

Contemporary Trends in Dental Education During Covid -19 - Narrative Review

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ABSTRACT

The emergence of COVID 19 virus strain has handicapped the world. It has forced us to change our habits and adapt to modern yet safe ways of working and learning, making health and safety the top priority. The pause that it has caused in our life cannot be ignored and the whole world is trying to adapt to new time. This narrative review was carried out to learn new methods of learning and how they can be incorporated into our system. Various search engines such as PubMed and Google Scholar were searched for. Recent articles on COVID 19 and E learning and how it can help us in these difficult times. Articles from 2016 to 2020 were researched using key words as dental education. E learning, synchronous, asynchronous learning were used. It is important to prepare future physicians in the time of global medical emergency. To keep up with the modern requirement of learning and to not leave our students and future physicians during this tough time while keeping them safe is the prime agenda. This article focuses on modern day technology learning methods and how they can be helpful in today's unprecedented times and how modern technology can help us to overcome these hard times without compromising the education of our students.

Keywords: Asynchronous Learning Covid 19, Dental Education, Synchronous Learning, Asynchronous Learning, Virtual Reality.

How to Cite This Article: Kayani S, Azad AA, Jamal N, Babar A, Saeed Z, Aslam A. Contemporary Trends in Dental Education During Covid -19 - Narrative Review. Pak Armed Forces Med J 2025; 75(Suppl-6): S1039-S1043. DOI: <https://doi.org/10.51253/pafmj.v75iSUPPL-6.6546>

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INTRODUCTION

The deadly and infectious COVID 19 has taken the world by a storm destroying the global economical, healthcare and education substructure.¹ Many hospitals have shifted their focus towards providing emergency care to the patients and deferring elective procedures. The education system is affected on a giant magnitude as well. Most of the medical and dental schools are closed owing to the safety of their staff, students and patients as a priority. The amount of uncertainty created by this pandemic cannot be ignored. Students are worried about losing a semester and drop in their learning graph. Pakistan is a country where traditional methods of learning and teaching are still being practiced. The shift from traditional learning mode towards a more digital readily available mode is the need of the hour to provide our students with the quality of education and learning while keeping them safe.

Changes in dental education are long overdue. Three landmark articles — the 1926 Gies Report,² the 1995 Dental Education at the Crossroads,³ and the 2017 the series of articles called “Advancing Dental Education in the 21st Century” have given deep insight

and suggestions regarding dental education and its future shaping.⁴ Some arenas in dental education and dentistry have improved drastically over the past few years though, some still remain neglected and need further attention.

The current COVID 19 pandemic is not the first pandemic to drastically decrease the human efficiency and productivity. SARS Pandemic (2002 -2004),⁵ and MERS that spread through camel and camel meat in the past also affected human efficiency.⁶ The present situation has posed extreme challenges in global economy and health care systems.

Dental practices and institutions are being closed, putting an immense pressure on both the health care providers and students. While social distancing is the only possible way to prevent this virus transmission, the future of our students is also important be kept in mind while keeping them and those around them safe.

However, this unpleasant scenario has made us realize to get out of traditional methods of learning and to adapt to a more advanced and accessible online method of learning. E-learning refers to sources and means of communication using modern technology. The current scenario is a call to step out of our conventional learning and teaching methodology and introduce new avenues in dentistry and dental education.

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Received: 07 Apr 2021; revision received: 24 Dec 2021; accepted: 29 Dec 2021

Various studies have been conducted on student efficiency in E-learning. According to some studies it is as equally good as the traditional method while some still prefer the traditional method.⁷ The use of online learning is no more a choice, the modern situation requires us to adopt to this method for the sake of safety of our faculty, students and most importantly our patients. Many dental institutions demand certain level of hands on experience for competency assessment from their students but the present situation has forced closure of dental schools. Institutions are now working in harmony to figure out best new methods and mode of assessments, clinical judgments and grooming of young dental students.⁸

Many universities around the globe are trying to fully digitalize the educational system and go from offline education to online education system. Thus, delivering the same education to their students without compromising on the safety, saving time. The millennials need everything at their own pace, e-learning is also an excellent solution to this.

