

Online Dental Teaching Practices During the COVID-19 Pandemic: A Cross-Sectional Online Survey From China

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Abstract

Background Coronavirus disease 2019 (COVID-19) emerged in China in December 2019. The COVID-19 pandemic hindered dental education and schools had to be closed. Online dental teaching provided an alternative teaching tool for dental education. However, it is not clear whether online dental teaching is efficient and what students preferred.

Aim To investigate the effect of online dental teaching practices during the COVID-19 pandemic in China.

Methods A total of 104 undergraduate dental students and 57 standardized resident physician training students from Zhejiang University were investigated. A 12-item survey was conducted. This investigation included teaching method, frequency of classes, degree of satisfaction, preferred teaching method, whether to participate in a course about COVID-19 prevention, and the effects of teaching. The percentage of the items were then calculated and evaluated.

Results A total of 161 students participated in this survey. All students had online dental classes during the COVID-19 pandemic. Lecture-based learning (LBL), case-based learning (CBL), problem-based learning (PBL), and research-based learning (RBL) were selected as classroom subjects. Students were more satisfied with LBL and CBL than PBL and RBL. The majority of students had more than 4 classes per week. The most selected protective measures were hand washing, wearing masks, and wearing gloves. A total of 46.6% students had courses on COVID-19. After training, the students consciously chose to wear face masks and protective clothing.

Conclusions Online dental teaching practices were effective during the COVID-19 pandemic. Students preferred LBL and CBL and were satisfied with the classes. Courses on COVID-19 helped students understand how to prevent COVID-19 in dental clinics.

1 Introduction

Compared with the pathogens of the two major respiratory diseases of the 21st century, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), COVID-19 possesses a much higher transmission speed which resulted in a global pandemic reaching 100 countries and locations in a short time [1]. Moreover, the occasions of infection varied in different countries due to socioeconomic and meteorological factors [2]. Undoubtedly, convenient international travelling contributed to transmission to some extent, while asymptomatic patients played a more important role in this process. The common symptoms of COVID-19 include fever, cough, fatigue, dyspnea, myalgia, sputum production, and headache [3–6]. Moreover, some people may also experience gastrointestinal discomforts such as anorexia, diarrhoea, nausea, and vomiting [7]. However, few or even no clinical manifestations could be observed or detected in a large portion of patients [8, 9]. For the groups that inevitably contact many people daily in school, children and teenagers, cluster disease has been reported to be the most common form [4]. In addition, despite the low mortality rate, the high infection rate [10] and uncertain prognosis of COVID-19 remind us of the importance of prevention. Therefore, since COVID-

19 was reported in December 2019 [11], dental education faced increasingly more challenges. Conventional dental treatments were deferred in the Affiliated Stomatology Hospital of Zhejiang University School of Medicine except for dental emergencies (such as acute pulpitis and tooth injuries) until June 2020. As a result, all in-person dental classes were also asked to shut down during the COVID-19 pandemic. It has been reported that many valuable solutions [12], such as online teaching, online conferencing, online lectures, and telemedicine, could effectively continue medical education.

Dentists face a high risk of the coronavirus infection [13]. Dental students cannot always keep a social distance and can easily be exposed to saliva and blood during dental practices. Moreover, tooth preparation and ultrasound cleansing will create aerosols that have the potential to transmit viruses. To prevent the spreading of COVID-19 among students, online dental teaching seems to be a daunting choice. The online teaching practice lasted four months from February to May in 2020 in the Affiliated Stomatology Hospital of Zhejiang University School of Medicine. However, online teaching lacks in-person communication. Therefore, it is hard to ensure the teaching effect.

Teachers had no experience teaching online and did not know what the final effect would be. Off-line classes included LBL, PBL, RBL, and CBL. Teachers used PBL, CBL, and RBL in online teaching practices during the COVID-19 pandemic to elevate teaching efficacy, as there is a pressing need for teaching knowledge about the prevention of COVID-19 during dental treatment. Some researchers [14] have summarized efficient measures involving wearing face masks, hand washing, wearing masks, and wearing gloves.

