Strides Dev Med Educ. 2023 October; 20(1):179-186. doi 10.22062/sdme.2023.198754.1242

Original Article

Challenges, Opportunities and Future Directions of Dental Education in COVID-19 Pandemic: A Qualitative Study

Arghavan Etebarian[1], Leila Sadati[2], Somayeh Khoramian Tusi[3], Kamran Farjad[4*]

[1]Assistant Professor, Department of Oral and Maxillofacial Pathology, School of Dentistry, Alborz University of Medical Sciences, Karaj, Iran
[2]PhD in Medical Education, Department of Operating Room, School of Allied Medical Sciences, Alborz University of Medical Sciences, Karaj, Iran
[3]Assistant Professor, Department of Pediatric Dentistry, School of Dentistry, Alborz University of Medical Sciences, Karaj, Iran
[4]Doctor of Dental Surgery (D.D.S), Student Research Committee, Alborz University of Medical Sciences, Karaj, Iran

Received: 2023 June 24
Revised: 2023 September 28
Accepted: 2023 October 21
Published online: 2023 October 27

***Corresponding author:**
Student Research Committee, Alborz University of Medical Sciences, Karaj, Iran.
Email: kamranfarjad1996@gmail.com

Citation:
Etebarian A, Sadati L, Khoramian Tusi S, Farjad K. Challenges, Opportunities and Future Directions of Dental Education in COVID-19 Pandemic: A Qualitative Study. Strides Dev Med Educ. 2023 October; 20(1):179-186. doi:10.22062/sdme.2023.198754.1242

Abstract

Background: With the onset of the COVID-19 pandemic and the impossibility of face-to-face learning, universities sought alternative methods to continue education and adapt to the upcoming conditions. Although technology development and virtual education methods created many opportunities in dental education, these modern solutions were not free of problems.

Objectives: The current study explored the challenges, opportunities, and future directions of dental education from the experience of dental students, faculty members, and the dean of Alborz Dental School during the COVID-19 pandemic.

Methods: The current qualitative study was conducted in 2021 using the content analysis method and in-depth semi-structured interviews with faculty members and students of Alborz Dental School. Purposive sampling was implemented to collect data with maximum variability in the faculty and student groups. In addition, 19 semi-structured interviews were transcribed verbatim immediately after each interview. The results were analyzed using MAXQDA version 10 software through the content analysis method.

Results: The results of data analysis in the evaluation of challenges and opportunities of dental education from the experience of dental students, faculty members, and the dean of Alborz Dental School during the COVID-19 pandemic detected three emerging categories: opportunities, challenges, and future direction with subcategories of e-learning, clinical training, infrastructures, and personal life.

Conclusion: Despite creating new learning opportunities during the COVID-19 pandemic, faculty members and dental students faced many challenges. Therefore, identifying these challenges, taking advantage of opportunities, and using faculty members' and students' experiences and suggestions can improve the learning experience and quality of education during the post-pandemic era.

Keywords: Dental Education; COVID-19; Online Learning; Qualitative

Background

COVID-19 is a novel acute respiratory infection that started in Wuhan, China, in December 2019 and has spread globally. WHO declared COVID-19 a public health emergency of international concern (1). Coronavirus is transmitted via droplets and aerosols in human-to-human contacts, making it more likely to spread in gatherings (2). One of the most important ways to prevent COVID-19 is social distancing. Based on disease trends and governmental public health policies, many countries implemented lockdowns for their population and temporarily closed schools and educational institutions, which affected many students and instructors (3-5).

Dental curriculum changes follow a similar pattern in many countries. Lectures were switched online using different platforms, including video-based programs (like WebEx®, Zoom®, Jitsi®, Google Classroom, Google Meet, and Skype®), MOOCs (massive open online courses), Moodle (Modular Object-Oriented Dynamic Learning Environment), social media (like Facebook®, Instagram®, YouTube®, WhatsApp®, Telegram®) and

many more (6). Like most dental schools worldwide, Alborz stopped preclinical and clinical activities and focused on theoretical courses via national online platforms like Navid and Skyroom. Navid (7) is an online learning platform initiated in 2016. In Navid, instructors can share materials (text or multimedia), enable student collaboration and discussion, manage assignments and quizzes, and assign grades. Skyroom (8) is a web conferencing service that allows instructors to hold virtual classes featuring audio conferencing, screen and file sharing, and discussion sessions. This service was developed during the pandemic to substitute for international platforms like Zoom.

