

# Impact of the COVID-19 pandemic on dental education in Brazilian institutions: An integrative review

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Received: 05/06/2021. Aprovado: 02/11/2022.

## ABSTRACT

The spread of SARS-CoV-2, the etiological agent of COVID-19, has become a public health problem of international importance. Among the measures to curb its spread is the suspension of classes in educational institutions. Thus, this integrative review aims to provide an overview of the impact of the pandemic on dentistry education in Brazilian institutions. The Medline, LILACS and SciELO databases were searched using descriptors in English and Portuguese. A total of 60 studies were retrieved, with 17 eligible for full reading. Of these, 4 studies met the inclusion and exclusion criteria. It was observed that the emergency remote education (ERE) model through digital tools was the most used remote teaching strategy in Brazilian institutions. ERE allowed the impact of the COVID-19 pandemic to be felt more mildly by the Brazilian academic community, better engaging students and reducing the anxiety of students and teachers. On the other hand, the deficient technological infrastructure in Brazil contributed to difficulty in replacing clinical activities. This fact is further exacerbated by the difficulty of adapting the physical infrastructure of the institutions when planning to return to in-person activities. Despite numerous strategies employed by Brazilian dental education institutions, they were not reflected in the scientific literature in the indexed databases. Thus, there is a need for studies on this topic so that it is possible to disseminate the experiences lived during the pandemic period.

**Descriptors:** COVID-19. Education. Dentistry.

## 1 INTRODUCTION

The new coronavirus (SARS-CoV-2) is a virus of the *Coronaviridae* family and is the etiological agent of COVID-19<sup>1</sup>. After the first outbreak of the disease in Huanan, China, on

December 2019<sup>2</sup>, the virus spread on a global scale, and on January 30, 2020, it was decreed, by the World Health Organization (WHO), a Public Health Emergency of International Importance<sup>3</sup>.

Among the professionals with a higher risk of infection by SARS-CoV-2, dentists stand out due to the constant contact with aerosols and droplets generated during dental procedures<sup>4</sup>. Aerosols and droplets contain high levels of salivary fluids, which are important sources of virus transmission<sup>5,6</sup>. Given the high risk of infection, both clinical care and the teaching of dentistry were impacted by the pandemic<sup>7</sup>.

In a context without a vaccine for the prevention of COVID-19, it was asserted that nonpharmaceutical interventions were necessary to contain the spread of the virus<sup>8</sup>. Thus, social distancing measures, such as the suspension of classes at all levels of education, were imposed to avoid the crowding of individuals<sup>8</sup>. This measure was supported by educators, parents and educational institutions<sup>9</sup>. Given this scenario, there were debates about the consequences of this suspension as well as about the ways to continue the activities by alternative means<sup>7</sup>.

Most dentistry teaching institutions in Brazil have totally or partially suspended their face-to-face activities<sup>10</sup>. Because it is an essentially practical course<sup>11</sup>, the suspension of activities can impair undergraduate and graduate students' learning<sup>7</sup>.

To mitigate the disruption in the construction of knowledge by students, as a matter of urgency and as a strategy to ensure the universal right to education, there was a restructuring of the methodologies applied in teaching and learning<sup>10,12,13</sup>. Thus, several actions and non-face-to-face activities were suggested so that students could learn remotely<sup>7</sup>.

Given the abrupt change in the dental education system caused by the COVID-19 pandemic, the objective of this integrative review is to present an overview of the impact of the pandemic on dentistry education in Brazilian higher education institutions. In parallel, the

concepts of the teaching strategies used are presented.

## 2 METHODS

This is an integrative literature review conducted using data from secondary sources obtained through a bibliographic survey in the Medical Literature Analysis and Retrieval System Online (Medline), Latin American and Caribbean Literature on Health Sciences (LILACS) and Scientific Electronic Library Online (SciELO) databases. The guiding question of the study was as follows: What impact did the COVID-19 pandemic have on the teaching of dentistry in Brazilian higher education institutions?