This study aimed to investigate the effect of online dental teaching practices and teaching measures for preventing COVID-19 and then summarizing our experience.

2 Materials And Methods

2.1 Participants

This study was approved by the ethics committee of the Affiliated Stomatology Hospital, Zhejiang University School of Medicine. All methods were conducted in accordance with the ethical standards of the declaration of Helsinki. One hundred preclinical students and fifty standardized trainees for dental residency participated in this study. The students or residents who did not have online classes were excluded. Participants were asked to complete a twelve-item survey. Information was collected, and the average percentages were calculated.

2.2 Questionnaire

Twelve questions were designed to evaluate the effect of online teaching during the COVID-19 pandemic. The basic information included grades, gender, and age. Questions 4, 6, 9, and 11 were single-choice, while questions 5, 7, 8, 12 were multiple choice. The detailed information follows in Table 1.

Table 1
Questions of survey

Number	Question	Choice
1	Grades	Preclinical dental students/standardized trainees for dental residency
2	Gender	Male/female
3	Age	Number
4	Have online classes or not	Yes/No
5	How to take online classes	Dingding/tencent conference/others
6	Frequency of classes per week	> 4/2-4/1-2/<1
7	What are the forms of online classes?	LBL/PBL/CBL/RBL/TBL
8	Which kind of teaching method is more suitable for online teaching?	LBL/PBL/CBL/RBL/TBL
9	How satisfied are you with online classes?	Very satisfied/satisfied/general/ not satisfied/ very dissatisfied
10	What is your most satisfied online course? What is the teaching format?	Fill in the blank
11	Have you received training on oral consultation during the epidemic of COVID-19?	Yes/No
12	What do you think are the protective measures that dentists take in daily consultations?	Hand washing/ protection suit/face mask/goggle/mask/glove/shoe cover

2.3 Statistical analyses

The data were collected through Questionnaire Star Software (<https://www.wjx.cn>). Further analyses were conducted using GraphPad Prism 8.0 (San Diego, CA). The percentage of the chosen items were calculated and evaluated.

3 Results

3.1 Participants information

A total of 161 participants attended this study, including 104 preclinical dental students and 57 standardized trainees for dental residency (104 female, and 54 male) as shown in Fig. 1. The average age of participants was 22.45 years old ranging from 19 to 30 years old. The percentage of age from 20 to 25 years old was 91.3%.

3.2 Online teaching methods and degrees of satisfaction

The teaching methods included LBL (53.90%), CBL (27.66%), PBL (13.48%), and RBL (4.96%) (Fig. 2A). In Fig. 2B, 21.12% of participants were very satisfied with the courses, and 57.76% were satisfied. However, some participants thought the courses were general (20.50%) or were not satisfied (0.62%). The participants preferred LBL (41.67%) and CBL (33.33%) more than PBL (25%) and RBL (0%) (Fig. 2C). As shown in Fig. 2D, the frequency of courses per week was 60.25% (more than 4 times), 11.80% (2–4 times), 18.01% (1–2 times), and 9.94% (0–1 time).

3.3 COVID-19 courses

According to the survey, 46.6% of participants attended COVID-19 training (Fig. 3A). More than 50% of participants thought hand washing, wearing a mask, wearing gloves, wearing protective clothes, wearing a face mask, and wearing glasses were important (Fig. 3B). After training, participants were more likely to accept wearing face masks and protective clothes (Fig. 3C). Similarly, standardized resident physician training students were more likely to choose to wear face masks and protective clothes than undergraduate students (Fig. 3D).

4 Discussion

This study evaluated the effects of online dental teaching during COVID-19. Online dental teaching provided an alternative teaching method for dental education. The COVID-19 pandemic brought us challenges and created a suitable situation for developing online teaching technology.

