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Impact of COVID-19 Pandemic on Dental Education: Perception of Professors and Students

Impacto de la pandemia COVID-19 en educación dental: percepción de estudiantes y profesores

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ABSTRACT: Purpose: The objective of this study was to evaluate perception and feelings experienced by dentistry professors and students about distance learning during the COVID-19 pandemic. Materials and Methods: Fifty professors and fifty-two students reported the perceptions and implications of distance learning imposed by the pandemic of COVID-19. The participants' answers were analyzed using the qualitative-quantitative method of the collective subject's discourse. The answers were summarized in central ideas, distributed in absolute and relative frequency. The answers with similar central ideas were grouped, obtaining the discourse of the collective subject. Results: The similar central ideas about distance learning addressed by professors and students were: suitable for didactic courses; limited laboratory and clinical courses, and internet access difficulties. Specifically for professors: a complement to classroom teaching; stress and learning with digital technologies; difficulty in reconciling classes with domestic activities; concerns with motivation

and interaction with students; asynchronous lectures favor knowledge fixation, and synchronous lectures favor interaction with students; unreliable assessment methods; concern about returning to face-to-face classes. For the students: it was applied to all courses; demotivating; fundamental to guide studies; professors' commitment; long lectures; excessive school activities; difficult attendance control and evaluation; the comfort of being at home; impact on research. Conclusion: Professors considered distance learning as a learning opportunity on how to use digital technologies but too limited for lab and clinical activities and interaction with students. Students found it discouraging due to the absence of practical classes and excessive school activities.

KEYWORDS: Coronavirus infections; Social distance; Dentistry; Students; Education; Dental; Qualitative research.

RESUMEN: Propósito: Evaluar la percepción y los sentimientos manifestados por profesores y estudiantes de odontología sobre la educación a distancia durante la pandemia por COVID-19. Materiales y métodos: 50 profesores y 52 estudiantes informaron las percepciones e implicaciones del aprendizaje a distancia impuestas por motivo de la pandemia de COVID-19. Respuestas de los participantes fueron analizadas utilizando el método cualitativo-cuantitativo del discurso del sujeto colectivo. Respuestas se agruparon en ideas centrales, obteniendo el discurso del sujeto colectivo y fueron distribuidas en frecuencia absoluta y relativa. Resultados: Ideas centrales similares entre profesores y estudiantes sobre el aprendizaje a distancia fueron: a) es adecuado para cursos didácticos; b) limitado para cursos de laboratorio y clínicos; c) presenta dificultades devido al acceso a Internet. Específicamente para profesores: a) complemento a la docencia en el aula; b) aumenta el estrés devido a la curva de aprendizaje con tecnologías digitales; c) dificultad para conciliar las clases con las actividades domésticas; d) preocupaciones con la motivación y la interacción con los estudiantes; e) las clases asincrónicas favorecen la fijación del conocimiento y las clases sincrónicas favorecen la interacción con los estudiantes; f) métodos de evaluación poco fiables; y g) preocupación por volver a las clases presenciales. Para los estudiantes: a) se aplicó a todos los cursos; b) desmotivador fundamental para orientar los estudios; c) compromiso de los profesores; d) conferencias largas; e) actividades escolares excesivas; f) difícil control y evaluación de asistencia; g) la comodidad de estar en casa; y h) impacto en la investigación. Conclusión: Profesores consideraron el aprendizaje a distancia como una oportunidad de aprendizaje sobre cómo utilizar las tecnologías digitales, pero demasiado limitado para las actividades de laboratorio y clínicas y la interacción con los estudiantes. Estudiantes lo encontraron desalentador debido a la ausencia de clases prácticas y al exceso de actividades escolares.

PALABRAS CLAVE: Infecciones por coronavirus; Distanciamiento social; Odontología; Estudiantes; Educación en odontología; Investigación cualitativa.

