

Impact of COVID-19 Pandemic on Dental Education, Research, and Students

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ABSTRACT

The coronavirus (COVID-19) has challenged healthcare professionals and those in dental education, evoking various response methods worldwide. This article will address the possible impacts of the outbreak on dental education and its methodologies, clinical research, and psychological impacts on students. This is conducted through an in-depth review of the available literature on the relevant aspects of the field. Although the COVID-19 pandemic has caused many difficulties in providing clinical dentistry, dental educators are provided the opportunity to modernize their approaches to appropriate pedagogy via using new digital concepts as well as enhancing online communication and usage of learning platforms. Proper preparation for a potential second wave or another virus should be undertaken. The COVID-19 crisis has also shown that there is a severe underestimation of the role of the facilities and innovative technologies for e-oral health education and services, as well as tele-dentistry.

Keywords: COVID-19, dental education, dental public health, dentistry, e-oral health

INTRODUCTION

Originating in Wuhan, China, in December, 2019, COVID-19 is a novel disease which spread to many countries across the world in the last few months.^{1,2} The COVID-19 pandemic has forced the world into a health and economic crisis. Different countries have established different forms of quarantine, interrupting numerous ordinary routines and affecting work, free movement, trade, and, in particular, education.³

Regarding dentistry, clinical preparation by dental professionals via protective and infection control elements should be considered by dental staff.⁴⁻⁶ However, very little is known of how dental education and research is affected.

This review of COVID-19's impact on education was initially based on the limited literature publications pertaining to this topic. However, the official websites of

many dental schools and dental education organizations worldwide were mainly researched.

Challenges and impact on dental education

Shortly after announcing the need for "social distancing" and reducing all face-to-face contact such as teaching and training programs, the immediate impact of COVID-19 on the field of dental education was observed quite early due to the significant impact of the pandemic.^{7,8}

Worldwide, colleges have been facing the devastating COVID-19 pandemic outbreak. Lockdowns in pre-clinics and clinics, limited to no access to clinical learning opportunities for students, and no available treatment for patients in faculties' clinics are just some of the challenges faced in dental education. The list of problems further includes millions of losses in revenue sources; economic instability;

collapse of research programs and grants; suspension of academic conferences, graduation ceremonies, and ceremonies of convocation; and dramatic shifts in pre-planned projects and activities. Moreover, COVID-19 influences recruiting new academics and scientists, causing psychological impacts on students and faculty.⁹

Although there are many parallels between global dental schools in handling the pandemic from an academic viewpoint, nations differentiate between their policies and guidelines of national agencies, the degree of infection spread, and the access to faculties and other tools.¹⁰

Many dental schools in the U.S. have discontinued clinical practices except for emergencies, while others conduct social distancing in their laboratory preclinical simulation activities. Simulation of mannequins is often difficult for those schools that do not have the option to teach online considering the time, manpower, and technology needed for instruction. Virtual reality devices and haptic technologies are not portable and thus cannot be used at this time.¹⁰

However, this pandemic has produced many academic strategies within the dentistry faculties to preserve guidance in the academic year's continuity. Since dentistry is primarily a profession in clinical practice, the use of strategies in virtual learning remains as a challenge for universities around the world. Nevertheless, academics include the use of virtual simulation methods and online learning applications.¹¹

Dental education is indeed a critical profession that requires a lot of preparation on the part of educators, not only in the various specialties of the discipline, but also with specific teaching and learning methodologies.¹⁰

Although direct and open communication with tutors, peers, and the relevant educational team has proven to increase the level of trust and cooperation,⁷ most regulatory bodies globally advised the

higher education institutions to prioritize safety and wellbeing of their students and staff by ceasing all on-campus teaching.

The American Dental Education Association (ADEA) led with regard to recommendations for teaching modalities such as online education and other creative teaching methods. This in turn connects faculty and administrators on the ADEA to share ideas and resources to implement during these times.¹⁰

Both dental schools and post-graduate teaching providers subsequently halted their daily face-to-face teaching, hands-on laboratory training, and clinical training under supervision. Therefore, they necessitated alternative modes of presentation and assessment teaching through written online reports, multimedia workshops, problem-solving sessions, webinars, and computer-based exams.⁷

Preclinical and clinical training is of utmost importance for students, as it is during this stage that the students learn various manual and cognitive skills that prepare the students to enter the dental profession.

Providing face-to-face activities with the students stands as an obstacle. Therefore, all those methodologies requiring direct interaction with students are no longer valid.

Using the internet enables communication between academics and students through virtual libraries, emails, chatting, and video conferencing webinars and telecommuting allow a better suited way of education.

