

CHAPTER 14

ADVANCES IN DENTAL EDUCATION DURING AND AFTER THE COVID-19 PANDEMIC

Vahti Kilic

*(Asst. Prof.), Department of Restorative Dentistry, Faculty of Dentistry,
Firat University, e-mail: dt.vahtikilic@gmail.com,
ORCID ID: 0000-0003-4653-3729*

INTRODUCTION

Coronavirus Disease 2019 (COVID-19), which first appeared in Wuhan, China in December 2019 and spread all over the world and was declared as a pandemic by the World Health Organization (WHO) in March 2020, still continues to affect the world. The virus causing this disease transmitted from person to person by droplet, aerosol or fecal-oral route and manifests itself with viral pneumonia is called severe acute respiratory coronavirus 2 (SARS-CoV-2; formerly 2019-nCoV). Although the effects and course of the disease differ from person to person, common symptoms are fever, dry cough, myalgia, shortness of breath, weakness, confusion, loss of taste and smell, headache, sore throat, vomiting and diarrhea. In reference to the latest figures (17 March 2021), a total of 120.38 mil. people were caught the disease and 2.66 mil. people died. Countries have resorted to prohibitions such as various restrictions and quarantine methods as a result of this disease, which has caused many deaths and health problems around the world since its onset. Daily living standards and routines have changed, and such standards have been replaced by new lifestyles including social distance rules. In many countries

around the world, these restrictions and rules are preserving their continuity.

As a result of this disease, dental practices and dental education have been affected as well as other fields. The situations such as droplet diffusion, inhalation and contact of oral, nasal and eye mucous membranes of respiratory secretions and oral fluids during dental practice; direct contact with blood, oral fluids, and other patient materials insufficient social distance; the aerosol spreading into the air posing a risk for cross infection may be a problem in terms of the spread of SARS-CoV-2 infection. Therefore, with the emergence of the pandemic, as in most countries, as a result of many legal and scientific regulations in accordance with the recommendations of Consultative Board of Coronavirus of Ministry of Health; a circular was issued by the Ministry of Health of the Republic of Turkey on 17.03.2020 in order to only perform urgent and compulsory dental treatments and postpone non-urgent procedures. As a result of this circular, while the emergency procedures related to dental health continued to be carried out, routine and elective procedures were suspended. Like dental practices, dental education has also been interrupted in terms of both theoretical and practical applications during this period. The aim of this study is to address the COVID-19 pandemic and its subsequent changes and developments in dental education.

COVID-19 AND DENTAL EDUCATION

Dental education generally consists of three stages all over the world. The first of these stages is the theoretical courses applied to ensure the theoretical knowledge of the students and to create a problem-based learning model for them; the second is preclinical applications, where preliminary experience is gained by working in models and simulation laboratories before proceeding to clinical practice and patient treatment, and the last one is the clinical applications involving the diagnosis and treatment performed by the student on the patient. During the Covid-19 period, difficulties were occurred in all three stages of dental education.

Theoretical Education

The theoretical part of dental education has also been affected by the COVID-19 pandemic, as all educational units around the world have been affected. Face-to-face education was suspended in order to reduce the spreading rate

of the pandemic, to overcome the anxiety of the students and the uncertainties about the pandemic. For this reason, postponements were made in the current academic calendars and extra intersessions were put forward. With the onset of the pandemic, distance education has replaced face-to-face education all over the world. Although the distance education model was not a method adopted for dental education before COVID-19, its popularity increased with the pandemic. During this period, dentistry faculties around the world have developed various methods in order not to affect the dental education that provides the academic competence of undergraduate students. It has been reported that with the pandemic, many dentistry faculties in Europe planned or implemented an online education model to replace educational materials in the period when access to academic buildings was restricted. Firstly, online courses, case studies, and problem-based learning techniques have been applied in order not to gather individuals together as much as possible, especially during pandemic periods, and to reduce the risk of infection associated with this.