Our results were consistent with previous studies. The Occupational Safety and Health Administration in the United States classified dental treatments as in the very high-risk category due to aerosol generation [15]. The biggest challenge for teachers in dental school is to decrease the risk of COVID-19 infection and to ensure the continuity and quality of dental education [16]. Online dental education was also chosen in Australia, Japan, Malaysia, Thailand, and the US [17]. In this COVID-19 period, we used PBL, RBL, CBL, and TBL methods for online teaching. Students are more satisfied in classes taught with the LBL and CBL methods than PBL and RBL methods. One study [18] also reported that online CBL was suggested as a potential teaching method that could be adopted during this period. Another study [19] proposed that group-based interprofessional education (IPE) was beneficial from a student perspective. Case-based discussions are recommended, and patient data protection should be more of a concern in this situation. Clinical apps based on dental case analysis may also be a good choice.

The platforms that could be used for online teaching are DingTalk and Tencent Conference in China. Outside of China, Skype, Google educational tools, Instagram, Facebook, YouTube, Telegram, and WhatsApp could be used. More professional apps for dental education are needed in the future. Online learning and the COVID-19 pandemic may also be considered significant stressors for students and teachers [20]. School administrators should pay more attention to the mental health of these groups. The impact of COVID-19 on dental education is enormous. Traditional dental education should be developed to use novel, intelligent technologies for future challenges in dental education. It is suggested that dental

educators from different countries or cities be invited to give dental knowledge presentations during the COVID-19 pandemic as a possible solution [21].

Online dental education faces challenges due to its dependence on hands-on training. Despite the odds, efforts have been made to overcome that. An online education programme conducted at the University of Nebraska built a database with digitised slides to serve as virtual microscopy. It developed several e-modules with an e-learning app, that allowed students to observe slides and take pictures from home in order to practice laboratory and clinical skills hands-on [22]. These could be helpful in the online courses for dental and oral Pathology and oral mucosal diseases. Stephan et al. [23] integrated immersive virtual reality for teaching anatomy by reconstructing cerebral anatomy images from DICOM, CT scans and MRIs into 3D VR formats, which achieved better engagement, more enjoyment, usefulness, and stronger and leaner motivation. With the development and popularisation of 5G technology, applying VR in anatomy teaching could be a new trend. For prosthetic dentistry, simulation training for ceramic crown preparation was facilitated by a virtual educational system, which was found to help students improve their clinical skills [24]. Liu et al. [25] used a series of online colour training systems for dental education and found that certain exercises effectively enhanced colour sense. Computer-aided design has become widely-accepted in prosthetic dentistry, with similar precision and reproducibility to traditional wax-up methods [26]. Efforts have been made to implement CAD/CAM technology in the preclinical curriculum, with satisfactory results [27]. Under the circumstance of the COVID-19 pandemic, CAD could be considered for carrying out online laboratory lessons as it allows dentists and technicians to work on occlusion design online. Digital technologies and 3D printing are gaining increasing attention in implant dentistry and oral maxillofacial surgery in treatment planning and guided surgery [28]. The planning of the treatment and design of a guiding plate involves a great deal of work online and is aided by recent advances in 3D imaging and computer-assisted planning [29]. All the work of the process could be remodelled as teaching tools. For instance, the software applications for 3D printing have been used in training in dental traumatology training by Reymus et al [30].

To further adapt clinical change in the post-COVID-19 era, courses should include how to prevent infectious diseases. According to our investigation, some students did not know about traditional personal protective equipment. The personal protective equipment and preventive measures included hand hygiene, masks, face masks, surgical caps, gloves, and protective clothes [17]. It has been reported that epidemiological investigation, body temperature measurement, personal protective equipment (PPE), surface disinfection, four-handed operation, and large-volume aspiration could be used to diminish the possibility of infection [31]. The majority of students (98.14%) thought wearing masks could prevent COVID-19, while the percentages were lower in countries such as India (73.15%) [32], the US (37.8%), and the UK (29.7%) [33]. However, without training on the prevention of COVID-19, the recognitional percentages of the importance of wearing face masks and protective clothes are lower (68.6%) than that (92%) in the training group. Therefore, it is essential to have courses in COVID-19 among students.