INTRODUCTION

COVID-19 (acronym derived from the English CO-rona VI-rus D-isease and the year of identification-19) is an infectious disease caused by the new coronavirus (SARS-CoV-2), transmitted through contact with droplets of saliva, by aerosols produced by the airways, or contact with contaminated surfaces (1,2). In recent months, the infection has spread to several countries globally, being responsible for the pandemic (3-6). As there are still no specific therapies (6,7), classic public health measures, such as social isolation, have been recommended by health authorities to contain the spread of the virus (5,8,9). Thus, to avoid gatherings, these measures directly affected educational institutions' closure worldwide (3,6,10-12).

With the suspension of activities in the classroom, so that learning was not interrupted, alternatives were created through the improvement and implementation of distance learning (5,9-11). Distance learning has been conducted electronically using tools available through digital platforms and using electronic devices (e.g., computers, tablets, and cell phones) and the internet (5,12). Thus, although professors and students are not physically present in the same place, they can interact using digital technology resources (e.g., video calls, video conferencing services' chats, text messaging applications, email, discussion forums).

It is essential to consider that, in the distance learning model, classes are based on essentially didactic content (10,13), so the teaching of students in professions that depend on practical training has been directly affected (13,14), including Dentistry (13). In Dentistry, laboratory activities and clinical care are of paramount importance for training students' manual ability and fine motor skills, in addition to handling and patient-care training. On the other hand, the need to pause clinical activities has become imperative due to the high risk of contamination of aerosols generated in most dental procedures, face-to-face contact with patients, and in the case of dental educational institutions, the number of students and patients together in the same place at the same time, and the lengthy treatment time usually required (6,15). In this way, professors and students have adapted to digital technology and a didactical teaching approach.

In this sense, despite each institution's characteristics concerning the didactic content adjustment for distance learning, the topic deserves a reflection by professors' and students' opinions regarding the teaching-learning process. Thus, this study's objective was to evaluate the perception and feelings experienced by professors and students of undergraduate and graduate students in Dentistry about distance learning during the COVID-19 pandemic.

MATERIAL AND METHODS

The present study was approved by the local Institutional Review Board (CAAE: 32042720.8.0000.5418). All participants agreed to participate in the research and agreed to the informed consent form. The Consolidated Criteria for Reporting Qualitative Studies (COREQ) was used in the present study (16).

STUDY SAMPLE

Fifty professors (30 women and 20 men) and fifty-two undergraduate and graduate students (36 women and 16 men) from Brazil, Costa Rica, United States, and Italy participated in the present study. Each group's sample size was sufficient to obtain saturation of the answers; that is when no different information was obtained from the participants' answers in each group (17). All participants had their face-to-face classes suspended in March 2020, when each location's governments implemented physical distance measures. All participants were taking remote lectures when they filled the survey.

In Brazil, the undergraduate program in dentistry is completed in a period of four to five years. In the United States, after obtaining a bachelor's degree in an undergraduate program (e.g., Dental Hygiene), students can take Dentistry, which is a four-year program. In Costa Rica and Italy, the undergraduate program is completed in 6 years. In common with all these programs are the laboratory courses offered from the second year and the clinical internship that has been intensified in the last two years.

PROFESSORS AND STUDENTS' INTERVIEW

For participation in the research, respecting social isolation and quarantine, professors' and students' approach was carried out through an invitation with a link to the Google Forms questionnaire (Alphabet Co., Mountain View, CA, USA) sent by email or WhastApp (Mountain View, CA, USA) messaging application. The form consisted of demographic data, the date on which the face-to-face classes were suspended, and a section with an open question was used so that the professors and undergraduate and graduate students in Dentistry could describe the perception and feelings experienced about distance learning imposed by the pandemic of COVID-19.

DATA ANALYSIS

The participants' answers were transcribed and analyzed using the qualitative-quantitative method of the discourse of the collective (17,18) using the Qualiquantisoft software (SPI-Sales & Pascoal Company, São Paulo, Brazil). Initially, one researcher coded all the participants' answers. Two other researchers independently analyzed each group's answers, aiming to identify in more than one perspective the key expressions, that is, the most significant parts of the answers. The key expressions were then compared and synthesized into central ideas by consensus, which were identified by letters of the alphabet and distributed according to the absolute and relative frequency in which they were cited by the participants (17,18). Subsequently, the answers of participants with similar central ideas were grouped, obtaining the collective subject discourse (17,18), obtaining a version for professors (Table 1), and another for students (Table 2).

