

## DENTAL STUDENTS' PERSPECTIVES ON THE IMPLEMENTATION AND EFFECTIVENESS OF ONLINE LEARNING DUE TO COVID-19 PANDEMIC: A DESCRIPTIVE CROSS-SECTIONAL STUDY IN BULGARIA

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**Purpose.** As dental education was significantly influenced by the novel coronavirus pandemic, this study aims to investigate pre-clinical dental students' perspectives on the implementation of remote education and school closure due to COVID-19 pandemic, self-reported effectiveness of on-line learning as well as their educational and personal experiences. **Method.** A self-administered questionnaire was posted online to a total of 258 out of 516 second and third-year preclinical dental students in Dec 2020/Jan 2021 at Faculty of Dental Medicine, Medical University-Sofia, Bulgaria. Survey items focused on 3 general domains: student attitude, assessment, and concerns regarding online learning; student current knowledge and perceptions of COVID-19 pandemic and student opinion of pandemic psychological impact on public health, personal experiences and intention for vaccination. **Findings.** One-hundred and sixty-nine students responded to the survey (response rate 65.5%). Most of them (70.4%) approved suspension of face-to-face classes due to the COVID-19 crisis. Eighty percent expressed dissatisfaction toward online teaching sessions and agreed that this will have negative effects on their education. Fifty-eight percent did not find remote education more stressful than in-person training. More concerns were expressed about financial issues than mental health problems. Intention for getting vaccinated was expressed by 53.3% and 40.8% thought that the vaccine would cause many side health effects. **Implications for research and practice.** Within the limitations of the study, identified gaps in online education could help increase effectiveness of learning environment and create opportunity to enhance education for the future. Dental student thoughts about COVID-19 vaccinations provide valuable information to administrators, public health professionals and policy makers to improve efforts towards preserving, protecting, and promoting public health.

**Keywords:** coronavirus; dental students; online education; COVID-19 vaccine; public health.

### Introduction

As of March 2021, approximately one year after the first lockdown due to the novel coronavirus disease 19 (COVID-19), the current pandemic has caused more than 114,751,575 cases in 192 countries and regions, causing >2,549,260 global deaths (Johns Hopkins Coronavirus Resource Center, 2020). Prior to the present pandemic, there have been previous outbreaks of other viral respiratory infections - seasonal flu, Spanish flu (H1N1), severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), etc. (Deery, 2020; Ghai, 2020). However, they did not result in long-term global disruptions. According to the Resolution on Oral Health, which has been adopted by the Executive Board (EB148) of the WHO in Geneva, oral health services are among the most affected essential health services because of the COVID-19 pandemic, with 77% of the countries reporting partial or complete disruption (WHO, 2021). Therefore, the recent coronavirus disease caused by the SARS-CoV-2 virus represents a serious public health issue (Al-Ansari, 2020). Furthermore, according to some authors it is believed to be the worst public health crisis of the 21<sup>st</sup> century (Hung et al., 2020). The novel coronavirus pandemic caused significant impact on all aspects of life, including dentistry, provision of dental care and dental education (Elangovan et al., 2020; Sukumar et al., 2020). In the US, the Occupational Safety and Health Administration classified dentists in the very high-risk category due to the nature of the profession, namely working in the oral cavity (which is reservoir of the virus) and the use of aerosol-generating procedures (Deery, 2020; Sukumar et al., 2020; Loch et al., 2021; Majeed et al., 2020).

To minimise the spread out of coronavirus infection all countries imposed social distancing measures – quarantine and lockdown measures were the most important strategies to prevent people from being infected (Chang et al., 2020; Haroon et al., 2020). Bulgaria was not an exception. According to the latest statistical data there have been more than 252,029 confirmed cases of coronavirus disease 2019 (COVID-19) and 10,391 deaths (Johns Hopkins Coronavirus Resource Center, 2020). Poor statistical facts regarding rapid dissemination of the novel pandemic disease necessitated implementation of stronger and more effective physical distancing measures. On account of the latter, as many universities worldwide, Sofia Medical

University (Bulgaria) had to transfer in-class education to online learning. Due to its established time and cost effectiveness, online teaching has been accepted as a good strategy for higher education and an efficient educational tool in the field of dentistry (Wang et al., 2021; Al-Taweel et al., 2020). During the first critical stage of the COVID-19 outbreak, in spring 2019/2020 semester, all departments of the dental school (clinical and pre-clinical) integrated in their curricula Web based education. At the beginning of winter term 2020/2021 “face-to-face” training was conducted for three weeks only in compliance with exceptional safety measures for both dental students and educators. Subsequently due to rapid spread of the pandemic disease the government imposed rigorous public health measures, such as new lockdown and quarantine. This involved another suspension of medical school classes and replacement with virtual teaching via Google classroom online platform.