Students and staff members face many challenges via online learning worldwide. One of the most significant challenges reported in the literature was financial resources. The infrastructure needed for this sudden change was not affordable for many countries. Otherwise, technical problems like internet connection issues, inadequate computer skills of senior faculty members, lack of time and preference for old teaching habits, and lack of direct contact between students and faculties were another reason to resist new methods (9-12). However, adaptation to COVID-19 created many opportunities for dental students and faculty members, like improving personal skills and self-management (13). As Hasanzade et al. discussed, 86.4% of students were satisfied with the new online methods (14). Moreover, Alrashdi et al. reported comfort, accessibility, and flexible administration of educational content as advantages of e-learning (15).

Many countries like the ***U.S.***, Brazil, Italy, China, Jordan, and Chile discussed the impact of COVID-19 on dental education and the changes made (16-20).

Objectives

Due to the lack of classified experience in Iran and the significant impact of the pandemic on dental education, we aimed to explore the challenges, opportunities, and future directions of dental education from the experience of dental students, faculty members, and the dean of Alborz Dental School through a qualitative study.

Methods

Research Design: The present qualitative content analysis study was conducted after receiving the ethical confirmation code from Alborz University of Medical Sciences. Key informants were selected and interviewed among 283 dental students and 40 faculty members in March 2021. To enrich the data, we tried to include samples with maximum variability in the students (age, gender, academic semester, educational level.) and the faculty member's group (age, gender, experience, field of expertise, Medical Science education background.). Eight faculty members and 11 students were involved in this study. Interviews were performed during the lockdown and also after the dental school re-opening.

Sample and Data Collection: Semi-structured interviews with open-ended questions were conducted in person and online (according to conditions) through the Sky Room platform between April and November 2021, including the lockdown and re-opening period. The interviews began with questions such as the following:

- What is your idea on the opportunities and challenges of the COVID-19 pandemic in dental education?
- What are the possible solutions for the existing challenges?
- What measures can be taken for the future?

Furthermore, based on the answers received from the participants, a more detailed interview was followed under sequential questioning. The interviews ranged from 45 to 60 minutes, according to the participant's responses and experiences.

Data Analysis: The data was analyzed using the steps proposed by Zhang and Wildemuth via content analysis (21).

First, the researcher read each interview transcript several times to gain familiarity with the data and develop a preliminary understanding of the related concepts. The codes were compiled to form categories and subcategories using continuous comparison, evaluation, feedback, and interpretation. The dates were analyzed using MAXQDA version 10 through the content analysis method. The saturation point was reached after the 11th interview with students and the eighth one with faculty members. To strengthen the data, the researchers used Guba and Lincoln's credibility, transferability, dependability, and conformability criteria (22).

The credibility was promoted by prolonged engagement with participants and contact with them for a long time. During the study, the interview transcripts and the extracted codes were sent to the participants to ensure they were consistent with their experience. Furthermore, maximum diversity was considered for both groups (age, gender, academic semester, and years of experience) to enrich the information. Also, dependability and conformability were determined through a review of the data and peer code review in the data-gathering process. Regarding transferability, the characteristics of the participants and the study process

were described clearly and accurately so that other researchers could use them.

Results

Faculty members were between 32 and 50 years old (Mean 39.7). Seven were females (87.5%), and one was male (12.5%). Also, students were between 20 and 34 years old (Mean 24.8), of which four were female (36.36%) and seven were male (63.64%). Student participants were from the first year to the sixth year.

After analyzing and reviewing transcripts, 133 codes, eight subcategories, and four main categories emerged from faculty members interviews, and 123 codes, seven subcategories, and four main categories emerged from students interviews. The main categories, subcategories, and some of the primary codes are shown in Tables 1 and 2.

The following section describes the main categories and subcategories extracted from Faculty members' interviews.

1. Opportunities

This category comprises two subcategories, "Advances in E-learning" and "Self-improvement."

