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Awareness of Dental Students Related to COVID-19 and Problems in Distance Education

Objective: In this survey, it was aimed to evaluate the awareness of dental students related to COVID-19 and to define their problems and concerns during distance education.

Materials and Methods: A new survey about COVID -19 was conducted. The online survey was sent to the students of seven dental faculties and the study consisted of 1310 students.

Results: Gender distribution of the respondents was as 38% male and 62% female. While 24.4% were very worried about getting coronavirus, 78.7% were very worried about transmitting it to their immediate environment. Most of the students (84.7%) knew the 3 most evident symptoms of coronavirus, 90.5% of them were aware of the most important measures to be taken to protect against it. Students who thought that transition to distance education was necessary were afraid of getting infected with COVID-19 at a high rate if formal education will be started again (88.3%). Although 63.5% of the participants stated that theoretical courses given by distance education system were sufficient, only 9.8% of them stated that practical courses were sufficient.

Conclusion: Currently challenges related to dental education remain as an important issue to be managed during this pandemic. Dental schools urgently need to improve their education policies and protocols and develop an emergency plan to maintain practical training safely.

Key Words: COVID-19, dental students, distance education, survey

Dişhekimliği Öğrencilerinin COVID-19 İle İlgili Farkındalığı ve Uzaktan Eğitimde Sorunlar

Amaç: Bu çalışmada, dişhekimliği öğrencilerinin COVID-19 ile ilgili farkındalıklarının değerlendirilmesi yanında uzaktan eğitimle ilgili sorun ve endişelerinin belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: COVID-19 ile ilgili yeni bir anket uygulandı. Anket online olarak yedi dişhekimliği fakültesi öğrencilerine gönderildi ve çalışmaya 1310 öğrenci katıldı.

Bulgular: Katılımcıların cinsiyet dağılımı %38'i erkek, %62'si kadın şeklindeydi. %24.4'ü koronavirüse yakalanmaktan çok endişelenirken, %78.7'si yakın çevresine bulaştırmaktan çok endişeliydi. Öğrencilerin çoğu (%84.7) koronavirüsün en belirgin 3 semptomunu biliyordu, %90.5'i koronavirüsten korunmak için alınması gereken en önemli önlemlerin farkındaydı. Uzaktan eğitime geçişin gerekli olduğunu düşünen öğrenciler, örgün eğitime yeniden başlanırsa, yüksek oranda COVID-19 ile enfekte olmaktan korkuyordu (%88.3). Katılımcıların %63.5'i uzaktan eğitim sistemi ile verilen teorik derslerin yeterli olduğunu belirtmesine rağmen, sadece %9.8'i uygulamalı derslerin yeterli olduğunu belirtmiştir.

Sonuç: Diş hekimliği eğitimiyle ilgili zorluklar, pandemi sırasında yönetilmesi gereken önemli bir konu olmaya halen devam etmektedir. Diş hekimliği fakültelerinin acil olarak eğitim politikalarını ve protokollerini iyileştirmeleri, pratik eğitimi güvenli bir şekilde sürdürmek için bir acil durum planı geliştirmeleri gerekmektedir.

Anahtar Kelimeler: COVID-19, diş hekimliği öğrencileri, uzaktan eğitim

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Introduction

Covid-19 disease caused by the SARS-CoV-2 virus, which was first identified in Wuhan, China in December 2019, has rapidly increased and spread across the world and was declared as a pandemic by the World Health Organization (WHO) on March 11, 2020 (1). As of April 21, 2021, it was reported that 140.332.386 confirmed COVID-19 cases and 3.004.088 deaths were present worldwide (2). Thanks to the measures taken, COVID-19 was encountered in Turkey much later than European countries and the first case was seen on March 10, 2020; then the number of cases increased gradually. After understanding that the outbreak will become widespread, the implementations of countries that have previously struggled with this virus were evaluated.

A series of measures have been taken in all countries around the world, collective activities have been suspended or canceled in order to ensure social isolation. In Turkey, whether or not educational activities could be continued was the first item on the agenda. First of all, education has been suspended for three weeks in all preschool, primary, secondary and higher education institutions starting from March 16, 2020. As the number of cases increased rapidly and it was understood that the pandemic would

last long, it has been decided to continue the spring term education-training process only with digital education opportunities and distance education on March 26, 2020 (3).

In accordance with the decisions taken by the Higher Education Council, distance learning has started in all formal programs of all universities. Since then, students have been studying through distance learning and exams are conducted in the form of distance exams or homework and projects. Although the history of distance learning in higher education is not very old, distance education research and application centers, distance education programs and courses in many universities existed also before the pandemic (4). Although there was a certain infrastructure, it is inevitable that this application, which was tried to be created and settled quickly, has deficits and negative effects (5, 6). However, this will have a greater impact on dental students, whose education greatly depends on clinical applications. It is of great importance to develop solution strategies by identifying the problems that may arise in case of transition to formal education or continuing distance education while vaccination is going on.

