

# The self-perceived competency of dental students about contagious diseases during the COVID-19 pandemic and its effect on their career plans

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## Abstract

**Background.** Dentistry is reported as a very-high-risk profession for COVID-19 contagion. A lack of face-to-face education and poor information during the COVID-19 pandemic may have impacted dental students.

**Objectives.** We aimed to evaluate the effects of the COVID-19 pandemic on career plans and self-perception of knowledge levels in undergraduate dental students.

**Materials and methods.** In this multicenter cross-sectional study, a multiple-choice survey was completed by dental students of Near East University (NEU) in North Nicosia and University of Kyrenia (UoK) in the Turkish Republic of Northern Cyprus (TRNC), and Erciyes University (ERU) in Kayseri, Turkey, in 2020. The  $\chi^2$  tests were used to determine statistically significant differences.

**Results.** Of the 755 students that participated in the study, 66% declared fear of being at risk for contagion. More than half of the students reported not having sufficient knowledge about occupational infections and methods for protection, and the percentages were significantly higher in female and preclinical students. Utilization of credible publications, guidelines (57% compared to 34%,  $p < 0.001$ ) and online education (19% compared to 8%,  $p < 0.001$ ) were significantly higher in students claiming to have adequate knowledge. Eleven percent of the students thought about dropping out of dental education because of the COVID-19 pandemic. These students exhibited a markedly increased fear of being at risk for contagion because of the COVID-19 pandemic (80% compared to 64%,  $p = 0.011$ ). Seventy-six percent of the students were aiming for a dental specialty. Eighteen percent changed their desired specialty, and 25% were in search of a specialty that they believed required fewer close contact procedures.

**Conclusions.** It is crucial to prepare students for the next possible outbreak using the knowledge gained during this pandemic by modifying the dental curriculum and providing credible information and psychological support to guide dental students in building a healthy career path.

**Key words:** coronavirus, dental education, career choice, personal protective equipment, dental specialty

## Background

The COVID-19, which was first encountered in China in the last days of 2019 and became a pandemic after spreading worldwide over several months, is caused by a virus that belongs to the coronavirus family. Because the infection is easily transmitted by close contact, many healthcare professionals, such as doctors, dentists, nurses, and paramedics, became a target for the disease. Dentistry is classified as a very high-exposure risk profession for COVID-19 due to the aerosol-generating procedures used in some dental procedures and examinations.<sup>1</sup> At the beginning of the pandemic, the American Dental Association (ADA) suggested postponing treatment of all cases other than those requiring urgent or emergency procedures.<sup>2</sup> As COVID-19 became better understood over time and dental practices resumed, it was reported that the number of infected dentists was extremely low, despite the high contagion risk.<sup>3,4</sup> Nevertheless, this fact was not well known to dental students at the early stages of the pandemic.

After the onset of the pandemic, understanding the disease, defining clinical symptoms and findings, developing diagnostic methods, and providing information about protection required a significant amount of time.<sup>1,2,5</sup> Unproven claims had reached a large number of people before evidence-based information on the properties of the virus was obtained and protection methods were established through scientific studies. While the initial distribution of information through social media seemed convenient, this channel often contained misleading headlines and content.<sup>6,7</sup> During the pandemic, many students were overwhelmed by a fear of the disease and faced significant pressure.<sup>8,9</sup> Therefore, institutions like the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and the ADA regularly published announcements to provide a reliable source of information.<sup>2,5</sup>

Many universities could not continue face-to-face education because of the quarantine measures taken during the pandemic. To ensure the continuity of education and keep students motivated, universities with adequate technological infrastructure switched to online education. Different evaluation and measurement methods have been applied to assess the effectiveness of this delivery method. For dentistry, it did not seem plausible that any distance learning course could replace face-to-face education since direct applications, which should be performed on patients during clinical practice and are an integral part of dental education, could not be performed.<sup>10</sup>

The sudden onset of the pandemic, the cessation of face-to-face education and essential clinical practices, and the initial distribution of unproven information may have especially burdened dental students at the beginning of the pandemic. These effects may have led to a decreased self-perceived competency in dental students with regard to understanding the nature of contagious diseases, the effective utilization of personal protective equipment (PPE),

obtaining valid scientific information, and verifying the information gathered under lockdown conditions. These effects, in turn, may have led to increased levels of anxiety, a change of career plans or preferred dental specialties, or even dropping out of dental education.