The interviewees expressed opportunities for virtual learning during the pandemic. Many interviewees believed that educational justice could be achieved by high-quality educational content that can be shared worldwide. Also, E-learning can provide more opportunities for students *("commuting in big cities can waste the time of the students, saving this time can help students to focus more on studying," said a 46-year-old female faculty member).*

Table 1. Emerging categories and subcategories from faculty members interviews regarding Challenges, Opportunities, and Future Direction of Dental Education in the COVID-19 pandemic

Main Categories	Subcategories	Primary codes
1. Opportunities	Advances in E-learning	Time-saving
		Educational justice
		Flexibility
		Self-learning
		Social media usage
	Self-improvement	Enhanced creativity
		Improved *I.T.* knowledge
2. Challenges	New to E-learning	lack of interactions
		I.T. skill shortage
		Learning content copyright
		Cheatings
	Insufficient clinical training	Decreased number of patients
		Poor clinical skills
		Lack of clinical education substitutes
	Lack of infrastructures	Internet access
		Lack of domestic content creation tools
		Undermanning content creators
		Online platform problems
	Personal struggles	Lack of modern technology
		Contracting COVID-19
		Learning loss
		Increased workload
		Time management
3. Future Directions	Accepting E-learning	Blended Learning
		Updated learning contents
		Using new technologies
		Providing infrastructures of modern lab training
		Instructor/ Teacher assistants
		Implementing faculty empowerment programs
	Transformation in clinical education	Extending school working hours
		Small group training
		Providing *P.P.E.* to staff and students
		Using simulation and mannequins

P.P.E: Personal Protective Equipment

Table 2. Emerging categories and subcategories from students interviews regarding Challenges, Opportunities, and Future Directions of Dental Education in the COVID-19 pandemic

Main Categories	Subcategories	Primary codes
1. Opportunities	Advances in E-learning	Time-saving
		Flexibility
		Easy access and higher-quality content
		Using social media
2. Challenges	New to E-learning	Lack of face-to-face interactions
		Limited library access
		Learning loss
	Lack of clinical training	Decreased the number of patients
		Poor clinical skills
		Fewer faculty members in the clinic
	Difficulties in personal life	Contracting COVID-19
		Learning loss
		Low self-confidence in clinical practice
		Prolonged Study duration
		Priorities modification
		Family adaptability
	Lack of infrastructure	Internet access
		Online platform problems
3. Future Directions	Future of E-learning	Blended Learning
		Using new technologies
	Working on clinical training	Extending school working hours
		Reducing treatment costs
		Adding supplementary courses

Although some faculty members believed that students were not ready for E-learning, others believed that virtual education and content strengthened students' self-learning skills and trained them to become more knowledgeable. Such a phenomenon changed teacher-centered learning to student-centered learning. Another opportunity was to use the potential of social media for communication and education, which was experienced more during this period.

Based on the faculty members experience, new conditions forced them to improve their skills and creativity to use social media for better connections and incorporate new teaching methods, such as related videos and other available E-contents. Maybe these skills would not be strengthened to such an extent in everyday situations and face-to-face learning *("… shifting to online learning created the opportunity to consider the potential of multimedia to deliver virtual content, said a 40-year-old male faculty member").*

2. Challenges

This category consists of four subcategories, "New to E-learning, "Insufficient clinical training," Lack of Infrastructures, "and "Personal struggles."

Faculty members stated challenges in E-learning include maintaining the copyrights in educational contents, reducing the faculty member-student interactions, and cheating in the virtual exams *("this type of student evaluation created fake grades that were not reliable feedback of their knowledge level." said a 41-year-old female faculty member).* In addition, the faculty members were unfamiliar with virtual content creation software at the beginning of this era, as a 36-year-old faculty member said *("We were not very familiar with the virtual system … We did not know how to create suitable educational content").*

According to many interviewees, clinical education was one of the essential areas severely affected during the pandemic. Many patients postponed their dental treatment because they feared contracting COVID-19. As a result, the number of patients decreased significantly after the school re-opening. On the other hand, there were few alternative methods to compensate for this shortage in clinical training. As a result, students faced many problems. They did not acquire the necessary practical skills *("Unfortunately, the experience of close contact, hands-on training, and interaction with the patient is an important point that had been lost*

during the pandemic," said a 36-year-old female faculty member).