Table 1. Absolute and relative frequency of central ideas and corresponding discourse of the collective subject (representative argument) from the sample of professors for perception about distance learning in Dentistry.

Central Ideas*	Professor (n=50) n (%)	Discourses of the collective subject
A. Suitable for didactic courses	5 (10.0)	"Concerning didactic topics, I believe that online teaching is extremely productive and should become a common practice in dentistry courses."
B. Limited for laboratory and clinical courses	19 (38.0)	"Dentistry cannot be virtual! Most theoretical classes are associated with practices. Non-face-to-face classes introduce the topics, but laboratory training, clinical practice, and interaction with patients are lacking."
C. A complement to classroom teaching	8 (16.0)	"The evidence is clear: online education helps, it can be a complement to face-to-face teaching, but it is not a complete substitute. I believe that nothing replaces face-to-face teaching!"
D. Stress and learning with digital technologies	12 (24.0)	"Everybody from everywhere had to leave their comfort zone. There was a high level of stress due to the need for quick learning of digital tools. I believe that the stress now is much less than it was at the beginning of the activities' suspension, and the tools can be used, even when the face-to-face activities normalize."
E. Difficulty in reconciling online classes with domestic activities	2 (4.0)	"With all the family members confined at home, supervising the children's school activities, maintaining the home, fear from illness, negative news from politics, economics, and health, it overwhelmed me, making it difficult to concentrate on online classes."
F. Concern about students' motivation	6 (12.0)	"The biggest problem faced is keeping our students motivated and willing to continue dedicating themselves even when they are far away. I notice that students access the online classroom, but they are not present in front of the computer or paying attention. Furthermore, I believe that they are saturated with so many videos and online classes."
G. Absence of interaction with students	6 (12.0)	"I feel unmotivated with the little participation of students in the chat. Besides, most students do not feel comfortable opening their cameras during classes, making facial feedback difficult."
I. Recorded lessons (asynchronous) fixing knowledge	2 (4.0)	"The students reported that they can be more focused on the recorded classes and still have the opportunity to watch again as many times as they wish. This method, consequently, increases the assimilation of the content."
J. Synchronous sessions - interaction with students	2 (4.0)	"Virtual classes are much better than face-to-face classes but using synchronous methods in which students can ask questions simultaneously at the class."
H. Unreliable evaluation methods	2 (4.0)	"In my opinion, the problem lies in the effectiveness and value of online exams due to the probability of exchanging information between students."
L. Internet access difficulties	4 (8.0)	"Given the great social differences that we are experiencing, I believe that the biggest problem is that not all students have access to the internet and individual computers that allow them to attend classes remotely."
M. Concern about returning to classes	3 (6.0)	"I do not see a safe return for clinical activities, as we need a huge reform to adapt the biosafety standards, and the institution does not have a viable budget. It would also be necessary to reorganize the courses with a lower number of students per term."

Bold numbers indicate the highest frequencies of answers regarding opinions caused by online education.
*The same participant may present more than one central idea.

Table 2. Absolute and relative frequency of central ideas and corresponding discourse of the collective subject (representative argument) from the sample of students for perception about distance learning in Dentistry.

