Seventh | 23 | 23.7 |
| Eighth | 19 | 19.6 |
| Ninth | 34 | 35.1 |
| Tenth | 5 | 5.1 |
| *Students diagnosed with covid-19* | | |
| Yes | 27 | 27.8 |
| No | 50 | 72.2 |

Continue

| Continuation | | |
|---|---|---|
| *Did you receive some type of COVID-19-specific biosafety training before returning?* | | |
| Yes | 97 | 100.0 |
| No | 0 | 0.0 |
| *How long was the COVID-19 specific biosafety training offered?* | | |
| Up to 1 hour | 50 | 51.5 |
| > 1 hour | 47 | 48.5 |
| *How was the COVID-19 specific biosafety training provided?* | | |
| Theoretical | 70 | 72.2 |
| Practical | 27 | 27.8 |
| *Was there a restriction on the use of aerosol generating-procedures?* | | |
| Yes | 54 | 55.7 |
| No | 43 | 44.3 |
| *Did you use N-95 mask as operator?* | | |
| Yes | 97 | 100.0 |
| No | 0 | 0.0 |
| *Did you use N-95 mask as auxiliar?* | | |
| Yes | 92 | 94.8 |
| No | 5 | 5.2 |
| *N95 mask was provided by the University?* | | |
| Yes | 74 | 76.3 |
| No | 23 | 32.7 |
| *Did you felt prepared to provide clinical care?* | | |
| Yes | 79 | 81.4 |
| No | 18 | 18.6 |
| *Did you felt prepared to provide clinical care for a patient with COVID-19 symptoms?* | | |
| Yes | 37 | 38.1 |
| No | 60 | 61.9 |
| *GHQ-12* | | |
| Symptomatic | 47 | 48.4 |
| Asymptomatic | 50 | 51.6 |

* n may vary in different questions and it is related to the number of each individual that have answered it

Students undergoing CSBT for longer than one hour reported to felt safe performing clinical care during pandemics than those with training for up to 1 hour (p=0.004). Similarly, students from schools where the aerosol-producing restriction was applied felt safer than without restrictions (p=0.016).

In such a context, women self-reporting to felt less secure than the man to perform clinical care for patients with covid-19 (p=0.046). Students that performed practical

training in CSBT felt safer performing clinical activities for patients with covid-19 than those who had only theoretical training (p=0.011) (Table 2).

Table 3 displays the factor associated with symptoms of common mental disorders assessed by the GHQ-12 instrument. Although no associations were observed between mental disorders and sex (p=0.680) or the time spent in the covid-19 training (0.927), was found an association with the nature of CSBT training (p=0.007). Students who received practical activities showed fewer mental disorders symptoms. Students in places without restrictions on the use of aerosol-generating procedures were associated with mental disorders symptoms (p=0.035). Those students classified as symptomatic in GHQ-12 reported feeling less secure in resuming practical activities related to clinical dental care (p=0.006).

**Table 2.** Factors associated with safety's self-perception to resume clinical care.

| | Did you feel safe to perform clinical care during pandemics? n (%) | | p- value |
|---|---|---|---|
| | Yes | No | |
| How long did the training last? | | | 0.004* |
| Up to 1 hour | 35 (70.0) | 15 (30.0) | |
| More than 1 hour | 44 (93.6) | 3 (6.4) | |
| Schools adopting protocol to restrict the use of aerosol-producing procedures | | | 0.016* |
| Yes | 46 (92.0) | 4 (8.0) | |
| No | 33 (70.2) | 14 (29.8) | |
| | **Did you felt prepared to provide clinical care for a patient with COVID-19 symptoms? n (%)** | | |
| | **Yes** | **No** | |
| Sex | | | 0.046* |
| Male | 10 (62.5) | 6 (37.5) | |
| Female | 27 (33.3) | 54 (66.7) | |
| Nature of received CSBT | | | 0.011* |
| Theoretical | 21 (30.0) | 49 (70.0) | |
| Practical | 16 (59.3) | 11 (40.7) | |

* Fischer's Exact Test p < 0.05

**Table 3.** Factors associated with GHQ-12

| | GHQ-12 | | |
|---|---|---|---|
| | Asymptomatic n (%) | Symptomatic n (%) 47 | p-value |
| Sex | | | |
| Male | 9 (56.2) | 7 (43.8) | 0.680 |
| Female | 41 (50.6) | 40 (49.4) | |