Distance education enables the student, who is not physically present in the classroom, to learn about the subject. With the purpose of distance education applications, institutions have obtained digital programs in agreement with some digital program providers. Thanks to these programs, the lecturers had the opportunity to teach their lessons to the students both live (synchronous) and asynchronously, which allows the course recordings to be accessed later. Apart from these programs, applications such as lectures, case discussions, discussion of scientific articles and reviews were performed interactively using video conferencing programs (Zoom, Google Meet, Skype, etc.). With the pandemic, the use of these applications and the number of their users have increased rapidly. For example, the number of users of the Zoom application has increased by about 30 times from December 2019 to April 2020. While conducting the lessons live has advantages such as direct interaction with the students, participation in the lesson and instant feedback; the other method (course recordings) offers the student the right to benefit by repeating it as many times as he/she wants. Studies have reported that synchronized or asynchronous courses give contradictory results in terms of preferences and there is no consensus on which one is more effective. However, it has also been stated that synchronously interactive distance dental education can be as effective as traditional face-to-face education. In addition to the courses, the midterm and final exams of the related courses have also started to be held online. During the exam, browser options have been developed that prevent

the student from searching for the answer to the question in the new tab and cheating. Technology-mediated approaches to this education provided an active learning environment for dentistry students and yielded positive results in terms of education and training. In the literature, it has been reported that online education is as effective as traditional face-to-face education and gives positive results. Using online distance education in environments where traditional face-to-face education cannot be provided can be advantageous at such times and offers an interactive sharing opportunity among the participants. The desire of dental professions and their students to take live online courses and classes shows that this mode of education has great potential for learning in the future.

Although online distance education has a very important place in theoretical dental education, it also has some handicaps. Distance online education is different from traditional face-to-face education and therefore some requirements are needed for this mode of education to be successful. The lecturer and the student should have knowledge about hardware technology, internet connection, and the use of media tools. In one study, it was reported that the distance education process was affected by students' basic computer skills and internet access. In addition to the necessity of having the same conditions, part of the responsibility normally undertaken by the lecturer passes to the student in distance education and the student may have motivation problems in distance education. Therefore, distance online education may not be suitable for all students. Since interaction plays an important role in distance education, arrangements should be made considering the needs of the student and it should not be forgotten that the number of participants is important in terms of interaction. As institutional support is necessary for the success of distance education; the institutional strategy should be designed to facilitate the adoption of basic skills and methodologies by faculty members.

In the COVID-19 process, the use of education blended with online distance education or hybrid education model has also gained importance. This education model means supporting face-to-face education in traditional and indispensable classrooms and laboratories, as a complement and reinforcement, from online platforms (lecture or lab videos, use of social media platforms, etc.). In a study, dentistry students wanted online education to be used together in a supportive way instead of replacing traditional education. Nevertheless, in order to prevent the spread of infection, this form of education is generally used in preclinical and clinical education rather than theoretical education. In addition, some dentistry faculties make the exams of the

relevant courses face-to-face in small-group classes, considering the social distance rules.

As a result, in the period of COVID-19 and the process we are in, which is called the “new normal” and in the near future, theoretical dental education is generally being carried out and is planned to be continued in the form of online distance education in the world and in our country.

Preclinical Practical Education

Preclinical education, which is taken together with theoretical education in dental education, is one of the most important parts. In general, the first three years of dental education are intensive in terms of the practical lessons taken in preclinical laboratories. Before clinical education, preclinical education is used to improve students' psychomotor skills, to increase the skills and competence of students on these models and to minimize the harm that can be given to the patient in the clinic. The lecturer aims to improve the professional skills of the students with training slides, videos and anatomical models, artificial jaws and phantom head and jaw models, demonstrations on extracted teeth prepared for this course. After the lecturer's necessary knowledge and demonstration processes, the student imitates the lecturer by using this knowledge and practical knowledge on models and improves her/his skills.

Although the theoretical dental education can be taught online with distance education, it is very difficult to receive preclinical education by distance education. In order to prevent crowds due to the emergence of the pandemic and violation of social distance rules, the face-to-face provision of preclinical education with the restriction of access to academic buildings in the early days has also been disrupted worldwide. The disruption of preclinical education, which has an important place in dental education, caused concern and the ways of students to receive this education appropriately were tried to be found out.