Central Ideas*	Student (n=52) n (%)	Discourses of the collective subject
A. Adopted to all courses	7 (13.5)	"We adapt to online classes, and I think that online teaching can be adopted widely instead of face-to-face. Teaching can improve more and more with the use of technology."
B. Suitable for theoretical courses	6 (11.5)	"In my opinion, the didactic part can be with online lectures, without prejudice to learning. We are taking didactic classes to reinforce many essential topics and new topics of great relevance before entering the clinical environment."
C. Limited for practical courses	20 (38.5)	"The clinic and laboratories' activities help establish knowledge, and learning is significantly compromised without the practical part, especially for students who have already started a clinical internship. We do not know when we can return to the clinics or how it will support our training, as we are the profession most affected by the pandemic!".
D. De-motivating	12 (23.1)	"It is not the same as face-to-face teaching! I lost a little motivation because I do not have practical classes. I think online teaching has been more difficult than face-to-face, as it is tedious to be at the computer and to have to study alone. We are not prepared and used to this teaching model! I also feel that it is much easier to lose concentration, but it is not for lack of trying!"
E. Fundamental to guide studies	2 (3.8)	"I think that online education is fundamental in this period to guide home studies because even if we try to study alone, it does not yield enough and is not very effective."
F. Commitment of professors	5 (9.6)	"Most teachers even ask questions, and explain it as a face-to-face class, sometimes even better! But some teachers don't even have time for the slide to load, they do not look for good images to improve our understanding, they don't take questions, and they don't pass activities for our training."
G. Long lessons	3 (5.8)	"Online lectures tend to be longer than face-to-face lectures, ignoring university directions. The result is an overload, which exceeds the credits attributed to each discipline, in addition to being tiring."
H. Excessive school activities	7 (13.5)	"These are new things for everyone about internet learning/teaching. However, I think they should be more comprehensive with students, as they send many tasks to do at home, simply because the students are at home, making the experience tiring and stressful. The materials accumulate in such a way that we feel confused, being very difficult to have a study schedule."
I. Difficult presence control and evaluatwion	2 (3.8)	"I think it isn't straightforward to have presence and attendance control in the remote model, as I know that sometimes some students are connected and don't even hear the lecture."
J. Internet access difficulties	3 (5.8)	"Some students do not have access to the internet, mobile or fixed, neither access to cellphones nor computers. These students will have a huge gap in their learning, as they have no way to attend classes and perform activities online. Most colleges are not considering this situation!"
L. Convenience of being at home	5 (9.6)	"Online classes are more comfortable, as I don't have to travel to the school building. I think the didactic lectures could remain online even after confinement, and the clinics and laboratories being in person."
M. Impact on research	2 (3.8)	"Postgraduate students are used to studying alone, so with universities closed, the most significant impact is on continuing research, as I have not yet been able to do my research."

Bold numbers indicate the highest frequencies of answers regarding opinions caused by online education.
*The same participant may present more than one central idea.

RESULTS

The average age of professors was 49.2 years, SD=11.6 years (minimum age of 26 and maximum age of 74 years), and among students, it was of 25.33 years, SD=5.7 years (ranging from 18 to 43 years).

The central ideas and the discourse of professors and students' collective subjects are presented in Table 1 and Figure 1, Table 2 and Figure 2, respectively.

Professors considered distance learning suitable for didactical courses but a limited teaching method for lab and clinical courses. Therefore, they thought that it should be used only as a complement to classroom teaching. After an initial period of stress with digital technology applied in distance learning, professors considered that they had learned to use digital resources. However, the persistent difficulty was reconciling classes with domestic activities during social isolation (Table 1).

The professors' concern with distance learning was related to the perception of the lack of motivation and interaction with students, which could be solved using different ways of disseminating the content of the classes (asynchronous or synchronous) (Table 1). They also reported concern about the value of evaluation methods applied in distance learning, with the difficulties of accessing the internet so that students could access the classes' content and the return to face-to-face classes due to the risks of contamination (Table 1).

Some students reported optimism about distance learning and suggested that it should be used in all courses. However, in the same way as the professors, some students reported that distance learning could be applied only for theoretical classes. They considered it a limited teaching method for courses that depended on lab-based and clinical activities, and for that reason, they felt unmotivated. However, they considered distance learning fundamental to guide their studies during the period of social isolation, but this fact depended on the professors' commitment to classes (Table 2).

The students also complained about the lectures' duration and excessive school activities. They also realized that it was difficult for professors to control attendance and evaluations rigorously (Table 2).

Students recognized that some students could have difficulty accessing the internet, which could impact access to classes. They reported that distance learning had the advantage of being comfortable at home, as they did not need to get to the school building (Table 2).