## Objectives

In this study, we aimed to survey dental students about their awareness and knowledge of contagious diseases, protection from infections, working conditions, and occupational hazards, and examine how the pandemic impacted their education. We also intended to investigate whether the pandemic affected the students' choice of dental specialties.

## Materials and methods

This multicenter cross-sectional study was conducted with the approval of the Near East University (NEU; North Nicosia, Turkish Republic of Northern Cyprus (TRNC)) Scientific Research Ethics Evaluation Board (approval No. 2020/802-1125). It was carried out in the dental faculties of NEU, the University of Kyrenia (UoK; Kyrenia, TRNC) and Erciyes University (ERU; Kayseri, Turkey). A survey was distributed via Google Forms, and the answers were collected through the same platform. The participants were asked to take part in the survey between July 20 and August 5, 2020. There were 15 multiple-choice questions, 4 of which asked about demographics, including questions on age, class, gender, and the university attended (Table 1).

All Turkish-speaking undergraduate students at the above-mentioned dental schools were eligible to take part in the survey. To be included in the study, the questionnaires must not have had missing answers and must have been submitted in the required timeframe. Students in the 4<sup>th</sup> and 5<sup>th</sup> years were regarded as the clinical student group, and 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>-year students constituted the preclinical student group. Responses were evaluated for all of the questions. No identifying data about the participants were collected.

The questions were grouped into 3 main sections. The 1<sup>st</sup> section aimed to gather data about confidence in their knowledge of the COVID-19 pandemic, fear of contracting a contagious disease, feeling informed about protecting themselves from the disease, and ways of gathering information about this topic. In the 2<sup>nd</sup> section, students were asked whether they ever wanted to drop out of dental education because of the COVID-19 pandemic. In the 3<sup>rd</sup> section, students were asked if they were planning to have a postgraduate residency in a dental specialty and whether the COVID-19 pandemic affected their dental specialty choice.

The survey was delivered by e-mail to every dental student at the institutions listed above to avoid sampling bias, and it was kept short to reduce the nonresponse rate. The overall number of included participants was

Table 1. Survey questions

Question No.	Question (answer options)
1	Age [years]
2	Gender (female, male)
3	University
4	Class in 2019–2020 academic year (1, 2, 3, 4, 5)
5	In the process of the COVID-19 pandemic, my awareness about the occupational infections that can be transmitted to me from my patients has increased. (agree, disagree, indecisive)
6	The process of the COVID-19 pandemic has caused in me fear of being at risk for contagion while I am practicing my profession. (agree, disagree, indecisive)
7	I think that I have sufficient knowledge about occupational infections and the methods to protect myself from these diseases. (agree, disagree, indecisive)
8	I know how to protect myself from the COVID-19 infection while I am practicing my profession. (agree, disagree, indecisive)
9	I have sufficient information about PPE that I have to use to prevent the transmission of COVID-19 disease from my patients. (yes, no, indecisive)
10	I use ..... as source of information to gather knowledge about prevention methods against COVID-19 infection and PPE, their properties and usage. (participants could select more than 1 option – see Table 3)
11	I have wanted to or have thought of dropping out of dental education because of fear of COVID-19 contagion. (yes, no)
12	I have planned to pursue further education in a dental specialty. (yes, no)
13	I have adequate information about the degree of close contact procedures applied to the patients in the dental specialty of my preference. (yes, no)
14	I have changed the dental specialty I was aiming for because of the COVID-19 pandemic. (yes, no)
15	I am in search for a dental specialty that requires less close contact procedures while treating patients, such as oral diagnosis and radiology or oral pathology. (yes, no)

PPE – personal protective equipment.

determined by the number of eligible students who responded in the given timeframe and filled out the survey without omitting any answers.