Descriptors in Portuguese and English, combined with the Boolean operator AND were used. The following MeSH (Medical Subject Headings) descriptors were used: COVID-19; Education; and Dentistry. The following DeCS (health sciences descriptors) were used: COVID-19; Education; and Dentistry. The study was conducted independently by 2 authors (FFCFF and FLV) under the supervision of a third author (FRF). The inclusion criteria were studies that discussed the COVID-19 pandemic, social distancing and the impact on dental education, in addition to those on emergency remote education and the teaching tools used in dental education during the pandemic. The exclusion criteria were duplicate studies and those that referred to dental education in countries other than Brazil. The selection of articles was initially performed by reading the titles and abstracts, and those that met the inclusion criteria were read in full. Divergences in the selection of studies were discussed and resolved by all authors. The study selection process is shown in figure 1. The analysis of the studies and the synthesis of the extracted data were performed descriptively.

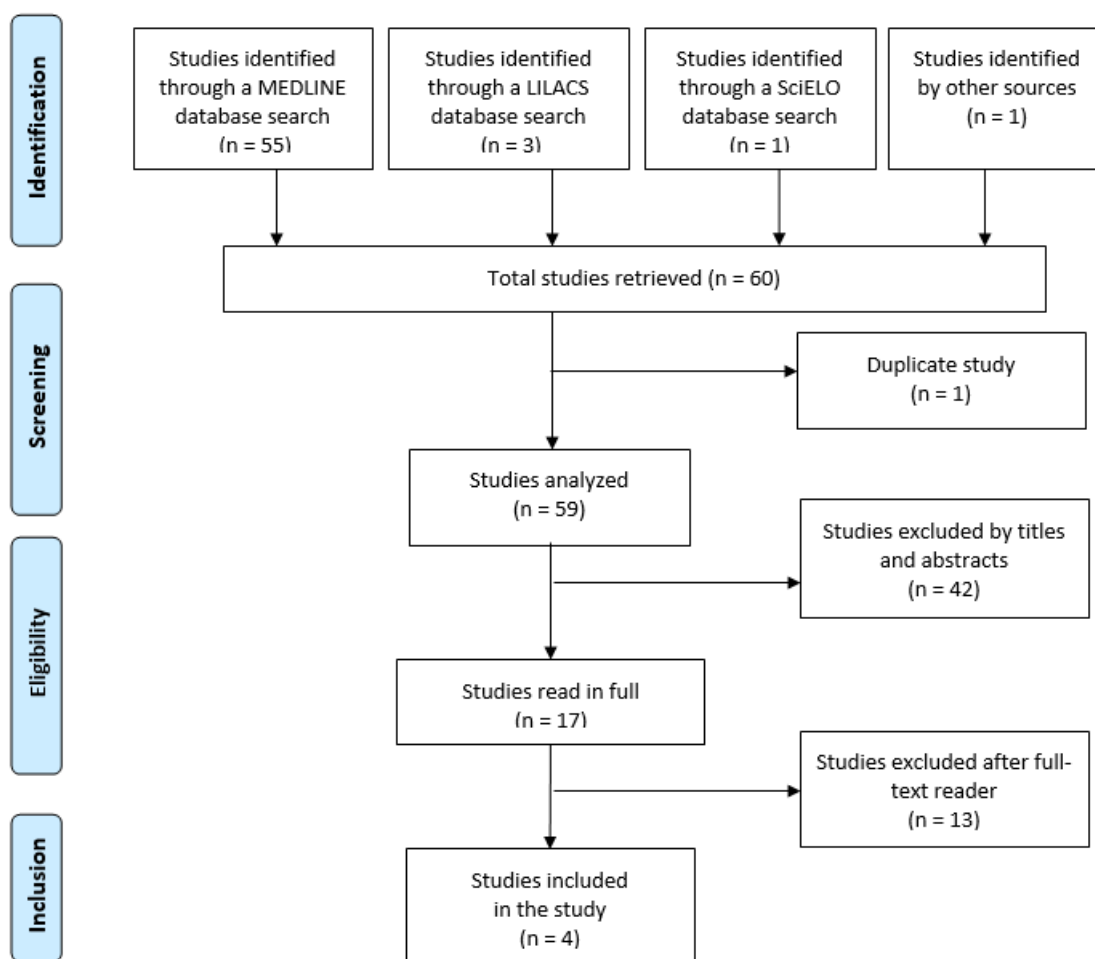


Figure 1: Flowchart showing the selection of studies for the integrative review

### 3 RESULTS

A total of 60 studies were retrieved in the searches performed in the databases. One study was excluded due to duplication, and 42 studies were excluded after reading the titles and abstracts, considering the inclusion criteria. Subsequently, 17 studies were eligible and read in full, and of these, 13 were excluded, considering the exclusion criteria. Finally, 4 studies were included in the integrative review.

In this integrative review, 17 studies were eligible and read in full, but 13 (76.5%) were

excluded because they addressed dental education in different countries during the COVID-19 pandemic, with 4 from the USA, 2 from Saudi Arabia, 2 from Portugal, 1 from Pakistan, 1 from the United Arab Emirates, 1 from Mexico and 2 from several countries. Only 4 (23.5%) studies were included in this integrative review because they addressed the impact of the COVID-19 pandemic on Brazilian dental education. A summary of the main points regarding the studies included in this integrative review is presented in table 1.

Table 1: Studies included in the integrative review

Authors and year of publication	Objective	Methods	Main findings	Relevance
Silva <i>et al.</i> , 2020 <sup>26</sup>	To assess the effect of distance education activities on undergraduate dentistry students in social isolation due to the Covid-19 pandemic	Cross-sectional study was carried out through an online questionnaire answered by dentistry students	Social isolation can reduce the quality of life of dentistry students; Distance activities promoted interaction between teacher and students and is considered essential for teaching during social isolation	Exposes the impact of the pandemic on the quality of life of dentistry students due to the suspension of face-to-face activities, but highlights the importance of distance activities to maintain interaction with teachers and learning.