COVID 19 - the Pandemic

The exceedingly infectious pneumonia which took the world by a storm started on 12th December 2019 in Wuhan China. During early January 2020, this infection was labelled as "Corona Virus Disease (COVID - 19)" by the World health organization.⁹ Lately, it has become the most resilient challenge for the whole world. Due to diverse clinical presentation and little research on the pathogen, the whole world is suffering. On 30th January 2020, it was declared as a public emergency by the World Health Organization on an international scale.¹⁰ This virus spreads by coughing, inhalation of micro droplets and sneezing. Some evidence also suggests spread of virus via aerosol production. The virus was first described by Tyrell et al. in 1968.¹¹ He named this group of viruses as "Corona virus" due to its morphological picture under microscope as shown in figure 1.0. Like all other countries, Pakistan was also hit by this global pandemic, Corona virus. A total of 1656 of cases were recorded in Pakistan till October 2021. From the beginning of first case being reported in Pakistan, it has been a tiring struggle to manage the economy, health care and education system of the country.

Teaching Methodology - the Conventional Method

The present-day health education system of Pakistan is more teacher centric than being student centric. The conventional methodology is based on classroom interactions, not evolving with the modern

day use of technology and upgrades.¹² The more passive teacher-based approach should be replaced with more active student-based approach. Teaching methodology around the globe is changing at a fast pace. Keeping up with the global standards is a necessity. World Health Organization in recent times suggested that the dental education should be more student - centered and it should be culturally and socially relevant.¹³ The new generation prefers learning to be easier and not time dependent. With busy clinical placement routine, many students find attending lectures difficult and do not absorb much through them.

The major purpose of teaching and learning is to design a creative thinking environment. Till date, less attention has been given towards the analysis and buildup of teaching methods but as the world is advancing and becoming a global unit, more stress is now being given to train individuals as per the international standards.

Impact on Dentistry and Dental Education

The US Occupational Safety and Health Administration has declared dentists to be the most potential candidates for contracting the infectious COVID 19 due to aerosol generating procedures.¹⁴ The Novel Corona virus has adversely affected both, the dental offices and education sector.¹⁵ While social distancing being the prerequisite to prevent the spread of this infection, the uncertainty it has brought with respect to work protocols cannot be ignored. The fear of losing on patients and not being able to provide the high-quality treatment is seen among our community. Students are worried about missing out on theoretical and clinical learning. COVID -19 demands a mark shift in dentistry and education sector. The current paper published by Wuhan; China highlighted the height of the infection but did not describe methods to take dental education ahead. The current COVID scenario presents extreme challenges for the dental community but it also provides great opportunity to explore new avenues in dental education and dentistry which were left unexplored.

Online Learning / E-Learning; Incorporating Technology into Education

E learning or online learning refers to use an electronic resource for learning and teaching.¹⁶ It can be an asynchronous or synchronous learning environment. With the advancing technology, distant learning is made easy (McBryan *et al.*,2009). Online education system has the ability to make the education

Table-I: Comparison of vArious Virtual Reality Systems

	CDS	PerioSim	IDEA	Simodont	DentSim
Ergonomic Posture	✓	✗	✗	✓	✓
Instant feedback	✓	✗	✓	✓	✓
Data transfer to Convener	✓	✗	✓	✓	✓
Exam Simulation	✓	✓	✗	✓	✓
Used Teeth	Animated	Animated	Animated	Animated	Plastic teeth