The current emerging literature reported significant impact of the COVID-19 pandemic on dental education and students’ experiences with distance education. Along with increased risk of reduced quality of life when facing social isolation, major students’ concerns involved fear of losing confidence and competencies as a result of lacking practical training; losing their manual dexterity skills and anxiety related to the examinations and overall consequences on their long-term plans and realisation as future dentists (Agius et al., 2020; Wilcha, 2020; Silva et al., 2020).

The current study aims to investigate pre-clinical dental students’ perspectives on the implementation of remote education and school closure due to COVID-19 pandemic, self-reported effectiveness of on-line learning as well as their educational and personal experiences. The latter were discussed with respect to students’ concerns, handling, and psychological impacts of distance education. Finally, students’ opinions and intention for getting vaccinated against COVID- 19 were explored.

## **Methods**

### *Research Design*

The current survey was a descriptive cross-sectional study. It used qualitative and quantitative research methods to assess undergraduate dental students’ perspectives related to COVID-19 pandemic situation. A self-administered questionnaire was developed to investigate and evaluate pandemic-related educational responses. Survey items were then independently reviewed by two researchers - public health professionals, dentists, and health psychologists – to improve clarity, content, and face validity of the survey.

### *Participants*

The survey was posted online to a convenient sample of 163 second and 95 third-year preclinical dental students. It was conducted at Sofia Medical University, Faculty of Dental Medicine as a part of internal survey. The dental faculty offers a dental medicine doctoral (DMD) master’s degree that is a 6-year full theoretical and practical training. The latter applies both for Bulgarian (BG) and English-speaking (ENG) students.

### *Instruments and Procedures*

The survey instrument consisted of demographic questions (age, gender, and country of origin) and 19 questions incorporating 57 items. Survey items focused on 3 general domains: (1) student attitude, assessment, and concerns regarding online learning, (2) student current knowledge and perceptions of COVID-19 pandemic - predisposing factors in dentistry and dissemination of the disease, prevention measures in dental practice and in society, relevant sources of information about covid pandemic, and opinion of government generally accepted measures and their adequacy to address the problem, (3) student opinion of pandemic psychological impact on public health, personal experiences and intention for vaccination. In this paper the authors will focus on the first part of the survey instrument representing students’ perceptions on the implementation and effectiveness of online learning due to SARS-CoV-2 (COVID-19) as well as their personal experiences in pandemic situation. Information was drawn by means of several Yes/No questions in the light of the following issues: student opinion of school closure and implementation of remote education due to COVID-19 pandemic, self-reported effectiveness of online training compared to face-to-face learning, student experiences regarding handling and lecturers’ involvement in learning process during pandemic situation, psychological impacts of distance learning, student concerns, and finally student perspective on the choice of dentistry as a future profession considering unprecedented times we live in.

Students were given additional information about the survey prior to completing the questions. The aims, possible results, their implication, and overall description of the study were included in provided information. Students were asked to complete the survey having been reassured that participation was

voluntary and their answers would be anonymous. In addition, the respondents were offered no incentives for taking part in this study. The window for survey completion ran 4 weeks (from December 21, 2020 to January 17, 2021). Remainder was sent at the end of the second week.

#### *Data Analysis*

In the present survey, descriptive statistics was used to process and present the relevant item responses (IBM SPSS Statistics 20.0). Frequency distribution (number, proportion) of dental students according to basic categorical variables was used to report the main outcomes of the study.

#### *Ethical issues*

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki, Institutional Review Board, and the local ethics committee of the Medical University – Sofia (IRB Letter of approval N1141/19.04.2021). No identifying information (name, surname, student number) was gathered. Voluntary completion and return of the questionnaire were accepted as a form of individual consent to participate in the survey. Students were informed of the withdrawing possibility, with no other consequences on their status or grades.