Regarding educational infrastructure, the interviewees mentioned the lack of native content creation software, content creation support team, modern technologies, technical problems with our native virtual systems (NAVID and Skyroom), and difficulties accessing high-speed Internet in Iran. Most faculties faced many issues with internet access and could not easily upload their content or hold online classes. In addition, problems such as limitations in uploading contents, system logging difficulties, concerns about sharing contents, and inability to supervise students learning were mentioned *("There are some modern learning tools such as virtual patient and students can practice a range of dental preparations. Unfortunately, these facilities are not available in Iran" said a 46-year-old female faculty member).*

Many faculty members shared similar concerns. The decrease in students' learning due to virtual education and the risk of students contracting COVID-19 were among the problems they mentioned. *(A 32-year-old female faculty member told us, "The main concern is that students get infected by the coronavirus from their patients.")* Higher workload and challenges in time management were also among other issues during this era *("Checking students assignments took much time from me, after a while I began to schedule one of my weekdays for feedback and could manage the process better" said a 33-year-old female faculty member).*

3. Future Directions

This category comprises two subcategories, "Accepting E-learning" and "Transformation in clinical education".

Future directions were expressed in virtual education, including using new technologies, having teacher assistants and *I.T.* team support, continuously updating educational content, and the faculty members' empowerment programs. Faculty members believed that to create perfect E-content, they must work hard as educational designers, *I.T.*, and content professionals *("Not only working with a supporting team including teacher assistants will ease our workload, but also enhance the quality of learning," said a 46-year-old female faculty member).*

Faculty members suggested extending the school's working hours during the re-opening period. They also recommend conducting small group activities, providing *P.P.E.* for students and faculty members, and using modern simulators and mannequins for training and clinical activities, as a 40-year-old male *faculty member* said *("Simulators are new and helpful technology that can be implemented during the lockdown").*

This section describes the main categories and subcategories extracted from students' interviews.

1. Opportunities

This category consists of one subcategory," Advances in E-learning."

Like faculty members, students also mentioned opportunities for dental education during the pandemic. According to interviews, with E-learning, they could study whenever they wanted, less commuting, and have more time to learn. Based on one of the interviewees, social media was also helpful during this period *("Several faculty members opened up a topic in WhatsApp groups, then they started to discuss and ask questions," said a 25-year-old female student).* They also mentioned better access to high-quality educational content. As a 22-year-old male student mentioned, students grades increased in various subjects.

2. Challenges

This category consists of four subcategories," New to E-learning, "Lack of clinical training," Difficulties in personal life, "and "Lack of Infrastructures".

On the other hand, many students stated that E-learning had reduced their learning and productivity due to the lack of interaction with the faculty members and problems such as lack of library access.

One of the primary students concerns in this era was clinical education. Due to social distancing, the number of faculty members and patients in each department was low; therefore, students faced problems with clinical training *("In the time of school re-opening, we had problems finding patients, which affected our clinical training." said a 24-year-old male student).*

Most students are worried about themselves or their families getting infected with COVID-19. In addition, most students were deeply concerned about their lack of hand skills during the lockdown *("I may not have acquired the skills I need, and I do not have confidence treating patients," said a 24-year-old male student).* One of the interviewees also mentioned his concern about continuing the pandemic and prolonged study duration. For some students, it was difficult for their families to adapt to the new conditions, and they could hardly keep the home environment quiet for studying or online classes. The students priorities were also modified, and instead of studying, many did their tasks and entertainment during the school closure. An interviewee from the first year stated that due to the quarantine, he did not have the opportunity to get to know the school

environment and his peers *("Due to lockdown, I wasn't able to meet my peers and experience the school atmosphere" said a 20-year-old male student).*

Internet access was also challenging for students during this era, and many had problems participating in online classes or accessing educational content. Our native platforms were not ready enough, and students faced many technical issues using them. In addition, due to filtering and sanction problems in Iran, we did not have easy access to other international platforms such as Zoom or Moodle.

3. Future Directions

This category comprises two subcategories, "Future of E-learning" and "Working on clinical training."

The use of new technologies for teaching, was among the suggestions made by the students for the future. *("One of the ways for long-lasting learning is to upload the content offline first, then hold an online class to discuss and resolve the learning problems based on those offline sessions," said a 34-year-old male student).*

Also, students suggested that the school working hours should be extended with the re-opening, and additional clinical courses could be programmed to compensate for any lack in this field. Also, the number of patients could be increased if the treatment costs are reduced.

Discussion

The COVID-19 pandemic has affected the academic community and dental education. Faculty members and dental students worldwide faced many challenges in adopting E-learning. Still, despite the challenges, they have shown remarkable adaptability, and the pandemic has created many opportunities for dental education (6).