Santos <i>et al.</i> , 2020 <sup>7</sup>	To elucidate experiences, benefits, and challenges imposed on dental education due to the pandemic, the learning technologies and methods used to maintain education	Systematic review	ERE is an option to ensure education during the Covid-19 pandemic; ERE can help decrease anxiety and promote mutual support between students and teachers; Problems associated with ERE include poor technological infrastructure in the environment and difficulty in substituting clinical activities	Shows several tools and strategies used for learning during the Dentistry ERE in several countries, including Brazil
Peres <i>et al.</i> , 2020 <sup>27</sup>	Describe and compare dental education experiences during the Covid-19 pandemic in three countries	Presents the teaching situation in 3 dentistry schools: Federal University of Paraíba (UFPB), Brazil, University of Pittsburgh (UP), USA, and Griffith University (GU), Australia	Different institutions have in common teaching based on online classes, but they differ in some strategies and tools	Portrays that the way dentistry and dental education are practiced have changed with the Covid-19 pandemic
Spalding <i>et al.</i> , 2020 <sup>24</sup>	Expose different possibilities of strategies and tools and analyze academic performance and student engagement	Descriptive, qualitative and quantitative study, of the type of experience report, from the adequacy of pedagogical strategies for remote teaching	Teachers sought emergency solutions to continue activities and recreated an educational model, with active digital teaching methodologies	There was student engagement and performance

#### 4 DISCUSSION

Before starting the discussion about the overview of the impact of the pandemic on the teaching of dentistry in Brazilian higher education institutions, it is necessary to understand the historical context of

nonclassroom teaching prior to the pandemic, in addition to the legal guidelines for the institutions after the pandemic was declared.

The National Education Council (Conselho Nacional de Educação-CNE), through Opinion 5/1997<sup>14</sup>, in the period prior to the COVID-19

pandemic, indicated that activities conducted in the classroom could be offered in other locations, if appropriate for theoretical and practical purposes. These activities could be included in the pedagogical proposal of the institution, with required frequency and guidance by qualified teachers. The objective was to go beyond the physical limits of the institution and stimulate the fullness of student training, allowing for new experiences<sup>14</sup>.