Continue

| Continuation | | | |
|---|---|---|---|
| How long did the training last? | | | |
| Up to 1 hour | 26 (52.0) | 24 (48.0) | 0.927 |
| More than 1 hour | 24 (51.1) | 23 (48.9) | |
| Nature of received CSBT | | | |
| Theoretical | 21 (30.0) | 49 (70.0) | 0.007* |
| Practical | 16 (59.3) | 11 (40.7) | |
| Did you felt prepared to provide clinical care? | | | |
| Yes | 46 (58.2) | 33 (41.8) | 0.006* |
| No | 4 (22.2) | 14 (77.8) | |
| Was there a restriction on the use of aerosol generating-procedures? | | | |
| Yes | 33 (61.1) | 21 (28.9) | 0.035* |
| No | 17 (39.5) | 26 (60.5) | |

* Fischer's Exact Test $p < 0.05$

## Discussion

The new world scenario and the new services routine have also impacted practical activities[20,21] and clinical care in dental schools[22,23]. In the present findings, it was observed that students who underwent training with a higher workload felt more secure to perform clinical care as well as students in places where aerosol use was restricted. In addition, female students were less secure to provide clinical care for patients with covid-19 as well it was also found that the type of activity was an important factor in the students' feeling of security. Thus, students exposed to training who performed practical activities showed a tendency to present greater confidence to perform consultations with patients with potential infection of covid-19 and tend to present fewer mental disorders symptoms.

In the present study, 100.00% of respondents reported having received some kind of CSBT, provided by dental schools before the return of clinical activities in that context (first semester of 2021). Students, who received CSBT for longer than 1 hour reported felt safe performing dental clinical care. A possible justification for the present result is that a longer discussion on the subject increases knowledge and understanding about the transmission of the disease and the respective prevention methods. Thus, students with more training would be more empowered and able to carry out all prevention strategies more safely. In addition, in-depth knowledge of the disease and its symptoms is essential in carrying out pre-treatment screening, which aims to identify possible patients with the disease. In this way, dental care for these individuals can be performed at a more opportune time.

According to Meng et al.[24] (2020) the biological risk of Sars-Cov 2 transmission is extremely high when performing dental procedures due to the use of handpieces under irrigation, which produces and diffuses significant amounts of aerosol par-

ticles, containing saliva, blood, and secretions, contaminating the environment[3,24]. This increases the fear of performing these services, once the patient can carry the disease and does not know about it (asymptomatic), evidence confirmed that more than 50% of the virus transmission is asymptomatic[25]. The risk of contamination of any family member and the need for enough information about the virus have been associated with greater burden and suffering psychological aspect of dentistry student[26].

Pre-clinical care training can be an alternative to reduce this risk since dentistry students during its formation may present higher stress levels than the general population[27]. Despite available guidelines for the management of dental patients and to make dentists (and students) safe from risks[27-29], the severity of the COVID-19 pandemic presents clear challenges to dental educational institutions worldwide, since it is necessary to think about the health of students, teachers, employees, and patients who frequent the environment[23,30]. Appointments with patients with respiratory disease should be scheduled at the end of the day to minimize the risk of nosocomial infection[6,31]. Isolated rooms with good ventilation or negatively pressurized rooms would be more appropriate for patients with suspected cases of COVID-19. The Brazilian Association of Dental Education (Abeno), has positioned itself, through the Abeno consensus, which ensures that each Dentistry course can build its own possible adjustments, between the ideal and the minimum necessary for the future resumption of teaching activities in classrooms, laboratories and clinics[32].

From the collected data, most students reported their professors restricted the use of aerosol-producing procedures between the months of February and April of the year 2021. In such cases, students reported more frequently feeling safe to provide clinical care than students in places without aerosol-producing procedures restrictions. In such context, it is important to highlight that there was an additional challenge for the dental profession during pandemics in the evaluated period[33]. As dentists work in close contact with patients' oropharyngeal region, they are exposed to an additional risk for nosocomial infection[34]. Besides, dental practice is strongly associated with aerosol-generating procedures potentially able to spread infections among dental professionals and their patients[24] by creating a virus-laden aerosolized environment. Thus, it is important to expose that the *Sars-Cov-2* can survive in aerosols for hours and on surfaces for up to days[33]. Such risk, related to dental practice, for transmitting respiratory infectious diseases due to aerosol-producing procedures[33,35] could explain why the students reported to felt safe preferably when performing clinical care in dental schools where the use of aerosol-producing procedures was restricted[30].