In the participants opinion, E-learning helped students study high-quality content whenever and wherever they wanted and guided them to international barrier-free content, especially in developing countries. Likewise, Chang et al. stated that collaboration among dental schools worldwide could make the best instructors around the globe available, and it is a big help for schools with a lack of teaching staff, especially in developing countries (6).

In our study, students and faculty members reported that using social media provides an environment for interaction and learning theoretical courses and believed social media could be used to enhance learning quality. Further, Sachin et al. suggested that WhatsApp can improve students performance and clear their doubts much faster, thus speeding the learning process (23). One of the opportunities mentioned by Loch et al. was infection control improvement in dentistry during the COVID-19 era, which can prepare us for future pandemics (24).

As mentioned by interviewees, lack of interaction and difficulties in monitoring students, *I.T.* skill shortage, national platforms problems, internet connection problems, and learning loss were among the challenges in implementing E-learning. Other authors have reported unaffordable modern educational hardware and software, internet connection issues, inadequate computer skills, preference for old teaching habits, decreased sense of presence, and psychomimetic effects of 3D software (9-11). Hung et al. also reported that the pandemic affected the mental health of students and faculty members, such as concern and anxiety about financial instability (25).

Another critical challenge that all the participants mentioned was clinical and preclinical training during this time. They believed students couldn't develop practical skills during the lockdown and school closures. The number of patients in school was low; furthermore, there wasn't a suitable substitute for these clinical courses. However, faculty members used videos, virtual journal clubs, and case reports to deliver these courses. Modern simulation technology could have helped students and faculty members experience less challenge. Simulation technology brings a variety of possibilities for clinical education and can be considered an effective method during the pandemic (26); therefore, dental schools must invest in these modern technologies.

All students and faculty members stated concerns arising from COVID-19. They were worried about contracting COVID-19 and their families well-being. Students were also concerned about delayed graduation, insufficient practical skills, and their future careers. Moreover, Deery et al. reported that poor mental health status negatively impacted students learning during the pandemic (27). In this case, students can benefit from school-supportive psychological counseling.

Participants made some suggestions to improve educational quality during COVID-19 and beyond. Faculty members described getting help from an *I.T.* supporting team that can edit and upload educational content and having teacher assistants send feedback to students assignments could have saved their time and enhanced the E-learning experience for students. Students and faculty members recommended extended clinical and preclinical programs and blended learning for theoretical courses to benefit E-learning

opportunities. Further, Ghai et al. suggested that dental schools must consider high-standard infection control protocols for students' and faculty members' well-being (28). It is believed that students and faculty members could benefit from changes in courses like infection control in the dental curriculum and prepare for upcoming pandemics (29).

Finally, COVID-19 taught us that teaching and delivering courses should not always be in person and face-to-face. The dental educational curriculum should be more flexible and modified to adapt to crises like pandemics. This modification in the dental curriculum has to be beyond the COVID-19 pandemic, and all students must be trained for any other crisis in the future. At the time of writing this article, Iran's Ministry of Health and Medical Education has officially implemented E-learning in the dental curriculum and clearly defined the aims and means of this method in each of its theoretical and clinical courses.

Conclusion

This qualitative study captured the expressive information of faculty members and students on challenges, opportunities, and future directions of dental education during the COVID-19 pandemic, including new insights on E-learning, clinical training, infrastructures, and changes in personal life. Regardless of the obstacles, the pandemic created many options, such as boosting E-learning, that would not be possible without this sudden shift. All faculty members need to embrace lessons learned from the pandemic and focus on new methods that could be implemented for more adaptive, dynamic, and creative learning. These steps can be the beginning of flexible learning and a significant change in the future of dental curricula worldwide.

Acknowledgements: We sincerely thank all the faculty members and students who participated in this study. We also appreciate the Clinical Research Development Unit of the Dental school, Alborz University of Medical Sciences, for its technical and financial support.

Conflict of interests: The authors declare that they have no competing interests.

Ethical approval: The Alborz University of Medical Sciences Ethics Committee approved the study protocol. All methods followed relevant guidelines and regulations, and informed consent was obtained from all subjects.

Funding/Support: Included in submitted data. (Alborz University of Medical Sciences, Iran).

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