## Statistical analyses

The Statistical Package for Social Sciences (SPSS) v. 15 (SPSS Inc., Chicago, USA) was used for all statistical analyses. The internal consistency of the given responses was measured using Cronbach's  $\alpha$ , and values over 0.70 were regarded as statistically reliable. The demographic data were analyzed using the median and interquartile range (IQR) values and frequency distribution tables. The results were reported as medians (IQR) or percentages. Participants were grouped for certain analyses according to the responses they gave to prior questions. The nominal data were compared using cross tabulations. The  $\chi^2$  tests or Fisher's exact tests were used to determine statistically significant differences between these groups. The p-values less than 0.05 were regarded as statistically significant.

## Results

### Demographic information and reliability

The online survey link was shared with 1532 students in 3 dental faculties in 2 countries. Overall, 755 dental

students participated in the study, corresponding to a 49% response rate. More than half of the participating students were from ERU (n = 394, 52%), while 286 NEU students (38%) and 75 UoK students (10%) responded to the survey. The study population consisted of 338 clinical (45%) and 417 preclinical (55%) students. Females comprised 63% (n = 474) of the sample and men 37% (n = 281). There was no difference in the gender distribution between universities (NEU 63% females, UoK 55% females, ERU 64% females; p = 0.292).

Cronbach's  $\alpha$  was used to evaluate the consistency of the responses given to the same group of questions. The  $\alpha$  values of questions about contagious diseases and PPE usage and education in dental specialties were found to be 0.71 and 0.79, respectively. Removing any of the questions did not increase the corresponding  $\alpha$  values.

### Fears

Ninety-two percent of the 755 students who participated in the study stated that their awareness of contagious diseases which can be transmitted in the occupational environment increased throughout the COVID-19 pandemic, and the percentages were significantly higher in female and pre-clinical students (Table 2). Also, fear of being at risk for contagion because of the COVID-19 pandemic emerged in 2/3 of the students and was markedly more intense in females. More than half of the students reported not having sufficient

**Table 2.** Students' opinions on their knowledge about COVID-19 pandemic and contagious diseases, and comparison of clinical compared to preclinical students and female compared to male students

Questions	Answers	Total (n = 755)	Clinical students (n = 338)	Preclinical students (n = 417)	$\chi^2$	p-value*	Female students (n = 474)	Male students (n = 281)	$\chi^2$	p-value*
In the process of the COVID-19 pandemic, my awareness about the occupational infections that can be transmitted to me from my patients has increased.	agree	698 (92%)	304 (90%)	394 (95%)	6.409	<b>0.041</b>	447 (94%)	251 (89%)	9.309	<b>0.010</b>
	disagree	19 (3%)	13 (4%)	6 (1%)			12 (3%)	7 (3%)		
	indecisive	38 (5%)	21 (6%)	17 (4%)			15 (3%)	23 (8%)		
The process of the COVID-19 pandemic has caused in me fear of being at risk for contagion while I am practicing my profession.	agree	499 (66%)	225 (67%)	274 (66%)	1.294	0.524	337 (71%)	162 (58%)	17.667	<b>&lt;0.001</b>
	disagree	99 (13%)	48 (14%)	51 (12%)			46 (10%)	53 (19%)		
	indecisive	157 (21%)	65 (19%)	92 (22%)			91 (19%)	66 (23%)		
I think that I have sufficient knowledge about occupational infections and the methods to protect myself from these diseases.	agree	348 (46%)	166 (49%)	182 (44%)	11.288	<b>0.004</b>	205 (43%)	143 (51%)	7.165	<b>0.028</b>
	disagree	75 (10%)	20 (6%)	55 (13%)			43 (9%)	32 (11%)		
	indecisive	332 (44%)	152 (45%)	180 (43%)			226 (48%)	106 (38%)		
I know how to protect myself from the COVID-19 infection while I am practicing my profession.	agree	480 (64%)	215 (64%)	265 (63%)	0.221	0.896	300 (63%)	180 (64%)	0.060	0.971
	disagree	48 (6%)	20 (6%)	28 (7%)			30 (6%)	18 (6%)		
	indecisive	227 (30%)	103 (31%)	124 (30%)			144 (30%)	83 (30%)		
I have sufficient information about PPE that I have to use to prevent the transmission of COVID-19 disease from my patients.	agree	441 (58%)	214 (63%)	227 (54%)	11.644	<b>0.003</b>	267 (56%)	174 (62%)	3.568	0.168
	disagree	17 (2%)	2 (1%)	15 (4%)			9 (2%)	8 (3%)		
	indecisive	297 (39%)	122 (36%)	175 (42%)			198 (42%)	99 (35%)		