## **Results**

#### *Demographic data*

The questionnaire was administered to a total of 258 (136 BG and 122 ENG) out of 516 (287 BG and 229 ENG) 2nd and 3rd year dental students. One-hundred and sixty-nine students (76 BG and 93 ENG) responded to the survey (response rate 65.5%). Of these 72 (42.6%) were males and 97 (57.4%) were females. Among the 169 respondents in the study sample there were representatives of 16 countries (from Europe, Africa, Asia, Middle east). Full demographic data are presented in Table 1.

**Table 1. Socio-demographic characteristics of dental students (n=169)**

<b>Variables</b>	<b>Value</b>
Age (years)	21±1
Gender – n (%)	
Male	72 (42.6%)
Female	97 (57.4%)
Year in school – n (%)	
2 <sup>nd</sup> year dental student	98 (57.9%)
3 <sup>rd</sup> year dental student	71 (42.1%)
Country of origin – n (%)	
Bulgaria	76 (44.9%)
Greece	27 (15.9%)
UK	33 (19.5%)
Germany	10 (5.9%)
Ireland	3 (1.8%)
Denmark	2 (1.2%)
Norway	3 (1.8%)
Sweden	1 (0.6%)
Italy	5 (2.9%)
Cyprus	1 (0.6%)
Ukraine	1 (0.6%)
Egypt	1 (0.6%)
Livan	1 (0.6%)
Kuwait	2 (1.2%)
Syria	1 (0.6%)
Pakistan	1 (0.6%)

#### *Students' educational experiences and perspectives on distance education*

Students' perceptions regarding online learning were assessed in the light of several basic aspects – approval of school closure and interruption of in-class education due to complicated epidemiological

conditions, self-assessed effectiveness and impact of distance learning on students' practical training, mental, and financial health, students' opinions of their professors effectiveness in teaching online classes, and overall attitude towards dentistry and more particularly, the choice of profession (Table 2).

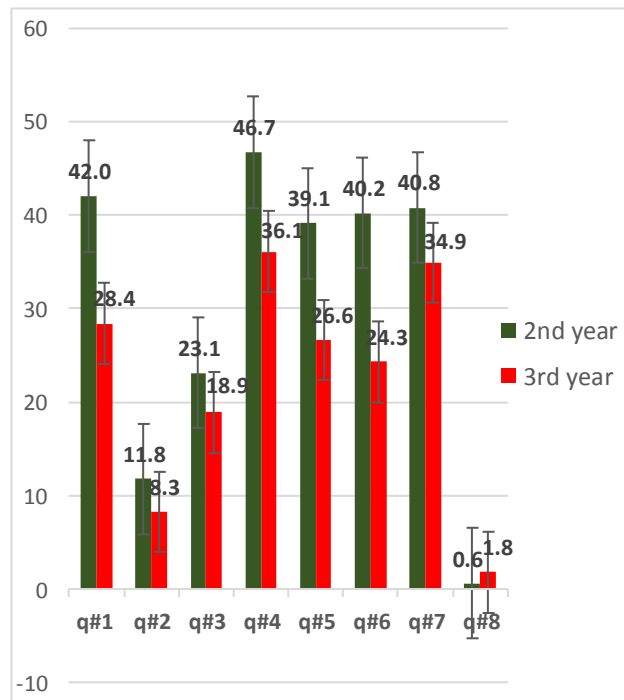
**Table 2. Distribution of students according to their perceptions on distance learning (n, %)**

N	Question	Yes	No
1.	Do you approve interruption of face-to-face classes because of the covid-19 pandemic?	119 (70.4%)	50 (29.6%)
2.	Do you think that online learning is as effective as in-person training?	34 (20.1%)	135 (79.9%)
3.	Do you think online learning is more stressful than in-person training?	71 (42.0%)	98 (58.0%)
4.	Do you think this will affect your practical training as a whole?	140 (82.8%)	29 (17.2%)
5.	Do you cope satisfactorily in the absence of face-to-face classes?	111 (65.7%)	58 (34.3%)
6.	Are your lecturers sufficiently involved in the learning process?	109 (64.5%)	60 (35.5%)
7.	Would you attend the classes if there were no restrictions at a higher level?	128 (75.7%)	41 (24.3%)
8.	Do you regret that you chose dental medicine as a professional field?	4 (2.4%)	165 (97.6%)