Regarding the regulation of remote learning, in 2016, outside the pandemic context, in Resolution 515<sup>15</sup>, the National Health Council (Conselho Nacional de Saúde-CNS) opposed the remote learning (RL) modality for health courses. In 2018, Ordinance 1.428/2018<sup>16</sup> of the Ministry of Education limited the workload of RL activities to face-to-face courses by 20%, but the ordinance did not apply to health courses. However, in 2019, still in a period prior to the COVID-19 pandemic, the Ministry of Education, through Ordinance 2.117/2019<sup>17</sup>, extended the workload of remote activities for face-to-face courses to 40% and included health courses, except medicine. Thus, it is understood that remote classes were already being legally recognized in Brazil in the period prior to the pandemic.

In April 2020, in the COVID-19 pandemic period, through Opinion 5/2020<sup>12</sup>, the CNE was in favor of remote activities for higher education, and RL activities could be computed in the mandatory workload of the courses. The performance of remote activities aimed to avoid a setback in learning and the loss of students' bond with the educational institution<sup>12</sup>. Subsequently, in Opinion 19/2020<sup>10</sup>, the CNE remained in favor of remote activities and exalted that the institutions have autonomy to regulate the reorganization of calendars and curricular replanning, provided that student learning and the recording of performed activities are ensured.

Nevertheless, it emphasized that the return to face-to-face activities should be gradual and in accordance with the protocols of health authorities, education systems, education departments and educational institutions<sup>10</sup>.

Considering the social isolation measures adopted to contain the spread of the virus, on March 17, 2020, the Ministry of Education, through Ordinance 343<sup>18</sup>, made an exceptional and urgent substitution of face-to-face classes for emergency remote education (ERE).

Faced with this scenario, it is necessary to differentiate the concepts of RL, ERE and hybrid teaching. RL is a teaching model structured so that all or part of a course is taught digitally; its main characteristic is flexibility because its content is recorded and access is free for students, tutors and teachers; therefore, they may view it when they want and as many times as necessary<sup>19</sup>.

ERE is a model approved by the Ministry of Education on an extraordinary and temporary basis so that educational institutions can meet the initially proposed schedule for face-to-face activities, using the digital medium in the face of circumstances that prevent the gathering of students, such as in the COVID-19 pandemic. In this model, the face-to-face content is virtualized, and the classes can take place live at the same time scheduled for the activities that would be face-to-face, enabling interactions between students and teacher (synchronous communication), or they can be recorded and made available to students with free access, with no instantaneous student-teacher interaction (asynchronous communication)<sup>19</sup>.

Hybrid teaching is a mixed model in which students learn digitally and in person. Through the digital medium, students have control of the time, place, mode and pace of study, and through the face-to-face environment, the student is supervised by the teacher<sup>20,21</sup>. This model aims to

increase the active participation of the student in the teaching and learning process, with the teacher as the mediator<sup>20,21</sup>.

To understand the impact of the COVID-19 pandemic on Brazilian dental education, it should be noted that the dentistry program in Brazil is characterized by a theoretical and practical workload, the latter being allocated to at least 40% of the total course workload<sup>22</sup>.

Theoretical and practical activities gather students, teachers and patients in environments with a high rate of aerosol and droplet production, which could increase the risk of transmission of and infection by SARS-CoV-2<sup>5</sup>. As a result, face-to-face activities in most higher education institutions were suspended<sup>10</sup>, and the dental curriculum needed to be restructured to fit the ERE model<sup>10,12</sup>. Currently, infection rates for the new coronavirus for dentists are low, as long as biosafety recommendations are followed<sup>28</sup>, including necessary adaptations for clinics. For the teaching of dentistry, these recommendations can be found in the ABENO Consensus<sup>29</sup>.