In the case of China, all students were expected not to return to school until further notice. Students are expected to return online after the Chinese Spring Festival.⁸

However, direct patient treatment, a central component of the dental program, was postponed. None of the virtual sessions are able to replicate the near patient experience, along with extramural rotations which were also cancelled.¹⁰

Dentistry faculties around the globe have moved onto a virtual field. Innovative

communication technologies were developed to educate and interact with staff and students about remote service and crisis-related strategies to sustain interconnections, whilst improving mental health by minimizing the sense of isolation. Security measures such as emergency funds were also created to assist students and to continue instructional activities.

At this time, these technologies enable many schools to teach dentistry ensuring the achievement of the learning outcomes associated with all skills required. Nonetheless, a sufficient amount of face-to-face practical hours with simulation models or clinical training on real patients is no longer a valid option for the acquisition of skills and manual skills.

The progress of practical activities should undoubtedly be postponed and wait until the quarantine state is ceased in each country and education can return to normalcy.

In this pandemic, scientific progression and evolution is a severe difficulty for academics, as well as exploring methodological methods beyond the classroom to keep the student motivated.

With modern technology, students have access from home to the contents of each lecture, thus avoiding attendance to decrease the risk of spreading infection. In some forms, e-learning facilitates self-learning among students and further adapts their style of informational acquisition.¹²

The main aim of dental education is to train independent dentists to effectively and safely treat their patients. Outstanding manual dexterity and fine motor skills are skills that must be attained by the students. Teaching these skills to the required level is arduous given that the time and resources available are limited.⁷ Undergraduate training in simulation settings was also used to promote the transitioning into dental clinics, to improve the preclinical experience via integrating a wide variety of realistic patient scenarios and exercises. Virtual reality (VR) is bringing a range of educational opportunities in dental schools,

offering continuous on-screen integrated feedback on the trainee's results to both the students and the tutor.⁷

This recent advancement of haptic technology has fitted the VR simulators with the ability to provide tactile feedback that allows the trainee to feel and touch virtual teeth. VR simulation has proven to be the most efficient method of teaching within a simulation scenario, according to research, and when paired with an experienced instructor, real-time feedback certifies and strengthens this methodology.

Improvement in hand-eye coordination, fine motor skills, and reflective skills for the students, is particularly proven in the very early stages of skill acquisition and leads to a conservative preparation approach and better retention of skills. It can therefore be suggested that VR simulation technology is a valuable resource to traditional dental training methods to be considered during the COVID-19 pandemic to enable distance learning.⁷

The Association of Dental Education in Europe (ADEE) has consistently advocated for high quality dental education, promoting the central role that Oral Health Professionals can have in public health. Dental schools in Europe limited many activities in their clinics, with access mainly permitted for managing only emergency dental treatments or urgent, non-delayable dental treatments, with a preference to provide dental care for vulnerable patients. In dental hospitals, 96% of clinical work was performed by the senior staff with some participation of postgraduate students (30%), while undergraduate students were being asked to help only in non-clinical activities (11%). For replacing the planned materials of non-clinical teaching, all the schools that reported restriction of access to academic buildings planned to provide or were already providing online teaching. Ninety percent of schools reported using online pedagogical software tools, with 72% using live or streamed videos, organization of virtual meetings (65%), links to other

online materials (48%), and also less frequently small-scale working groups, social media groups or journal clubs. For examinations and assessments, the lockdown has led dental schools to organize examinations entirely online (50%), postpone formative assignments (46%), or defer summative assessments (42%). Some schools still wish to have some examination elements held in person (19%). However, most schools (72%) were considering a postponing of the evaluation of required clinical competences for the students. Changes in assessment schedules or extension of program dates, particularly with regards to clinical hours rather than reduce the clinical requirements in order to graduate are planned to provide efficiency and ease to the students.¹¹

In addition, the perception of virtual learning for dental students should be investigated to ensure a positive effect, allowing this virtual learning tool to keep the student attentive and motivated. Tools such as mobile applications and demonstrative videos of various preclinical and clinical learning methods could be an effective solution to keep the theoretical development up-to-date. All academic's implementation of these tools could ensure the quality of education.

Conversely, examinations have been modified, and requirements adapted for successful graduations. Residents and academics at affiliated hospitals work with other health care professionals on the frontlines of patient care, and thus put their own health at high risk.^{4,10} In addition, various ongoing virtual education, academic and non-academic activities were maintained to guarantee the safety and well-being of those in the professional field of dentistry alongside students and the allied oral health care workforce.^{8,9}

At Queen Mary University of London, Barts and The London School of Medicine and Dentistry, all patient treatment for undergraduate and postgraduate students was terminated on 16 March, 2020. Non-clinical teaching soon

shifted to online sites, as was the case at other universities.⁴

All Italian schools and universities suspended teaching activity on 24th February, 2020 to minimize infection spread. Thus, universities and those in similar high-risk areas should consider using online web-based teaching.¹²

The American Dental Association (ADA) has encouraged dental practitioners to pursue dental treatment only for patients on an emergency basis, with only 9 states currently having no restriction laws against dental practice.¹³ This leaves clinics in dental schools closed for students, while they are primarily limited to faculty emergency care.