When asked if they approve suspension of face-to-face learning because of COVID-19 pandemic most of the respondents answered positively – 119 (70.4%), as the group of 2<sup>nd</sup> year dental students scored higher rates. Only one-fifth of the students – 34 (20.1%) believed online learning was as effective as in-person training. Again 2<sup>nd</sup> year students were more optimistic in this regard than their 3<sup>rd</sup> year colleagues – “...for me online classes are really good. I can work better. I can manage my time easier, and I am not so tired as I am after Uni...”. More than half of the respondents – 98 (58.0%) did not find online learning more stressful than in-class education. More mental health concerns were reported among 2<sup>nd</sup> year students – feeling lonely, anxiety, depression. Some of them expressed worries about financial issues – reduced family income, parents working hard to meet ends. “...I have this problem in my family, and I am worried about my tuition fee...but Uni does not care. It is sad...”

However, most of the dental students – 140 (82.8%) expressed concern about the lack of practical training during the current crisis and negative consequences for their future practice. In students' opinion missed practical classes in preclinical simulation environment would affect their performance in clinical disciplines. Some of the respondents believed that limited practice would cause a serious deficit in knowledge and skills, as it was not effective to learn things only in theory as well as practice was the basis of training in dentistry. Lack of muscle memory and improvement of fine motor skills along with demotivation due to lack of working environment were the most indicated negative consequences of online education. Furthermore, as a result of missing prosthetic and conservative practical lessons, many students felt insecure about their future training and working with patients in the next years. Finally, some dental students thought that distance learning was stressful and less communicative than in-person training in which students and lecturers had an immediate feedback and learning was more efficient: “...I think that at the moment I am not learning anything, neither in theory nor in practice, but we are doing everything fictitiously, which is quite a pity and unacceptable”. On the contrary, some of the respondents thought that remote education would have a positive impact. They found it less stressful, as it was easier to learn from home: “...I am more concentrated, and I feel healthier...”; “...we will compensate next years...”. Among 3<sup>rd</sup> year students there was a bigger proportion – 85.9%, expressing concern that online learning would have any impact (positive or negative) on their training compared to the group of 2<sup>nd</sup> year students in which only 80.6% expressed such concern.

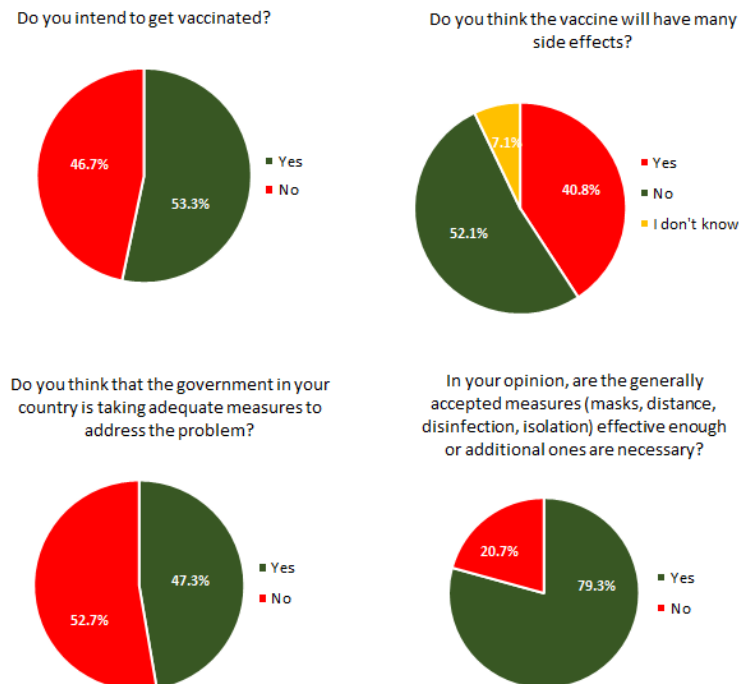
Students' educational experiences regarding dealing with study materials were also of interest to the present survey. More than one-third of the respondents – 58 (34.3%) experienced difficulties in understanding and interpretation of educational materials. An almost even distribution was observed in terms of students' assessment of their professors' effectiveness in teaching online courses – 60 (35.5%) felt negatively, which was mostly reported by 3<sup>rd</sup> year dental students. Despite all the difficulties encountered due to the coronavirus crisis, over three-quarters of the students – 128 (75.7%) indicated they would attend the classes if there were no restrictions at a higher level. Furthermore, only one 2<sup>nd</sup> year and three 3<sup>rd</sup> year students expressed regret for choosing dental medicine as a professional field (Figure 1).