This study lacked feedback concerning long-term online teaching practices. Post-COVID-19, future dental education can combine online classes with offline classes to elevate teaching efficacy. More creative

methods, such as PBL, RBL, CBL, and TBL, are needed to further increase teaching satisfaction. Courses covering the prevention of COVID-19 are suggested to respond to future infectious diseases.

5 Conclusions

It is effective to develop online dental teaching practices during the COVID-19 pandemic. Students preferred PBL, CBL, and RBL and were satisfied with the classes. Courses on COVID-19 helped students understand how to prevent COVID-19 in dental clinics.

Abbreviations

COVID-19

Coronavirus disease 2019; LBL:Lecture-based learning; CBL:Case-based learning; PBL:Problem-based learning; RBL:Research-based learning; SARS:Severe acute respiratory syndrome; MERS:Middle East respiratory syndrome; IPE:Interprofessional education; PPE:Personal protective equipment.

Declarations

Ethics approval and consent to participate

This study was approved by the ethics committee of the Affiliated Stomatology Hospital, Zhejiang University School of Medicine. And informed consent was obtained from all subjects. All the authors listed have approved the manuscript and transfer, assign, or otherwise convey all copyright ownership to the BMC Oral Health.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated during and analyzed during the current study are available due to they are supplied by Guoli Yang under license but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

Data collection was conducted by DZ, JL, and LR. All authors helped in designing the survey. ZJ and GY are the major contributors in writing the manuscript. All the authors read and approved the final manuscript.