PPE – personal protective equipment; \*Pearson's  $\chi^2$  test, degrees of freedom (df) = 2. Values in bold are statistically significant.

knowledge about occupational infections and methods of protection, and this ratio was significantly higher in females and preclinical students. The percentage of students who knew how to protect themselves from COVID-19 while practicing their profession was 64%, which did not differ between the gender or training stage of the students. The ratio of students who stated that they had sufficient information about PPE to protect themselves from COVID-19 was 58%, which was markedly higher for clinical students but did not differ between genders (Table 2).

Social media were found to be the most common source of information about PPE, their properties and usage (57%), followed by reliable publications and organizational guidelines (47%), friends and social circle (37%), television (37%), and online sources (14%; Table 3). There were no statistically significant differences between female and male students regarding the sources used to obtain information, but clinical students pointed at their friends and social circle and social media more often compared to preclinical students.

To investigate the relationship between gathering adequate information and the sources of knowledge, we separated the students who stated that they have adequate knowledge about using PPE to protect themselves from COVID-19 as the PPE group, and compared them with the rest of the students. In the PPE group, the use of reliable publications and guidelines (57% compared to 34%,  $p < 0.001$ ) and online education (19% compared to 8%,  $p < 0.001$ ) to obtain information was significantly more

prevalent, and relying on friends and social circle (32% compared to 44%,  $p = 0.001$ ) was significantly rarer. The percentage of students using television or social media as an information source did not differ significantly between the PPE group and the rest of the students ( $p = 0.067$  and  $p = 0.180$ , respectively; Table 4).

## Thoughts about dropping out of dental education

The students were asked whether they ever thought of dropping out of dental education because of the COVID-19 pandemic. The responses to these questions are summarized in Table 5. While 675 of the students never considered dropping out, 80 students (11%) had thoughts about quitting dental education. Students who contemplated dropping out had a significantly increased fear of being at risk for contagion because of the COVID-19 pandemic. Furthermore, the proportion of students who reported knowing about occupational infections and how to protect themselves from them, how to be protected from COVID-19 in the occupational environment, and which PPE should be used to prevent infections, was significantly lower among the students who considered dropping out. The percentage of students who considered dropping out of dental education was considerably higher in clinical students compared to non-clinical students, but there was no statistically significant difference between genders (Table 5).

**Table 3.** Distribution of the responses of students for the source of information they use to gather knowledge about prevention methods against COVID-19 infection, PPE, their properties and usage

Source of information	Frequency (%) <sup>a</sup>	Clinical students (n = 338)	Preclinical students (n = 417)	$\chi^2$	p-value*	Female students (n = 474)	Male students (n = 281)	$\chi^2$	p-value*
Friends and social circle	281 (37%)	144 (43%)	137 (33%)	7.595	<b>0.006</b>	179 (38%)	102 (36%)	0.162	0.687
Television and public service broadcasting	281 (37%)	118 (35%)	163 (39%)	1.394	0.238	177 (37%)	104 (37%)	0.008	0.928
Social media	433 (57%)	213 (63%)	220 (53%)	8.034	<b>0.005</b>	282 (60%)	151 (53%)	2.390	0.122
Online lectures of my faculty	109 (14%)	48 (14%)	61 (15%)	0.028	0.868	62 (13%)	47 (17%)	1.898	0.168
Credible publications and guidelines issued by organizations (WHO, ADA, Ministry of Health, etc.)	356 (47%)	171 (51%)	185 (44%)	2.905	0.088	234 (49%)	122 (43%)	2.507	0.113
I don't have a specific interest in gathering information and PPE	17 (2%)	12 (4%)	5 (1%)	3.682	0.055	11 (2%)	6 (2%)	0.028	0.868
Other (research papers, family members, lecture notes, etc.)	16 (2%)	6 (2%)	10 (2%)	0.349	0.555	9 (2%)	7 (3%)	0.298	0.585