**Figure 1. Proportion of 2<sup>nd</sup> and 3<sup>rd</sup> year students according to their educational experiences (%)**

*Students' personal experiences and intention for vaccination*

Thirty-seven students (21.9%) reported they suffered from COVID-19. Of these over one-third 13 (35.1%) intended to be vaccinated even though they had had the disease. Two-thirds of the respondents – 113 (66.9%) indicated that a relative, friend or acquaintance close to them tested positive for COVID-19. Over half of the students – 90 (53.3%) would like to be vaccinated (Figure 2). According to the opinion of 88 students (52.1%) the COVID-19 vaccine would not have many side effects. However, almost one-quarter of them – 21 (23.8%) did not intend to get vaccinated. Sixty-nine students (40.8%) thought that the vaccine would cause many side health effects. Despite this fact, one-quarter of them – 17 (24.6%) intended to be vaccinated.



**Figure 2. Proportion of students according to their personal experiences and intention for vaccination against COVID-19 (%)**

Most of the dental students – 134 (79.3%) found the generally accepted measures against coronavirus (masks, distance, isolation, etc.) effective enough. However, every 1 in 5 (20.7%) indicated that additional measures were necessary to deal with the problem. Sanitisation of streets to contain the spread of coronavirus, mass population testing, and a hard lockdown were mentioned in the light of improving effectiveness of covid control measures. Some students were final in their speech: “...we need mandatory isolation for everyone from any country, enforced lockdown measures for longer periods...”. In addition, more than half of the students – 89 (52.7%) thought that the government in their country was not taking adequate measures to cope with pandemic situation: “... the measures are good, but their implementation needs to be controlled better and non-implementation must be penalized more seriously...”; “... proper enforcement of said measures are required as well, or else people won't obey them...”.

### Discussion

This paper questions students' perspective and self-assessed effectiveness of online learning during COVID-19 pandemic. As reported previously in the literature, virtual teaching provides continuous and flexible learning despite the pandemic as well as opportunity to enhance education for the future (Wilcha, 2020; Schlenz et al., 2020). However, electronic learning platforms are used to teach theoretical content only and the greatest concern is about interruption of preclinical and clinical activities (Machado et al., 2020). Although the decision to suspend in-person teaching activities may lead to a serious skill deficit among the new generation of dentists, as indicated by many authors, the students show a predominantly positive perspective on the implementation of distance learning (Schlenz et al., 2020; Jum'ah et al., 2020). We found that most of the participants in the study (70%) approved suspension of face-to-face classes due to the COVID-19 crisis. It was not surprising that the proportion of 2nd year students was bigger compared to 3rd year ones as the latter were usually involved in more hours of practically oriented disciplines and felt more influenced by interruption of in-class education. Furthermore, the third year of education is the last one prior to the real clinical work of the students and they experienced high level of concern regarding their future education and handling with patients. In general, younger students prefer and tend to adapt more easily to distance learning than the seniors (Amir et al., 2020; Siritongthaworn et al., 2006; Teo et al., 2011).

Our findings indicated a very low level of self-reported effectiveness of remote education. Despite students' conflicting opinions on the issue, most (80%) respondents expressed dissatisfaction toward online teaching sessions as similarly reported in a study conducted by Sarwar et al., 2020. The fact is that virtual teaching could only partially replace traditional classroom learning, and patient-based clinical experiences are adversely affected (Elangovan et al., 2020; Generali et al., 2020; Haridy et al., 2020). However, in this study according to some students remote education could also have a positive impact. They reported less fatigue, greater concentration, feeling more secure when working in a healthier environment as well as more effective time management. Furthermore, some respondents mentioned the opportunity to compensate for missed clinical disciplines on a later phase, which underlined some basic advantages of alternative remote methods of teaching.