Table-II: Comparison of Augmented and Virtual Reality

Augmented reality (AR)	Virtual reality (VR)
AR is and amalgamation of virtual and real worlds.	VR stands for virtual world.
Let's users intermingle with both virtual and real world and differentiate between them.	It is hard to differentiate between virtual and real.
The goal of AR is to boost experience by using virtual components such as graphics and digital images.	The goal of VR is to generate computer-based world.
Audience stays in real world.	Audience are shifted into real world.
Adds relatable information to the existing world view.	It instills large graphics to form virtual environment.
Users can manipulate, rotate, scale, move, 3D objects in real world.	Users can manipulate, rotate, scale, move, 3D objects in virtual world.
It is useful for demonstrations, mapping and interior designing.	It is used in medicine military etc.

system more student based rather than teacher based. It offers a more flexible learning environment and mode of learning. The term synchronous learning refers to attending live lectures, interactions and instant feedback. It gives vast opportunity to learn (Mc Brien et al 2009) whereas, the term asynchronous learning refers to other means of acquiring online education without live sessions and interaction. Asynchronous learning refers to learning through the web.

E-learning: Need of an Hour

Soon after declaration of COVID -19 as a global emergency by World Health Organization, the whole focus shifted towards protecting the students, faculty and patients. Most of the world went into quarantine. Dental offices and colleges were shut down till situation got clearer and more known. The negative impact of the pandemic can be seen on education sector. The Corona virus has forced the institutions to modify the teacher centric learning to a student centric learning.¹⁷ It is no more an option but need of the current time and situation. New methods have to be in cooperated in order to make our students learn without putting them at any risk. All educational organizations are working towards finding new methods of incorporating digital platforms into education sector and to use it more aptly. Many dental schools around the globe have digitalized their education system. Online learning is the new emerging trend. Therefore, the quality enhancement of online learning is critical at this stage. Educators around the globe have shifted their complete

pedagogical approach to cater new conditions and emerging trends. Teaching infrastructure has revolutionized. Incorporating information technology into dental education has become the primary highlight. It not only involves the classic learning, but also includes feedback, logistics, assessment, audit, administration, communication and quality assurance. In a developing country like Pakistan this system is still facing problems and is on initial stage. Globally E-learning has revolutionized the health care system. The COVID pandemic has shaken up the global education sector. In order to save the semester and fear of losing time, there was a dire need to establish the E-learning structure.

Resources of E-Learning for Didactics

The current COVID situation has made us realize how the digital platforms have been ignored in dental education. The present scenario demands to ameliorate the e-oral health infrastructure. Since a long time, dentistry has always been associated with interactive study sessions and hands on. The current global emergency is however, more about the safety and continuing the education rather than technique. Electronic platforms can act as a substitute for classrooms. Platforms like 1 Moodle can be used by dental schools to promote blended learning providing chance to interact via live sessions and discussions.¹⁸ Systems like Black board can also help in learning and providing classroom environment.¹⁹

Openly accessible platforms such as ZOOM, WebEx or Jitsu also provide platform from

synchronous learning. Interactive sessions give sense of connectivity and better communication. Microsoft teams and Google Classrooms if used efficiently, can also help in the pandemic.

Social media platforms such as YouTube, Facebook, Twitter and WhatsApp can also play an important role in providing dental education. It can bridge the gap between students and teachers.

Resources of E-Learning for Clerkship

The shift in paradigm and incorporation of electronic modes into education sector poses a great challenge to the institutions, staff and students. Dentistry has always been a hands-on field primarily. However, modern day technology is providing more avenues for teachers and students to explore. The placement of Virtual and Augmented reality systems can help in developing the clinical skills of the future dental surgeons and to assess them. The initiative of recruiting VR and AR in dental education can benefit every department of the dentistry, helping students and trainees to polish their skills.²⁰ As said by Liguori and Winkler, Only innovative solutions can help us to deal with this pandemic.²¹ The evolution of virtual and augmented reality has helped the user to put medical data and information together and practice them safely. Augmented reality system is more widely used, providing three-dimensional virtual object in a virtual 3D environment. The virtual reality base systems give user real, inside virtual 3D model. Numerous systems exist for this purpose such as PeriosimR, DentSim, Idea.