Among graduate students, the main concern was related to the impact educational institutions' closure would bring to their research (Table 2).

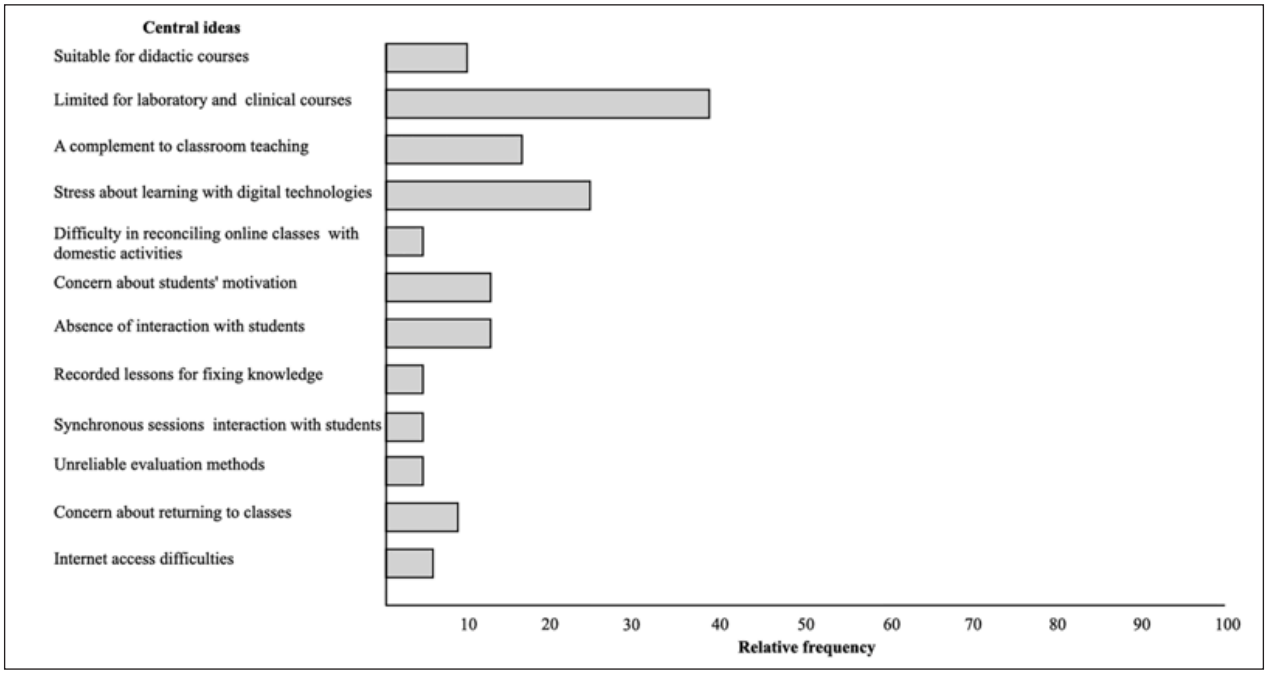

Figure 1. Representation of the numeric data of the Central Ideas of the discourse of the collective subject (representative argument) from the sample of professors (vide Table 1).