On the other hand, students' preference for e-learning and their self-regulatory behaviour are influenced to a greater extent by other factors such as personality types (Amir et al., 2020). According to Jung's theory of psychological types, there are two personal attitudes (introversion and extraversion) as well as four basic psychological functions (sensation/intuition and thinking/feeling) and their combination determines one's perceptions, behaviour, and judgements (Bolliger & Erichsen, 2013). The impact of personality type is well demonstrated if it refers to preferred educational environments, communication mode or participation in online discussion (Bolliger & Erichsen, 2013). In contrast with the results of our study, Amir et al. (2020) suggested time management and difficulty to focus while learning online for a longer period of time as internal challenging factors regarding remote education. One of the factors that contribute to these differences might be related to student personality types and their behavioural patterns.

Besides the obvious advantages of online learning, the present study demonstrated its most important disadvantage resulting in reduced student learning motivation and satisfaction. Much has been written on the main problem in online dental education, namely the lack of practical classes (Hung et al., 2020; Elangovan, 2020; Loch et al., 2021; Haridy et al., 2020). In this study, more than 80% of the participants agreed that this will have negative effects on their education as, unlike medical education, it requires appropriate physical setting and psychomotor skills which cannot be ensured by means of distance learning only. In addition, the results indicated difficulties in communication, handling with educational materials, and reduced lecturers' engagement during online teaching. More than one-third of this group of dental students experienced such feelings, which is well comprehended and also reported by the current literature (Wang et al., 2021; Wilcha, 2020; Amir et al., 2020; Sarwar et al., 2020).

Another important issue for discussion about online learning is related to psychological impact of the COVID-19 pandemic on dental students. Studies by Hakami et al. (2020), Chakraborty et al. (2020) and Akinkugbe et al. (2020) showed similar results regarding coronavirus disease negative impact demonstrated in elevated levels of anxiety, higher depression scores, and stress in students. In another study by Kharmia et al. (2020) dental students' anxiety and stress to return to training in COVID-19 era were assessed. The authors reported only 1% of respondents ready to continue education in clinical part. It is interesting to note that in this paper more than half of the students (58%) did not find remote education more stressful than in-person training. More concerns were expressed about financial issues than mental health problems or other pandemic-related psychological impacts. Moreover, the majority (76%) agreed to attend in-person classes if there were no imposed restrictions. Through student feedback, the results indicated almost 98% not regretting for the choice of profession and being satisfied with dentistry as their future occupation.

During the coronavirus outbreak reports from official statistical sources (WHO website, COVID-19 website, etc.) provide up-to-date information on the number of infected and deceased population. It was normal and not surprising that in this group of dental students there were also persons who suffered or had infected friends or relatives. Along with Bulgarian students, the results reported bigger proportion of respondents from UK, Greece and Germany sharing such information. In addition, most dental students believed that wearing masks, social distancing, disinfection, and isolation in general are effective measures to minimise the spread of COVID-19. However, one interesting and concerning fact was that over half of them did not share the same opinion of the government measures to manage the COVID-19 crisis. The main criticism concerned effectiveness of said measures and government introduced plans to combat coronavirus. In student opinion, there should be stricter control over the implementation of the imposed measures as well as sanctions for deviating persons.