One of the methods applied for preclinical education is to transmit the demonstration video of the application to be performed in a synchronized form and online recorded form to the students in order to provide the opportunity to watch again later. Some of the dental schools provided portable handpiece units and typodonts for students to continue to improve their hand skills. Preclinical education can be given as distance education in the form of online simulation on dental training manikins, but this application is very difficult. Although various simulators have been developed for preclinical education; the operations performed on these simulators do not include all

branches of dentistry and are not available in all institutions. Video simulations and virtual reality (VR) applications can be used in conducting preclinical courses during the pandemic period. Galibourg et al. reported a model in which clinical skills can be gained using virtual reality and haptic. Advances in virtual reality systems increase the opportunity to use simulation technology in dental education. The use of such systems in dental education provides a continuous and integrated feedback between the lecturer and the student. VR technology is a system that has tactile feedback capability by allowing students to virtually touch and feel dental tissues. Studies have reported that the use of VR technology in operative courses increases hand skills in dental practices. Although VR simulation technologies are a useful tool for students' education, their use is limited due to their high cost and lack of availability in most institutions. Nonetheless, among the methods that can be used for preclinical education during the pandemic process, it is one of the safest methods that can be preferred to prevent the spread of infection.

Although most educational institutions suspend preclinical education with the onset of the pandemic; preclinical education continued in countries where the pandemic was brought under control with the strict measures taken at the beginning. In addition, preclinical education in small groups have begun in countries where the rate of spread of infection and the number of cases has decreased over time. In preclinical education, the preference of students is generally to take the education face-to-face in the laboratory, and it has been stated that online education cannot replace face-to-face education. In addition, blended learning or hybrid learning models are also used in preclinical education. Face-to-face practical applications, which were diluted and decreased lesson time due to the pandemic, were supported with online training materials to increase efficiency. Although the face-to-face preclinical practices were initially used in small groups in some regions with the introduction of the so-called "new normal" period, the effect of the pandemic still continues. While some of the dentistry faculties in Turkey continue their preclinical education remotely, some of them have switched to the hybrid education model. As in some countries, students go through triage at the entrance to faculty buildings and students with symptoms and risk of contamination are not admitted to the building. In regions where the number of cases has decreased, the preclinical education part of dentistry has started to be carried out in small groups diluted face to face and within intensive programs.

Preclinical practical education's being the last step before clinical education and application on the patient makes this education important. Therefore,

although technological applications provide advantages for the student in this period, making the preclinical education face-to-face is important for the manual dexterity of the student in dental practices. Regardless, attention should be paid to the development of virtual reality, video simulation and haptic technologies that play a role in the distance education of students against the continuity of the pandemic uncertainty and the possibility of a rigging in the course of the pandemic.

Clinical Practical Education

Clinical practical training, the third and last part of dental education, is the most important part of the education life in which clinical skills that prepare students for the dentistry profession are acquired. Clinical training includes the diagnosis and treatment of dental and oral diseases on the patient in the presence of a specialist. At this stage, intern dentists are now under close interaction with patients, as much as lecturers are. During the pandemic period, the most affected portion of dental education was the clinical education. In addition, in vivo studies that require human contact with both undergraduate and postgraduate education have been highly affected by this situation. With the onset of the pandemic, access to academic buildings and clinics has been restricted in many parts of the world, thus, it has become impossible to conduct clinical practice and research. This situation caused the internship training to be delayed and the trainee physicians to experience less patient practice and less case variety than normal.

The emergence of the pandemic and the uncertainties tailed the pandemic in many countries of the world have limited dental practices, and cases except emergency and cases that could not be delayed have been postponed. Clinical work in dental hospitals in Europe was mainly carried out with the participation of senior staff (96%) and postgraduate students (30%). Undergraduate students (11%) only helped non-clinical activities. For dental practices, academics have taken into account the literature on infectious diseases as well as the protocols defined in relation to COVID-19, and have applied the directives and guides described on a country basis.

The methods applied at the beginning of the pandemic for the clinical education of students bear a resemblance to preclinical education. Simulation technologies, which are a safe form of training that will prevent students from being exposed to infection and patient contact in a clinical environment, have been gravitated. Case-based discussions are an important learning method applied in dentistry education and this method can be used in this pandemic

period. Virtual patient (VP) based learning improves the diagnosis and diagnostic skills of students by simulating clinical cases. Case-based, live-participation discussions conducted online via video simulations can be beneficial by attracting the attention of students and motivating them in their remote education period. Teledentistry can be applied by imitating patient care in the clinical education of students. Although all these virtual reality, video simulation and case-based discussions can be used as remote education materials in the clinical education of students, studies have shown that these materials cannot replace the practical application on the patient and that clinical practice and patient-trainee physician interaction are more effective in terms of education of the students.