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Figures

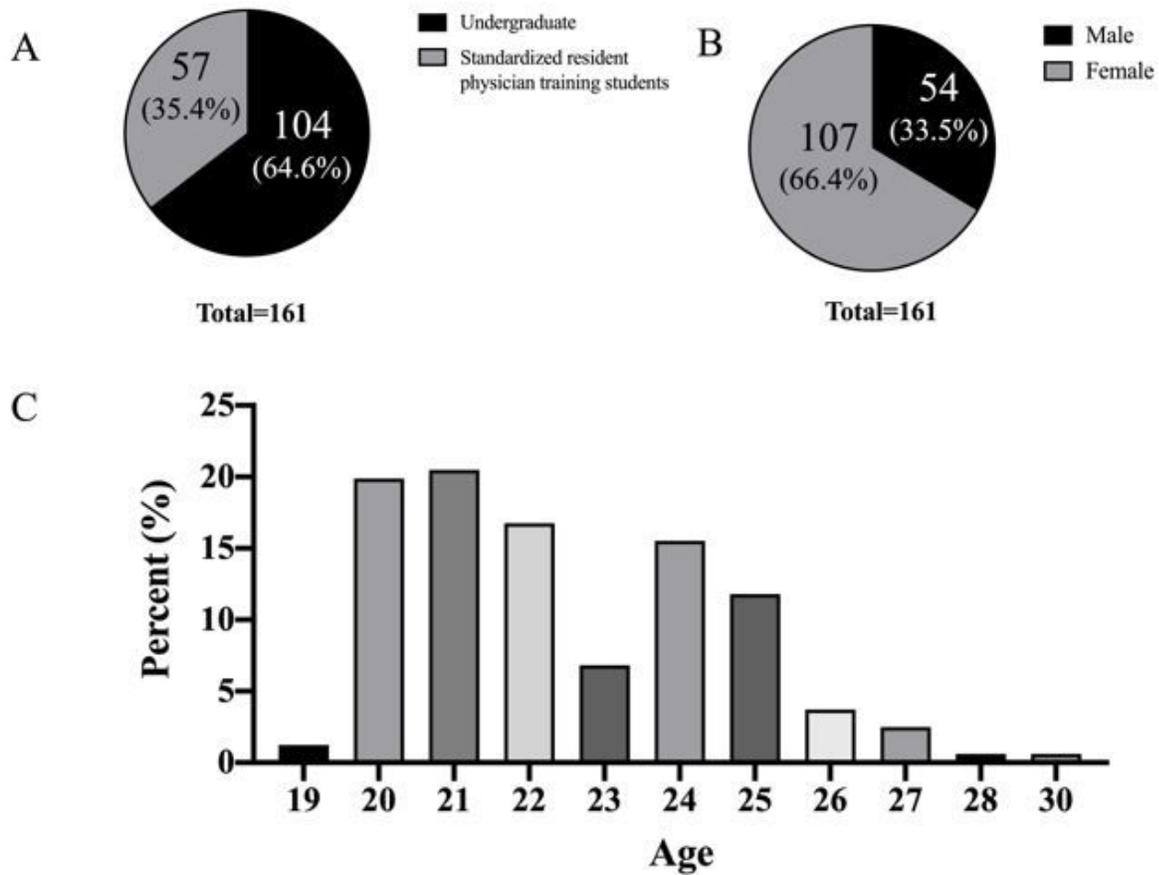


Figure 1

Detailed information of participants. (A) The percentage of undergraduate students and standardized residency physician training students. (B) The percentage of male and female participants. (C) The percentage of participants at different ages.

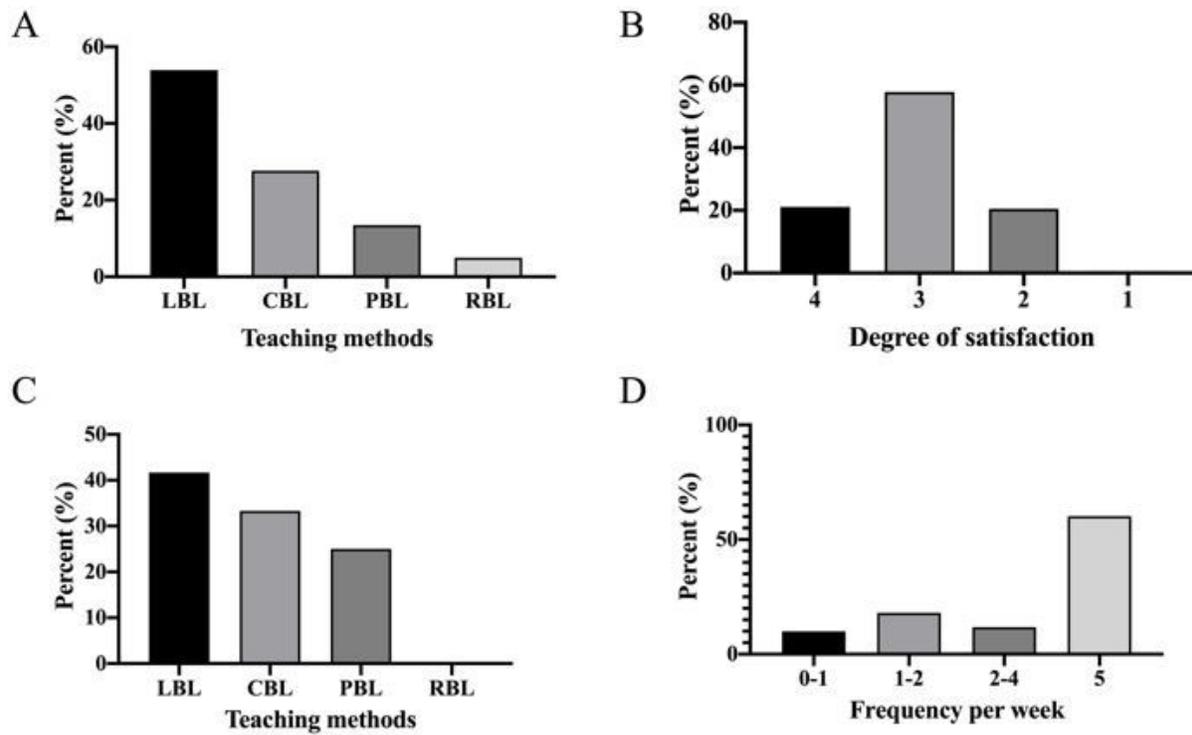


Figure 2

Online teaching methods and degrees of satisfaction. (A) The percentage of online teaching methods. (B) Different degrees of satisfaction of online teaching. (C) The percentage of satisfying online teaching methods. (D) The percentage of different frequency of online teaching per week.