COVID-19 era has been definitely a challenging time. As previously mentioned, dentistry is a high-risk profession, and it is the only one in which the healthcare worker says, "Take your mask off". To ensure healthy working environment dental professionals should be aware enough of all preventive measures that help maintain the health of both patients and members of the dental team. During pandemic, a vaccine provides the best solution to prevention of infectious diseases. Furthermore, according to a study by La Fauci et al. (2019) among healthcare university students, vaccinations should be a prerequisite for healthcare professionals to work in healthcare area. COVID-19 vaccinations are already ongoing in many countries. Even though there has been an anti-vaccine propaganda, misinformation, and conspiracy theories that are already promoting vaccine hesitancy (Rzymyski et al., 2021; French et al., 2020), perceptions and attitudes of future generations of dentists are essential. In the current study, we estimated dental students' intention to receive COVID-19 vaccine as well as their attitude towards some vaccine uncertain attributes such as effectiveness and side effects. We found that more than half of the respondents (53%) would like to be vaccinated against COVID-19. Although the authors could not find information about dental students' intentions for vaccination and this issue is not much analysed in the literature, the results are comparable to the findings of other studies regarding general population, healthcare staff members and students of other specialties. Studies conducted in the United States, France, and China, demonstrated a COVID-19 vaccine uptake rate 68-69%, 78% and 85% respectively (Pogue et al., 2020; Reiter et al., 2020; Detoc et al., 2020; Leng et al., 2021). According to a cross-sectional study by Baloran (2020) conducted among two local private colleges in Southern Philippines, there were 81% student respondents willing to be vaccinated against COVID-19. Apparently, these studies were associated with higher vaccine acceptance compared to our findings. However, they involved non-medical respondents. In contrast, a study among nurses by Kwok et al. (2021) reported 63% intending to take COVID-19 vaccine. In addition, even lower vaccine uptake rate (44%) was reported by Grech & Gauci (2020) in a study in the University of Malta, Faculties of Health Sciences, Dentistry and Medicine. As stated in the current literature, vaccine hesitancy might be related to the level of trust in information sources and risk perceptions (Qiao et al., 2020; Qiao et al., 2020) as well as insufficient knowledge about such a vaccine regarding its effectiveness, duration, and potential long-term side effects (Pogue et al., 2020; Reiter et al., 2020; Leng et al., 2021; Baloran, 2020; Kwok et al., 2021; Grech & Gauci, 2020). Of interest, in the present study almost 41% believed that COVID-19 vaccine could have health risks or side effects. In fact, COVID-19 vaccination decision-making is a matter of individual preferences. However, we must not forget that vaccines have the potential to save millions of lives every year, they are one of the most effective public health preventive interventions and bring numerous social and economic benefits (Ozawa & Stack, 2013).

### Limitations

Results from the current study indicated some essential characteristics of online learning, regarding its basic advantages and disadvantages thus having the potential to improve technology-based strategies in future dental education. However, the survey had some limitations. First, it used data from one dental university only. Second, it was cross-sectional in nature and the findings provided a snapshot of the situation in time. Third, the study was descriptive, and the data were reported without statistical tests. Although the aim of the study was not to compare differences among respondent groups, the results should be interpreted with caution. This could be further investigated in future studies. Fourth, the study was voluntary with response rate 65.5% and therefore the number of non-respondents may have undermined the power of the study (Amir et al., 2020). Fifth, the study assessed pre-clinical students' experiences while more objective perspectives on distance learning effectiveness could be obtained by the clinical students. Despite all limitations, the present study provides useful information on the dental student educational and personal experiences during the COVID-19 pandemic. Future longitudinal studies can be performed to track outcomes in time or to compare different dental schools and share educational initiatives (Hung et al., 2020).

### Conclusions

Dental education was significantly influenced by the novel coronavirus pandemic. Implementation of online learning was a satisfactory solution to provide continuous education and a chance to improve it for the future. Our findings indicated that despite the low level of self-reported effectiveness of distance learning, dental students did not communicate it was more stressful than traditional in-person education. Most students expressed concerns with regard to their future clinical training as well as current financial issues due to the COVID-19 crisis. Nonetheless, the vast majority of student respondents demonstrated satisfaction with dentistry and the choice of profession. In general, dental students favoured preventive measures against COVID-19, however they underlined the need for their proper implementation. Finally, living in uncertain times, the COVID-19 era has been challenging individual preferences for getting vaccinated. Although there was a great percentage of respondents thinking that the COVID-19 vaccine could have possible health risks or side effects, many dental students approved vaccinations and intended to receive this vaccine. Within the limitations of the study, it provides valuable information, and the findings could be of interest to dental students and educators to increase effectiveness of learning environment as well as administrators, public health professionals and policy makers to improve efforts towards preserving, protecting, and promoting public health. Gaps and weaknesses regarding virtual teaching issues should help improve provision and continuity of dental education. Furthermore, technology-based approach in dental education should be innovated and possibly applied to different situations, thus ensuring better quality of future dental education and improved public health.

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