<sup>a</sup>Participants were allowed to choose more than 1 option. WHO – World Health Organization; ADA – American Dental Association; PPE – personal protective equipment. \*Pearson's  $\chi^2$  test, degrees of freedom (df) = 1. Values in bold are statistically significant.

**Table 4.** Difference in the source of information for the students who have knowledge about PPE for protecting themselves from COVID-19 while treating their patients

Source of information	Question: "I have sufficient information about PPE that I have to use to prevent the transmission of COVID-19 disease from my patients."		$\chi^2$	p-value*
	Students who responded "yes" (PPE group, n = 441)	Students who responded "no/ indecisive" (n = 314)		
Friends and social circle	142 (32%)	139 (44%)	11.431	<b>0.001</b>
Television and public service broadcasting	152 (35%)	129 (41%)	3.435	0.067
Social media	262 (59%)	171 (55%)	1.839	0.180
Online lectures of my faculty	84 (19%)	25 (8%)	18.247	<b>&lt;0.001</b>
Reliable publications and guidelines issued by organizations (WHO, ADA, Ministry of Health, etc.)	249 (57%)	107 (34%)	36.885	<b>&lt;0.001</b>
I don't have a specific interest in gathering information and PPE	3 (1%)	14 (5%)	11.896	<b>0.001</b>
Other (research papers, family members, lecture notes, etc.)	13 (3%)	3 (1%)	3.510	0.074

\*Pearson's  $\chi^2$  test, degrees of freedom (df) = 1. PPE – personal protective equipment; WHO – World Health Organization; ADA – American Dental Association. Values in bold are statistically significant.

## Career plans

The percentage of students who were aiming for a dental specialty was 76% (n = 574), which was higher in women (82% compared to 69%, p = 0.004) and lower in clinical students ( $\chi^2$  test, df = 1, 67% compared to 83%; p < 0.001). Of these 574 students, 18% stated that the COVID-19 pandemic caused a change in the specialty they were aiming for, and 25% of these students stated that they were in search of a dental specialty requiring less close contact while treating patients. Both of these percentages were higher in female students compared to male students (22% compared to 14% and 29% compared to 20%; p = 0.006 and p = 0.006, respectively). In the students who wanted to change their desired dental specialty because of the COVID-19 pandemic, fear of facing contagious diseases while practicing their profession was significantly

higher (78% compared to 64%; p = 0.004). The students who wanted to change their desired dental specialty also reported having less knowledge about occupational infections and protection methods (32% compared to 48%; p = 0.007), and the PPE used for protection from COVID-19 (47% compared to 63%; p = 0.002). The students who were aiming for a dental specialty and did not have adequate information about the close contact procedures applied to the patients in their preferred specialty showed a higher tendency to change their choice of dental specialty (29% compared to 15%; p = 0.001), and they were more eager to look for a dental specialty with less close contact with the patients (42% compared to 18%; p < 0.001).

The clinical students aiming for a dental specialty had a higher rate of looking for a specialty requiring less close contact with patients compared to the preclinical students (28% compared to 19%; p = 0.008). The clinical students

