

# COVID-19 Era: Challenges and Solutions in Dental Education

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## ABSTRACT

Coronavirus infectious disease 2019 (COVID-19) pandemic has brought a myriad of challenges to the dental education. Amidst the quarantine and lockdown measures, face-to-face education is disrupted around the globe. Dental educators have come up with innovative solutions to resume dental education remotely. Different online platforms are being utilised for didactic teaching and learning as well as for students' assessment and examination. Clinical learning has also shifted to virtual learning. Manikins and virtual reality/augmented reality (VR/AR)-based simulation devices along with haptic technology can be very helpful for skills training. However, some sorts of blended learning and virtual curriculum may be incorporated in dental education in the future. For this narrative review, a thorough in-depth review of the available literature, relevant to our field, was carried out. In this article, impact of COVID-19 on dental education has been discussed along with some solutions to these challenges.

**Key Words:** COVID-19, Dental education, E-learning, Virtual/augmented reality.

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## INTRODUCTION

In human history, many pandemics have hit the world. Coronavirus infectious disease 2019 (COVID-19) pandemic is the most recent one and still prevailing. The highly contagious SARS-CoV-2 virus causes COVID-19. It presents with symptoms ranging from flu-like manifestations to pneumonia.<sup>1</sup> Originating from Wuhan, China, in December 2019, this virus has infected millions of people till date and has a variable case fatality ratio (CFR), ranging from less than 0.1% to over 25%.<sup>2</sup> It mainly spreads via close contact and respiratory droplet transmission.<sup>3</sup>

Presently, no vaccine is available for SARS-CoV-2 infection. So, this highly contagious virus has led the world to "stay-at-home" and adopt "social distancing" to limit the spread of infection. Most people are in quarantine and obeying "work-from-home" till further orders; dental profession is no exception. Majority of dental clinics and hospitals have deferred all elective treatments. Only emergency treatments are being carried out very cautiously.<sup>1</sup>

Dentists along with their team have been categorised as a profession with the highest COVID-19 risk due to physical proximity and direct exposure to the oral cavity.<sup>4,5</sup>

## Impact of COVID-19 on dental education and training:

Since the outbreak of SARS-CoV-2 virus, there has also been a disruption in dental education. Dental institutes are closed for the students and faculty. All educational and research activities have suddenly stopped. Even emergency care is being provided at very few setups. This sudden halt due to COVID-19 crisis has many implications on dental education and training.<sup>6</sup>

Since the dental schools have closed their doors for the students, there has been a surge in the exploration of new ways for continuing education distantly.<sup>7</sup> Clinical learning has ceased for some time. All external rotations and graduation ceremonies have been cancelled owing to social distancing.<sup>3,8</sup>

COVID-19 crisis has brought all non-essential and laboratory-based research activities to a standstill. Funding by institutes or government bodies has also ceased, which will bring a major setback in research activities. Rather, there has been a shift to COVID-19-based research and its impact on oral health and dental profession.

Many patients from low socio-economic status mostly rely on students' clinics for their routine dental care. Most dental schools have also shut their students' clinics temporarily, offering only emergency care by the faculty. This will have a negative repercussion on these vulnerable patients.<sup>6</sup>

Likewise, most dental institutes depend heavily on the earnings from their clinics. Therefore, the closure of clinics to elective dental care has definitely led to financial burden on many institutes. Their faculty may also suffer the financial loss.

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The outbreak of COVID-19 pandemic has also disrupted the world's economy. The global economic recession will also affect the individuals. So, we may expect lesser number of prospective dental students in the coming educational year.<sup>9</sup> Moreover, there could be an increase in dropout rate from the dental schools of private sector owing to high financial cost of dental education.<sup>10</sup>

## **INNOVATIONS IN DENTAL EDUCATION**

### **Electronic platforms for e-learning:**

During this stay-at-home time, dental educators have resorted to different creative ways for delivering dental education remotely.<sup>11</sup> E-learning involves the use of internet and different software programmes like Microsoft Teams®, Zoom®, Google Classroom®, WebEx®, Moodle® etc.<sup>12</sup> These online/remote learning platforms/softwares have been in use since long; these have been used in crisis situation in Afghanistan, Africa and Far-eastern countries.<sup>13</sup> These online free/paid pedagogical softwares allow synchronous or asynchronous teaching. Flipped classrooms/blended learning methods are highly successful in remote teaching.<sup>10</sup> Students are also encouraged to make use of online study materials, either uploaded by the university or clinical videos available on the internet.<sup>14</sup> Many universities are arranging webinars to involve a larger number of participants. Group discussions on multiple social media platforms are also being conducted by multiple educational bodies. Others have implemented small group problem-based learning (PBL) and case presentation and discussion to engage the students.<sup>15</sup>

### **Online assessment strategies:**

Dentistry is slowly adopting to this new norm of distant education; and online assessment strategies are also being implemented. Softwares like Canvas and Examsoft allow to conduct examinations remotely. Objective structured clinical examinations (OSCEs) and online open book examinations (OBEs) are other useful tools for student's assessment remotely.<sup>6,16</sup> However, some sorts of assessments of the clinical competence need to be done for awarding the final degree.