This has resulted in a dental program that is entirely virtual.⁵ The virtualized curriculum plan is tied to be expected COVID-19 duration. While dental clinics and schools plan to reopen immediately after their respective states have issued guidance, it is important to recognize the potential need to broaden the virtual curriculum in some way to accommodate the financial situation caused by the pandemic.¹⁴ As of February 17, dental students in China began studying online; through the use of online seminars, case studies, assignments, and problem-based learning tutorials. Current smart devices and applications have already allowed students to listen to lectures and review them whenever and wherever possible, therefore encouraging education autonomy.⁸

Impact of COVID-19 on dental research

The COVID-19 outbreak notably resulted in the cancellation of the March 2020 conference of the International Association of Dental Research (IADR) in Washington DC, USA, one of the largest international dental research events.⁷

Due to mandatory government and institutional policies limiting non-essential research activities, suspension of most laboratory-based dental research projects and postgraduate student research projects was unavoidable. Consequently, some dental researchers changed their focus to

off-campus and electronic study means such as conducting literature reviews and online surveys.⁷

However, it has launched many research projects with a focus on COVID-19 and related dental issues.^{4,10}

Psychological impact of COVID-19 on dental students

It should be noted that during the COVID-19 crisis, students may suffer from depression and be negatively affected by the fear of being infected with the virus. Therefore, the need for counselling services and psychological help should increase following the COVID-19 pandemic.⁷ A recent publication highlighted the thoughts of the dean of the dental school at Queen Mary University in London about the COVID-19 outbreak and his approach to managing it.⁴ It was reported that initiative was taken on the basis of moral judgment to cease all patient care for undergraduate and postgraduate clinics in order to save the lives of students, staff and patients, which in turn prompted further discussion on this subject.⁴

Inevitably, dental students were anxious due to the high viral exposure to frontline medical personnel involved in disease incidences and deaths, especially of doctors and medical students. The high volume of patients has put many dental students and the dental team at risk.⁴

Instinctively, dental students have set up support and volunteer groups despite their own immense anxieties regarding their academic research, evaluation, and accommodation.⁴

In China, around a quarter of college students have experienced anxiety due to the circumstances of the outbreak. As a result, government and schools were incentivized to work together to address this problem and provide high-quality, timely psychological services to college students.^{8,15}

In Europe, concerning the management of student and academic staff stress, it appeared that almost 30% of the responding schools at the time had no COVID-19 specific support. The types of

support provided were mainly for students or staff with an academic contact or emergency phone number. However, web pages for support or discussion via online meetings were less frequently offered to students.¹¹

Possible positive impact of COVID-19

The rise in international and national interactions between universities and the growth of cooperation is substantial.⁴ Dentistry faculty not only operate in educational and academic institutions, but also small hospitals and operating companies with high costs of maintenance and service. The contributions they provide are significant to the health and well-being of the community and the economy as a whole. Offering oral health care services and stimulating the economy, by organizing students, educators, and workers, domestically and internationally, as well as helping industry and businesses thrive, the impact of these faculties cannot be ignored.⁹

The internet is a powerful resource for reaching millions of people in different geographical regions and serves as an engine to continue education. During this period of COVID-19 isolation, there is an opportunity for dental students and practitioners to build and retain the theoretical and clinical dental expertise through many educational instruments.¹⁶

Whether it be research in dentistry, university-based patents, strategic innovation partnership, deployment, or usage of new technology in academic institutions, coupled with start-ups and ventures by students, these are all important factors to benefit the peoples and economies around the world.

CONCLUSIONS

The COVID-19 outbreaks make providing clinical dentistry and education within the field a difficulty. However, dental educators now have the capabilities and technologies to modernize their approaches of teaching by adopting new digital concepts to amplify communication online.

Proper preparation for a potential second wave or another virus should be undertaken. The COVID-19 crisis has also shown that there is a severe underestimation of the role of the facilities and innovative technologies for e-oral health education and services, as well as tele-dentistry.

The pandemic will leave a lasting transformation in dental education, with the evolution and advancement of research protocols, tele-dentistry, and clinical trials with flexible approaches to solutions. The effects of the pandemic are profound and may forever change how future dentists are educated.

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