The fact that clinical education cannot be carried out without patient care and practice on the patient and that students cannot be graduated without training on patients has paved the way for taking necessary precautions in most of the countries, even during the COVID-19 period. Since most of the dental applications involve aerosol formation, clinical training has begun to be taken carried out all around the world, taking into account the necessary regulations deemed in clinics and the safety of patients, physicians, students and clinical staff by the reason of the COVID-19 pandemic. Patients were subjected to triage practices when they reached dentistry faculties for examination and treatment; their body temperatures were measured, short and scrutinizing questionnaires were conducted regarding the COVID-19 transmission and symptoms, and diagnosis and treatment procedures were initiated. Instructions on hygiene, wearing masks, distance and breathing related to the pandemic were posted in commonplaces in the hospital, hand sanitizers were provided in appropriate corners of the building, companion entrance was blocked unless deemed necessary in the presence of the patient, and the number of patients were restricted by arranging the sitting areas in the waiting rooms as per the social distance rules. Regulations were made in dental clinics due to the COVID-19 pandemic, and in order to prevent cross infection, applications such as control of aerosol formation and distribution and air flow, high-efficiency particulate arresting (HEPA) air purifiers, cabin systems and screen assembly were performed. Before starting the education, the students were taken to the campus after various screening and they were warned in terms of social distance.

The following regulations were recommended for the students to practice on the patient in clinical education during the COVID-19 process. Students should be trained by infection committees established in schools before clini-

cal practice. Before starting patient treatment, all materials to be used should be adjusted in order to prevent contamination of the environment and other staff. Before starting the treatment of the patient, both the intern physician and the staff responsible for the patient should wear enough disposable or disinfected personal protective equipment (PPE) (N95 mask, surgical mask, hair restraint, protective visor and goggles, boxing apron or overalls). The student should use a rubber-dam to avoid contamination with saliva during treatment, and if it is not possible, prescribing mouth rinses before treatment is recommended. Rinses should contain 1% hydrogen peroxide, or 0.2% to 1% povidone, or 0.05% to 0.1% cetylpyridinium chloride agents. Attention should be paid to the disinfection and sterilization of the instruments used. It is very important to use “runner” students who are responsible for four-hand work and bringing necessary materials to the application site in order to shorten the time of interaction with the patient and prevent contamination during the study. Considering the treatment procedure, the time spent with the patient should not be prolonged. PPE should not be removed before leaving the treatment area, and hygiene rules should be applied while removing PPE. Students, lecturers, and auxiliary staff should be evaluated for COVID-19 at regular intervals, and people with symptoms or those who are at risk of transmission should be isolated by abiding the quarantine parameters.

Developments are taking place in the clinical practice of the dentistry education all over the world, and the situation in Turkey is as mentioned. Fourth and fifth grade students, who are given clinical practical training, have started or are planned to start their education in most faculties. Upon the notification of the faculty management to the Ministry of Health of the Republic of Turkey, the students in this group were included in the priority groups in terms of vaccination administration and COVID-19 vaccines were administered at the request of the student. By making the clinical and student-based arrangements described above, the students were enabled to start clinical practical education with the hybrid education model, which was diluted and concentrated in small groups. Students generally preferred patient practice in the clinic. In addition, the delays caused by the pandemic also worried the students regarding the inefficacy of the education they receive.

Considering the effects of the COVID 19 process on clinical education, it is obvious that it will affect clinical education in the medium and long term. Historically, most of the dental education has been in the form of practical application. In order to continue clinical education during the COVID-19 pandemic, the safety of patients, employees and students should be kept in the

foreground, and the regulations related to the clinical and personnel should be taken into consideration and students should be given the necessary support.

CONCLUSION

All phases of dental education have been significantly affected by the COVID-19 pandemic. In the present situation, it remains uncertain how long the pandemic will continue, whether it will end, and when will we adapt the “new normal” or traditional education model in dental education. It is important to benefit from all the fields of technology at the maximum level in order to continue both the theoretical and practical part of dentistry education in the future. Regardless, deemed regulations should be made accordingly, taking into account the anxiety and concerns of the students regarding the education. Studies on this issue should be supported and popularized by institutions. It should not be forgotten that each crisis causes a new opportunity and each will contribute to the management of such problematic processes that will be encountered in the future.

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