There are several digital tools available to be used during dentistry ERE. These tools consist of *websites*, applications and platforms

that allow the production of content, the sharing of information in multiple formats and social interaction<sup>7</sup>. Examples are Google tools (Google for Education, Google Forms, Google Meet and Google Classroom), Zoom, Microsoft Teams, hangouts, WhatsApp, and YouTube, among others<sup>7</sup>. According to the literature, there are several advantages and disadvantages of using digital tools during ERE (box 1). In addition, Santos *et al.* (2020)<sup>7</sup>, through a systematic review, showed that some countries used different tools to teach dentistry, such as restorative procedures performed live by the teacher and student and interaction between teacher and student performed through virtual reality (VR). Iwanaga *et al.* (2021)<sup>24</sup> showed that conducting a 3D lecture using VR was a tool that allowed more detailed and simultaneous visualization of images and videos and that, compared to other tools, it better retains the attention of students. This seems to be an efficient tool that could be used in Brazilian dental education, but its applicability is not viable to the reality of Brazil, where access to computers and the internet is still a problem.

Advantages	Disadvantages
Maintains student learning <sup>7</sup> ; Flexibility of access times to content <sup>23</sup> ; There is no need to travel to the university <sup>23</sup> ; Reduces expenses with food and transport <sup>23</sup> ; Encourages students' independence and self-learning <sup>23,24</sup> .	Makes the practical development of students difficult <sup>23</sup> ; Makes it difficult to supervise the execution of activities by teachers <sup>23</sup> ; Reduces contact between teachers-students and students-students <sup>7,23,24</sup> ; Requires adequate and continuous training of the faculty <sup>23,24</sup> ; Lack of experience and difficulty in accessing computers and the internet can impair use <sup>23,24</sup> .

Box 1: Advantages and disadvantages of digital tools during the ERE

Despite all the overcoming strategies employed by Brazilian dental education institutions, they were not reflected in the scientific literature in the indexed databases. When searching the databases, several publications were retrieved that addressed the topic of the impact of social detachment generated by the COVID-19 pandemic on dental education and talked about the teaching tools used during the pandemic. However, most studies (76.5%) were conducted in other countries and therefore were not considered eligible articles in this review. Thus, there is a need for more studies on this subject so that it is possible to disseminate the experiences lived during the pandemic period and thus boost knowledge gain in dentistry.

Considering the effect of remote activities on undergraduate dentistry students during the COVID-19 pandemic, the study by Silva *et al.* (2020)<sup>25</sup> demonstrated that social isolation can reduce the quality of life of students. The authors emphasize that the activities performed promoted interactions between teachers and students and were considered fundamental for dental education during the pandemic. This finding corroborates the systematic review conducted by Santos *et al.* (2020)<sup>7</sup>, in which ERE was considered a good option to ensure dental education during the pandemic period.

Regarding the technologies and methods used to maintain education, although the study by Santos *et al.* (2020)<sup>7</sup> included 8 other countries in addition to Brazil, it was possible to highlight the importance of the teaching tools used and student engagement. ERE, in addition to being important for the maintenance of teaching, contributed to and reduced the anxiety of students and teachers<sup>7</sup>. They emphasized that the problems associated with ERE are deficient technological infrastructure and difficulty in replacing clinical activities<sup>7</sup>. This limitation of the ERE model was

also addressed in another study<sup>23</sup>, in which the practical activities developed were considered of low quality because the procedures were presented to students by videos and not performed by them<sup>23</sup>. Perhaps VR is the tool that is closest to the reality of clinical care; however, its implementation in Brazil is not feasible.

The available studies show that in general, ERE was satisfactory for the students, but in contrast, the teachers were challenged by the elaboration and diversification of learning and evaluation methods<sup>7,20,23</sup>. Spalding *et al.* (2020)<sup>20</sup> reported on the promising engagement of students in ERE but emphasized that digital tools do not solve the problems of education in Brazil and that there is a need to integrate them into the content to contribute to effective learning. Furthermore, Mendes *et al.* (2020)<sup>23</sup> reported that teachers, aiming to ensure the quality of teaching, make use of various exercises and activities that end up overloading not only the teachers but also the students. Corroborating these authors, Santos *et al.* (2021)<sup>7</sup>, through a systematic review, reported that in general, the students rated ERE during the pandemic as positive, although their opinion on the continuation of this model of education after the end of the restrictions caused by the pandemic is controversial, as most of the students (77.51%) evaluated *online* classes as ineffective<sup>7</sup>. It is observed, then, that student engagement and teacher overload during ERE does not contribute to a high level of understanding and learning through *online* classes.