Surveys among students and teachers have showed varying results regarding the effectiveness and usefulness of online education.<sup>17,18</sup> Nonetheless, it is expected that even after this COVID-19 pandemic is over, some sort of e-learning and online evaluation strategies may make a place in dental education system.<sup>11</sup> This may, however, pose a challenge in developing world where poor internet connection coupled with frequent power outages have resulted in failure of this concept.

### **Pre-clinical and clinical learning:**

Dental education differs from traditional medical education as in this, a dental student has to gain sufficient amount of practical skill to qualify their final examination. Hands-on skill acquisition is the cornerstone in dental training.<sup>19</sup> In the present scenario of lockdown and elective dental care, it is difficult for the students, especially the 3<sup>rd</sup> and 4<sup>th</sup> year students, to achieve this milestone.<sup>10</sup> Traditionally, many dental schools use manikins and physical typodonts for the first two years of teaching. With the

advancement in technology, alternate teaching methods such as haptics, VR/AR-based simulation devices (e.g. Simodont, DentSim, Periosim, etc.) have also been developed. These non-clinical teaching and learning methods are safe and reliable in providing the students with the much-needed achievement of fine-motor skills and manual dexterity. These simulation devices accompanied by haptic technology provide tactile feedback to enable the students feel and touch the virtual teeth.<sup>20</sup> AR/VR technology is an effective supplemental teaching tool, which enables the students to gain clinical experience without being in a clinical environment. But these simulators do not cover all aspects of dentistry, are yet scarce in developing countries and quite expensive. We suggest that these evidence-based methods should be developed and made accessible to a wide number of dental institutions throughout the world. Presently, they do not replace the traditional practical training methods in many dental setups, especially in the developing world. Meanwhile, PBL and virtual-patient-based learning offer great learning material to train students on clinical diagnosis and decision-making.<sup>12</sup>

### **Dental research activities:**

Despite the explosion of information available online and through social media, it is still difficult to identify reliable research evidence and guidance.<sup>21</sup> Dental research can be prioritised according to the risk assessment level. Laboratory-based research, which does not involve contact with the patient, can be carried out safely soon after this pandemic is over.<sup>16</sup> Critical review of existing scientific literature may be undertaken along with surveys employing online data collection.<sup>11</sup> Patient-based research activities should only be performed under strict precautionary measures as advised by the regulatory authorities.

### **Curriculum amendments:**

We also need to make certain amendments in dental curriculum<sup>22</sup> by introducing topics such as crisis management during a health crisis and natural disasters and knowledge about infectious disease at undergraduate level. Inter-professional education and extramural rotations should be reinforced in the dental training programme.<sup>14</sup> Management of occupational hazards and training in proper infection control should be made mandatory. Some training in tele-dentistry and triaging the patients is also valuable for the future dental workforce.<sup>23,24</sup>

### **Psychological support to students and faculty:**

COVID-19 pandemic has affected different people differently. Social isolation, financial burden, loss of any near-and-dear ones due to SARS-CoV-19 infection, and unpredictability of future are some of the stressors that have brought anxiety and depression in our society. The vast amount of incorrect information circulating on the internet regarding the shortage of supplies, adds negatively to our own health and well-being.<sup>25</sup> It is due to the uncertainty that is intensifying those worries, but universities and educational centres can mitigate this by regularly updating their students and colleagues on what is happening regarding the future of their course or programme. In these hard times, it is the responsibility of the dental institutions to extend psychological support and care to their faculty, staff members, and students to

help cope with anxiety, depression and post-traumatic stress syndrome (PTSD) as an aftermath of this pandemic.<sup>4,14</sup> Moreover, supervision of students must be highly focused, and limited to only what is required, not what is idealistic.

## CONCLUSION

In order to cope with this pandemic, the dental community needs to reconsider many aspects of dental training and education. Virtual dental curriculum, as part of the comprehensive dental curriculum, may need to be considered in foreseeable future. It is evident from literature that AR/VR-based devices are making their way to dental education. While dentistry as a profession can never be virtual, the future of dental education may be 'blended' with components including both face-to-face and online components.

## CONFLICT OF INTEREST:

Authors declared no conflict of interest.

## AUTHORS' CONTRIBUTION:

ZH: Data collection and manuscript writing.

AAA: Study design and critical review.

MS: Manuscript writing.

AA: Critical review.

KA: Manuscript writing.

SR: Manuscript writing.

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