Table 5. Students' thoughts on dropping out of dental education

Training stage/gender of the students	Question: "I have wanted to or have thought of dropping out of dental education because of fear of COVID-19 contagion."			
	Yes, I have considered dropping out (n = 80)	No, I have never thought of it (n = 675)	$\chi^2$	p-value*
Cross tabulation with clinical students				
Clinical students	52 (15%)	286 (85%)	14.813	<b>&lt;0.001</b>
Preclinical students	28 (7%)	389 (93%)		
Cross tabulation with gender of the students				
Female students (n = 474)	58 (12%)	416 (88%)	3.617	0.057
Male students (n = 281)	22 (8%)	259 (92%)		
Cross-tabulated questions, responded "yes/agree"				
The process of the COVID-19 pandemic has caused fear that I am at risk for contagion while I'm practicing my profession.	64 (80%)	435 (64%)	9.098	<b>0.011</b>
I think that I have sufficient knowledge about occupational infections and the methods to protect myself from these diseases.	20 (25%)	328 (49%)	16.674	<b>&lt;0.001</b>
I know how to protect myself from the COVID-19 infection while I am practicing my profession.	37 (46%)	443 (66%)	26.564	<b>&lt;0.001</b>
I am aware of the PPE that I have to use to prevent the transmission of COVID-19 disease from my patients.	34 (43%)	407 (60%)	17.411	<b>&lt;0.001</b>

\*Pearson's  $\chi^2$  test, degree of freedom (df) = 1. PPE – personal protective equipment. Values in bold are statistically significant.

had also a higher tendency to choose specialties like oral diagnosis and radiology or oral pathology (33% compared to 21%;  $p < 0.001$ ). Only 38% of clinical students stated they would not change their choice of dental specialty due to the COVID-19 pandemic, compared to 53% of the pre-clinical students ( $p < 0.001$ ).

## Discussion

The COVID-19 pandemic has not only affected the health status of individuals but has also had significant impact on social interactions and careers. COVID-19 cases among dentists have been extremely rare thanks to PPE and infection prevention measures.<sup>3,4</sup> However, dentistry was declared a very-high-risk profession for COVID-19 early in the pandemic because of the close physical interactions with patients and the use of aerosol-producing procedures.<sup>1,11</sup> Dental students were also mentally affected during this early period. These students experienced a sudden onset of distance education, were not able to attend laboratory classes, had to cease clinical practice, and suffered from fear of COVID-19 contagion caused by the pandemic.<sup>12</sup> In our study, female students presented an increased fear of being at risk for contagion, which may be attributed to the higher anxiety levels in women reported in other studies.<sup>13,14</sup>

The COVID-19 pandemic has drawn attention to infectious diseases in the general population, and college students are no exception.<sup>15–17</sup> The fear due to COVID-19 has been reported to vary from moderate to high in undergraduate dental students,<sup>15</sup> dentists<sup>16,18</sup> and other college students.<sup>17</sup> This variation may be attributed to differences in social distancing measures and quarantine

implementation across governing bodies, together with individual psychological diversity. All of the dental faculties in the TRNC and Turkey suspended face-to-face education and clinical practice due to lockdown measures. As institutions swiftly shifted to online education, students lost opportunities for practical education, sustained personal interactions and clinical experience, which are integral to dental education.<sup>19</sup> This may be one of the reasons for the lack of confidence in having adequate knowledge about protection from contagious infections in more than half of the students in our study. Similar results for the level of knowledge about the COVID-19 pandemic have also been reported in other undergraduate dental students.<sup>20</sup> In contrast to undergraduate dental students, dentists have been reported to have a much higher level of knowledge about COVID-19 and personal protection methods.<sup>3,4</sup> As awareness is higher in this group,<sup>17</sup> more lectures about infectious diseases and protection methods in the curriculum may be beneficial to students and crucial for preparing them for possible future outbreaks.

Proper utilization of PPE is of the utmost importance to protect individuals from COVID-19 infection during dental treatment procedures.<sup>21,22</sup> For this reason, we wanted to evaluate the sources of information students used to gather information on this subject, and whether they thought they had adequate knowledge about using PPE at the beginning of the pandemic. Social media seemed to be the most common source of information for participants of this study. It has been previously reported that students usually used the internet and social media to gather information about the COVID-19 pandemic, but students who used journal articles and the websites of trustworthy organizations had a significantly higher

level of knowledge.<sup>6</sup> These findings are similar to our results. Obtaining knowledge from online faculty lectures or reliable publications and organizations has a more substantial effect compared to gaining knowledge from social media, circle of friends or television. In the age of distance education, it should be a priority to use credible information sources for dentistry education and to ensure that all students have access to these resources.