With regard to planning to return to face-to-face activities, Peres *et al.* (2020)<sup>26</sup> described and compared this process in dental institutions in 3 different countries (Brazil, Australia and the USA). According to the study, in Brazil, biosafety has been widely discussed, and the greatest challenges are related to physical structures, the availability of human resources

and the acquisition of personal protective equipment. In the USA, there was a change in physical structures to ensure safe distancing between individuals to reduce the risk of infection by SARS-CoV-2. In Australia, clinical care had already returned, and although there were no structural changes in the environment, a rigorous biosafety protocol was established.

Given the above, although the COVID-19 pandemic has brought challenges to Brazilian higher education, especially to courses with an eminently practical matrix, such as dentistry courses<sup>22</sup>, it provided an opportunity, even through ERE, to revolutionize education<sup>27</sup>. Even though the restructuring of health programs in Brazil was already being legally discussed before the pandemic by the Ministry of Education and the CNE, the experience lived in a pandemic period allowed for their re-evaluation and restructuring, especially the dentistry program<sup>10,12</sup>.

## 5 CONCLUSIONS

Although the literature on the teaching of dentistry in Brazil during the COVID-19 pandemic is scarce, RL was important for the academic community, and ERE, through digital tools, was the most relevant strategy adopted. ERE, therefore, despite the limitation of remote access and teacher training for RL in Brazil, allowed the impact of the COVID-19 pandemic to be felt more mildly by the academic community.

## ACKNOWLEDGMENTS

The authors of this article thank the Pro-Rectorate of Extension (PROEX) of the Federal University of Juiz de Fora (Universidade Federal de Juiz de Fora-UFJF) and the Research Support Foundation of the State of Minas Gerais (Fundação de Amparo à Pesquisa do Estado de Minas Gerais - FAPEMIG) for their support.

## RESUMO

### **Impacto da pandemia de COVID-19 no ensino odontológico em instituições brasileiras: uma revisão integrativa**

A disseminação do Sars-CoV-2, agente etiológico da COVID-19, se tornou um problema de saúde pública de importância internacional. Dentre as medidas para conter seu espalhamento, está a suspensão das aulas em instituições de ensino. Assim, esta revisão integrativa objetiva apresentar um panorama sobre o impacto da pandemia no ensino da Odontologia nas instituições brasileiras. Foram realizadas buscas nas bases de dados Medline, LILACS e SciELO, utilizando-se descritores nas línguas inglesa e portuguesa. Foram recuperados 60 estudos, sendo 17 elegíveis para leitura integral. Destes, 4 estudos atenderam aos critérios de inclusão e exclusão. Observou-se que o modelo de Ensino Remoto Emergencial (ERE) por meio de ferramentas digitais foi a estratégia de ensino não presencial mais utilizada nas instituições brasileiras. O ERE permitiu que o impacto da pandemia de COVID-19 fosse sentido de maneira mais branda pela comunidade acadêmica brasileira, engajando alunos e diminuindo a ansiedade de alunos e professores. Por outro lado, a infraestrutura tecnológica deficiente no Brasil contribuiu para a dificuldade em substituir as atividades clínicas. Fato ainda exacerbado pela dificuldade de adequação da infraestrutura física das instituições durante o planejamento de retorno às atividades presenciais. Apesar de todas as estratégias de superação, desempenhadas pelas instituições brasileiras de ensino odontológico, estas não foram refletidas em literatura científica nas bases de dados indexadas. Assim, enfatiza-se a necessidade de trabalhos sobre esta temática, para que seja possível disseminar as experiências vividas durante o período pandêmico.

**Descritores:** COVID-19. Educação. Odontologia.

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