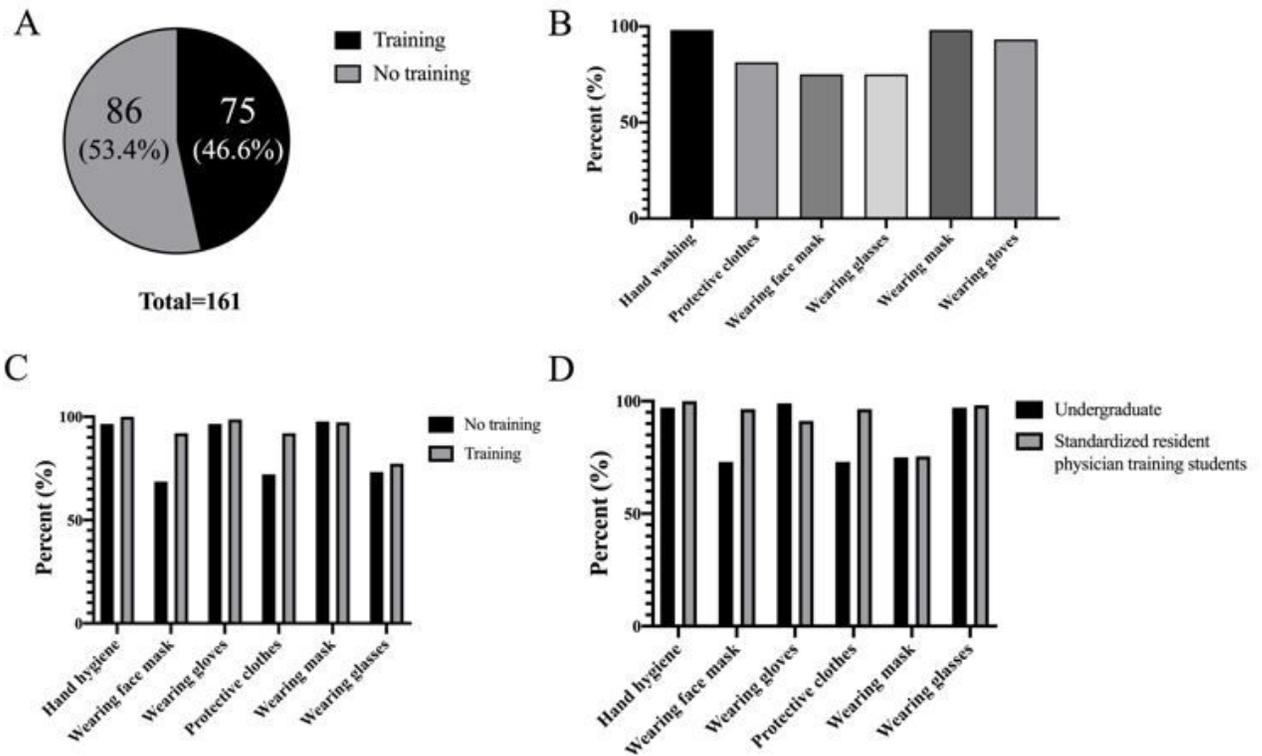


Figure 3

The effects of courses of COVID-19. (A) The percentage of courses and no courses in participants. (B) The percentage of protective measures chosen. (C) The percentage of different protective measures chosen after courses of COVID-19. (D) The percentage of different protective measures chosen by undergraduate students and standardized residency physician training students.