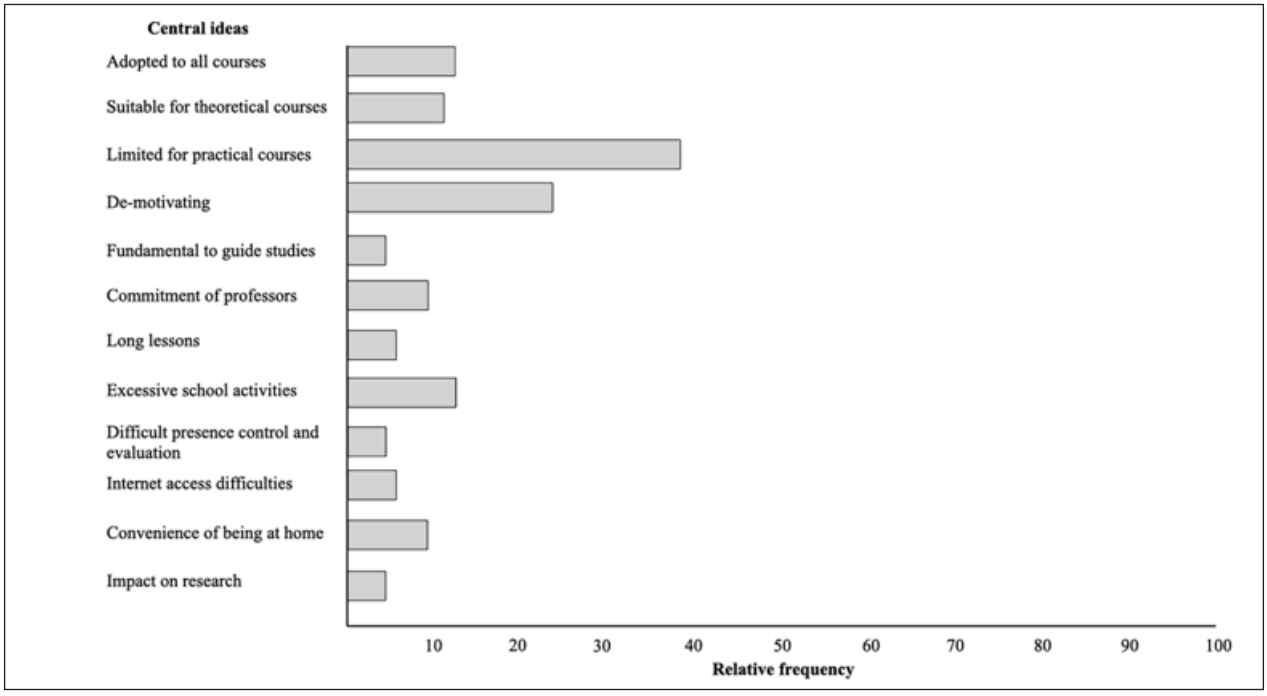

Figure 2. Representation of the numeric data of the Central Ideas of the discourse of the collective subject (representative argument) from the sample of students (vide Table 2).

DISCUSSION

Despite the presence of digital resources in people's lives, it is crucial to consider that their use in teaching is still associated with a learning curve for many professors and students, who, in the context of the COVID-19 pandemic, had to adapt quickly to migration to an exclusively virtual curriculum (5,12,19). Thus, this study's objective was to verify the opinion of professors and students of Dentistry about distance learning imposed by the pandemic of COVID-19.

Even after initial stress, the professors reported that they learned to use the different digital resources, gaining greater mastery and skill, and considered themselves able to use them. They still intend to use it even with the return of face-to-face activities. So, it is possible to notice a difference between professors and students: the latter did not report such stress related to the migration to the online format or the necessity to improve digital skills. This difference can be attributed to the difference in the groups' average age, with the youngest being more familiar with digital technology. Although young people assimilate the use of digital technology easily (10), the present study's exciting finding was that students did not express professors' enthusiasm with this teaching method, declaring that the absence of practical classes unmotivated them as one of the causes. Also, a previous study (20) observed that students' most significant interest occurred when the subject of didactic classes was taught together with clinical activities.

The students also mentioned difficulty concentrating, probably due to the internet's distractions and the change of focus on digital resources, which were usually more associated with relaxation activities and not with the learning's intense use (10). On the other hand, among professors, the difficulty of concentration was related to domestic activities caused by social isolation (e.g., all family members at home, children's schoolwork, concern about contamination, and worrying news about the pandemic). Students could be experiencing a similar situation, with families confined to their homes, siblings concerned about the economic situation or health condition, and the lack of an appropriate environment for distance learning at home (21); however, this has not been directly reported.