Although the majority of the surveyed students did not consider dropping out of dental education, 80 did consider this, and their fear of contagion in clinical practice was higher than in those who had not considered dropping out. Their self-confidence regarding the utilization of PPE to protect themselves from COVID-19 was also lower. These factors, in part, may have contributed to their thinking about dropping out of dental education. Students usually feel increased anxiety during outbreaks and pandemics,<sup>21,23</sup> which is even more intense in clinical students,<sup>8,23</sup> and this may directly impact both their daily lives and career plans. Interestingly, the percentages of female and male students who thought of dropping out of dental education did not differ significantly despite their presumed anxiety levels being different. Among the clinical students who had thoughts of dropping out of dental education, the percentage of those who sought for dental specialty that they believed to involve less close contact procedures with patients was significantly higher than of those who did not. This was also true for female students, which may be attributed to increased levels of anxiety among women. These results are consistent with a study that reported that in 15% of otolaryngology trainees, the COVID-19 pandemic affected decisions that could impact their future careers, and that this was more widespread in senior-level trainees.<sup>24</sup> Although otolaryngology and dentistry do not have the same degree of risk according to the Occupational Safety and Health Administration (OSHA) in the USA,<sup>1</sup> they indeed share some degree of similarity, such as working on the same body region and close contact with the upper respiratory tract. To the best of our knowledge, there are no similar studies in the literature comparing clinical and preclinical dental students in this manner.

One of the main goals of this study was to investigate the impacts of the COVID-19 pandemic on the specialty choices of dental students. We found that 18% of the students thought about changing their desired dental specialty due to COVID-19, and that these students declared more intense fear of contagious diseases and felt inadequate in terms of knowledge and protection. In addition, 22% of these students were looking for a dental specialty that involves less close contact with patients. Moreover, the students who did not have enough knowledge about the degree of close contact procedures applied to the patients in the dental specialty that they had planned to pursue were more likely to change their preferred specialty and aimed to choose specialties that require less close contact

with patients. In a recent study, it was reported that fear of COVID-19 and future career anxiety are closely related, which also supports the findings of our study.<sup>25</sup> When these findings are evaluated altogether, it may be presumed that these factors are affecting the career plans of the students. Thus, providing psychological support and guidance to the students, in addition to compensating for their lack of information and knowledge during the COVID-19 pandemic, are of crucial importance.

## Limitations of the study


Our study was carried out during the summer break and in lockdown conditions, which prevented us from successfully reaching out to students in different dental faculties. The 49% response rate was also lower than we had expected. The inclusion of more universities would have led to a nationwide study and could have provided more robust results. Also, because there were no similar surveys conducted previously when this study was carried out, we had to design our own questionnaire. Given the urgency to better understand the nature of COVID-19, we did not have the time to perform validity and reliability testing before the study. Furthermore, we did not have a scale to measure the anxiety and fear levels of the students. Designing a Likert scale for the anxiety caused by the COVID-19 pandemic and examining associations between the scores on this scale and the career plans of undergraduate dental students may produce valuable outcomes.

## Conclusions

After the onset of the COVID-19 pandemic, understanding the disease, developing diagnostic methods, providing information about protection from the disease, and understanding that (with proper safety measures) the contagion risk is not as high as it was initially believed required a significant amount of time and caused severe anxiety. We found that the lack of information during the early period of the pandemic impacted students' dental education and caused changes in their specialty choices. In an unexpected situation like the COVID-19 pandemic, it is crucial to teach students how to obtain reliable information, not only through face-to-face education, but also through online education materials from faculties and reputable organizations. Lack of trustworthy information has also had important effects on the psychological status of students, which may have impacted their dental education and career choices at the beginning of the pandemic. Therefore, it is crucial to prepare students for the next possible outbreak using the knowledge gained during this pandemic by modifying the dental curriculum and providing credible information and psychological support to guide dental students in building a healthy career path.

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