The production of aerosols is the main self-perceived contributor to COVID-19 cross-infection in teaching clinics by students and staff[30]. In such a context, 93% of students perceived their health to be at risk while they were at the dental teaching clinics during the COVID-19 pandemic[30]. In the same study, 87% of students reported a significant increase in their stress levels[30]. Therefore, dental school clinics must perform and prioritize measures to reduce contaminated aerosol-producing during dental procedures, such as the use of rubber dams to minimize contamination[34].

This work showed that the majority of interviewed students reported it unsafe to provide dental clinical care to a person with COVID-19 symptoms. There were statistical differences in self-reported by gender, with women more frequently reported to feel insecure to attend a person with COVID-19 symptoms than men. Previous studies evaluating dental students' stressors during the COVID-19 pandemic and, in agreement with our results, identified women being significantly more anxious most of the time about themselves or a family member contracting COVID-19[26]. Besides, depression and anxiety are more common symptoms among women, and during the COVID-19 pandemic anxiety's prevalence can be three times greater in women[36]. In literature, recent studies showed that male dentistry students felt more confident in their competence during clinical procedures[37]. The greatest ease female to articulate their emotions besides the biggest feminine propensity for the development of posttraumatic stress in a pandemic situation are some possible explanations for these results[38]. Most of patients with COVID-19 are asymptomatic or only mildly symptomatic but discharge large amounts of infectious viral particles in the early phase of infection. This poses an enormous challenge for containing the spread of the infection[39]. Standard precautions are not enough to prevent the spread of the coronavirus, especially during the incubation phase of COVID-19[28], the whole dental team should be vigilant and keep patients and themselves in a safe environment.

Presented findings highlight that a high number of students presented a propensity to develop psychological disorders and the adoption of safety and training measures increased the students' perception of safety. COVID-19 has challenged the higher education sector worldwide, strongly affecting healthcare professionals and students. Dentists, as well as dental students, are at the top of the pyramid of healthcare professionals at risk for contracting COVID-19[24]. This fact affects the continuity of activities in dental schools during the pandemic outbreak, as they need to concern with the safety of all students, patients, staff, and professors[22,40]. The present study evaluated the self-perception of safety by dental students performing dental clinical care during the COVID-19 pandemic related to biosafety measures adopted by dental schools in the south of Brazil.

We know that dental students are likely to develop stress-related disorders during their undergraduate courses, even more during a pandemic period. Previous study[24] proved the increase in stress levels, especially when related to some health risk, has a strongly negative impact on students' clinical performance. Precisely due to this affirmation, it is necessary to investigate students' stress levels during the pandemic. The *GHQ12* is a tool used to identify the severity of disorders in non-psychotic psychiatric patients of the non-clinical population. It works as an identifier of potential causes of these disorders[19,32]. The questionnaire was chosen for this research due to the advantage of recognized validity in the literature studies carried out with samples composed of students. Increased stress, anxiety, and fear are expected to happen during a pandemic period and dental schools need to be prepared to provide mental health support for students[30].

Some limitations of the present study need to be discussed and considered when interpreting the results. A low response rate was achieved, and this is mainly because

participants were invited by email. Complementary strategies for forwarding e-mails and invitations via social networks were implemented but with little success. Studies using electronic tools for data collection tend to have lower response rates when compared to studies where the invitation is made in person. Thus, considering the low response rate affects the statistical power in the statistical analysis and additional associations may not have been found due to the limited statistical power. In addition, it is important to note that the sample was composed of students from private institutions. Thus, the present data should only be extrapolated to populations with similar characteristics.

In conclusion, students from private universities who underwent training with a higher workload and in places where aerosol use was restricted felt more secure to perform dental clinical care. Moreover, students classified as symptomatic in GHQ-12 reported feeling less secure in resuming practical activities related to clinical dental care. Female students and students who performed only theoretical biosafety training were less secure to provide clinical care for the patient with covid-19. Thus, students exposed to practical training showed a tendency to present greater confidence to perform the consultations with patients with potential infection of covid-19.

## Data availability

Datasets related to this article will be available upon request to the corresponding author.

## Declarations of interest

None.

## Funding

None.

## Author Contribution

LQG and MCMC conceived the ideas, analyzed the data, collected the data, and wrote the paper. LAC and FSC rewired the paper.

All authors actively participated in the manuscript's findings, and have revised and approved the final version of the manuscript.

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