An increased interest and acceptance of under graduate students was seen towards simulator training for operative and surgical procedures. Positive feedback was received for procedures like cavity preparation, apicectomies etc. Increased learning was seen with use of Augmented reality and Virtual reality systems.

Better student learning and performance was observed in crown digitization and framework designing by introduction of CAD /CAM courses in dental education. The magnification component of the system improved student understanding and finishing.

Student's Interpretation About Distant Learning or E-Learning

Multiple studies have been conducted to analyze student's opinion about online learning and shift in the Paradigm from teacher-based learning to student-

based learning. In one of the studies conducted 90% of students agreed that e-learning had a positive impact on their learning. Another study conducted in Saudi Arabia also showed positive outcome. Many schools and dental institutions have successively shifted their education mode online. Most of the UK and American teaching pedagogy has already shifted to online mode because of its ease of learning, less time constraints and it being more student centric. Majority of the students prefer to learn things at their own pace and as per ease of time.

The current aim of dental education these days is to strike a balance between long clinical hours and didactics. The millennial generation is very comfortable with the online mode of learning.

Some studies suggest that blended classrooms improve students understanding, interest and concept buildup. Another study showed 76% students admired the use of E learning and incorporation of internet into study. 18 % preferred tadeonal classroom-based learning.

Opportunities in E-Learning during COVID Time:

The COVID 19 has caused the world to shut down and education sector is no exception. However, the current situation provides great opportunity to explore the E learning field. In the past decade, the abundant use of internet, smart phones and technology has enhanced learning. As Favale stated that, the current COVID outbreak has exploded E - Learning avenues which were remote in the past. E-learning has a lot of scope during time of this pandemic and is allowing the continuation of education. Many institutions have switched from offline mode to online mode of learning. Most of the EdTech companies are already working in bringing new programs so that the education does not hamper during this challenging time. Radicle transformation can be made in the field of E- learning during this time as it is the absolute necessity of the hour.

Advantages: E-Learning

E-Learning is providing positive solutions in the time of crisis. The strength of online learning can save students from wasting their semester. Student centric education is the primary advantage that E-Learning provides.

Being student centric, it gives time flexibility and an effective and efficient learning environment. Many organizations at the time of COVID crisis are adapting to new technology and taking help from it. To conduct

efficient online services a list of etiquette was shared with students by Saxena *et al.*

Educators can use mixing videos, pictures and lectures to maintain contact with their students and to provide effective work environment. The ease of availability anytime and anywhere makes E-Learning a beneficial source of learning. Technology gives new avenues for people to work and interact with one another without face to face interactions thus, saving economy, education and combating disruption in the times of COVID.

Challenges: E-Learning

With all the positives that E-Learning gives it has few negatives also Loss of human connection is one of the most stated. Issues such as bad internet quality can hamper the learning process (FAVable *et al.*, 2020). Time and location aspects provided by E-Learning can cause students to become lazy and non-serious. Inadequate customization can create and imbalance and obstruction in teaching process. Teachers are yet to be trained and made comfortable with this mode of learning and how to engage students. Huge investments to be made by institutions for installing new software and technology set up into education sector. The maintenance of quality is the real challenge of online education, an efficient and effective educational infra structure must be designed for E-Learning.

CONCLUSIONS

COVID 19 pandemic has revolutionized our approach towards life and learning. It has made us realized that the only effective way of moving in these tough times is to adapt to modern day change and incorporate best of our E resources into every day learning .It has provided good opportunity to modernize our education system which was long over due in dentistry community especially .Each learning comes with its own set of challenges but in these uncertain times preparing the future physicians without risking them and patients is of utmost importance.

Conflict of Interest : None

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SK & AAA: Data acquisition, data analysis, critical review, approval of the final version to be published.

NJ & AB: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

ZS & AA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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