Besides, students pointed out the difficulty of studying alone as a cause of demotivation. It is noteworthy that in distance learning, different from in-classroom lectures, there is a change in the learning process, moving from the professor's central figure to active, self-directed learning centered on the student (8,11,22). It is observed that although this is a crucial competence to stimulate lifelong learning among health professionals (11), this adaptation process takes time to be assimilated. One of the distance learning methods that stimulate this learning process is asynchronous sessions because the content is recorded. Later on, students can observe it at any time of the day, establishing a study routine (12). On the other hand, some students reported excessive school activities requested by professors, making distance learning exhausting and challenging to create a study schedule.

Another challenge of distance learning is developing interaction between professors and students (22). The lack of immediate feedback is an inconvenience as it does not allow professors to assess students' understanding (12). The results of the present study corroborate these statements, although digital platforms provide resources for this interaction. In this sense, aiming for meaningful interaction with students, professors reported the benefits of synchronous classes. When classes are transmitted live, it allows more significant dynamics between professors and students (8). However, some platforms' resources are being underused because there is resistance from

students to participate in classes with turned-on cameras and microphones, which increases the lack of interaction.

Another interesting fact mentioned by the students was that the virtual classes seemed longer than the in-person lectures. Some studies suggest (11,23) that students' time tends to be shorter than face-to-face classes in distance learning. In this sense, to improve students' motivation, it is suggested to prepare more concise lectures, using active teaching methodologies and inverted learning. These could lead to more dynamic classes and increase the interaction between professors and students (11).

Most professors and students' common observation was related to distance learning limitations for courses that require practical activities. Even using stimulating critical thinking methods, such as clinical and scientific article discussions, or clinical procedure videos (4,9,13,19), these are unable to fulfill the requirements for training the interpersonal skills and confidence on patient management (13,14). This issue is a concern mainly for students who have already started the clinical internship (12), as seen in the present study.

Professors' concerns are the possibility of returning to laboratory and clinical classes due to the risks of contamination, the need to remodel the clinic infrastructure, and reduce the number of students per term. Besides, it is also essential to consider that, to return to clinical activities, it will be necessary for students to receive reinforcement in training regarding updates to infection control measures (15,24).

As in face-to-face teaching, the difficulty of encompassing a large volume of content in a divided time with clinical activities (25) suggests prioritizing the theoretical content during this period and improving students' background knowledge before classroom activities return (3,24).

It is noteworthy that in distance learning, in addition to the challenges imposed on professors and students, there is also the need for an adequate internet connection to access the content of the classes (8,11,22). However, this fact may not be a reality, especially in developing countries (9), due to restrictions on internet access (5,9,10), as well as the availability of equipment for connectivity (computer/tablet/cell phone) (10,21). Thus, distance learning may not reach all students' socioeconomic levels, and it is not an equitable form of education in all regions of the world (5).

In addition to affecting various academic areas of dentistry, including patient care and education, the current health crisis has also hampered graduate research (15), with the suspension of most laboratory research or non-essential clinical research (3), as reported by some students. Although laboratory research does not involve direct contact with patients, care must also be taken about health-safety protocols and social distance, aiming at students' and employees' well-being with the resumption of activities (3).

A limitation of the present study was in relation to the non-participation of students from other countries because, despite the efforts of researchers in the dissemination of this research, not all universities provide the email of professors and students. Besides, some universities were in the vacation/recess period when conducting this research.

It is noteworthy that the impacts on dental education shared by professors and students from some countries participating in this study may reflect the enormous challenge that the pandemic of COVID-19 created for educational systems worldwide. Thus, the arguments regarding the perception and feelings experienced with the participants' distance learning in this study can be applied to make this teaching format more efficient. The current pause is an alternative for improving

the use of digital technologies and alternative teaching methods (e.g., active methodologies) during distance learning, encouraging professors' creativity and students' greater involvement, resulting in new forms of teaching (3,25).

CONCLUSION

Although distance learning is an adequate tool to limit contamination during the COVID-19 pandemic, each institution must evaluate and align which format is suitable for each discipline and term/period. Creating hybrid content to facilitate the students' learning is an alternative for taking advantage of digital technologies.

CONFLICTS OF INTEREST

None.

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