On the other hand, dental practices increase the risk of cross infection, especially during the incubation period of COVID-19, due to aerosols and droplets formed by routine procedures. Although the Centers for Disease Control and Prevention (CDC), American Dental Association (ADA) and national institutions have published guidelines for dentists and patients, there are no official instructions on how to ensure the continuity of dental education by protecting students, faculty and patients. Dental students to be graduated need to be not only perfect dentists but also healthcare professionals having an effective role in preventing infectious outbreaks. That's why, determining the awareness and knowledge of dental students, as well as dentists, about COVID-19 is mandatory for safe dental services and education. In this survey, it was aimed to evaluate the awareness of dental students related to COVID-19 pandemic and to define their problems and concerns during distance education.

Materials and Methods

Research and Publication Ethics: This study was approved by Non-Interventional Clinical Research Ethics Committee of Health Sciences, İnönü University, Malatya, Turkey (2020/923) and was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

The present cross-sectional study was conducted using an online questionnaire. A questionnaire consisting of 27 questions and 92 items adapted from the current Interim Infection Prevention and Control Guidance for Dental Settings During the COVID-19 Response published by the CDC (7), updated on August 28, 2020 was compiled. The questionnaire was distributed via google docs among the study participants

and the data was collected during a one week period, between October 15 and October 22. Before starting the study, the adequacy of the content of the questionnaire and the clarity of the questions were evaluated by five experts (two periodontologists, one pediatric dentist, one general dentist and one biostatistician).

Finally, the online survey was sent to the students of seven dental faculties, in metropolitan cities, through social media (WhatsApp, Facebook, Instagram), forums and private mailing lists. The google doc had two parts. In the first part participants had to consent, only then they could access the second part of the survey. A total of 1310 students who agreed to participate in the study responded and filled the questionnaire online. The questionnaire included questions based on personal demographic characteristics (first four questions; age, gender, grade level, presence of chronic disease), concern and awareness level, knowledge level, attitude and behaviors related to COVID-19 disease. The effects of COVID-19 on dental education and students' considerations and problems regarding distance education were also evaluated. These topics in the survey content were evaluated with multiple choice questions.

Statistical Analysis: Simple random sampling method was used to calculate the sample size. When a total sample size made up of 3268 students from seven dental faculties were accepted as the study population, the minimum number of questionnaires to be collected was calculated as 344. Since 1310 individuals answered the web-based questionnaire during the survey period, number of participants of this survey was higher than the minimum number required to achieve 98% confidence interval and 90% power.

For statistical analysis, IBM SPSS Statistics 22 package program (SPSS IBM, Turkey) was used to analyse the obtained data. While evaluating the study data, whether the parameters showed normal distribution or not was evaluated by Shapiro Wilks test. Besides descriptive statistical methods (mean, standard deviation, frequency), the Chi-Square test was used to compare qualitative data. A P value <0.05 was considered statistically significant.

Results

Demographic Findings: A total of 1310 students, 498 males (38%) and 812 females (62%), aged between 18 and 32 years (mean 21.63±1.9) participated in the survey from October 15 to October 22, 2020. 15.6% of the participants were 1st grade, 22.7% were 2nd grade, 21.9% were 3rd grade, 26.1% were 4th grade, and 13.7% were 5th grade. While 8.8% of them had chronic diseases/diseases that require regular drug use, 91.2% of them did not.

Analysis of Questionnaire Questions: The majority of the students (73.2%) thought that COVID-19 was definitely a serious public health threat, 53.4% thought they were in a high-risk population for COVID-19. While 24.4% were very worried about getting the

coronavirus, 78.7% were very worried about transmitting it to their immediate environment. Most of the students were affected spiritually by current events related to COVID-19 (39.9% somewhat, 44% very)(Table 1). According to the answers of the 11th question, 84.7% of

the students knew the 3 most evident symptoms of the coronavirus, 90.5% of them were aware of the most important measures to be taken to protect against it (Table 1).

Table 1. The participants' responses to questionnaire questions

		n	%
Q5- Do you think Covid-19 is a serious public health threat? (n=1309)	Impossible	7	0.5
	Possible	71	5.4
	Probably	273	20.9
	Definitely	958	73.2
Q6- Do you think you are in a high-risk population for Covid-19? (n=1309)	Yes	699	53.4
	No	610	46.6
Q7- How concerned are you about getting the coronavirus?	Not at all	33	2.5
	A little	227	17.3
	Somewhat	730	55.7
	Very	320	24.4
Q8- How concerned are you about transmitting Covid-19 to your immediate environment? (n=1309)	Not at all	21	1.6
	A little	47	3.6
	Somewhat	211	16.1
	Very	1030	78.7
Q9- Do you think that current events about Covid-19 affect you spiritually? (n=1308)	Not at all	35	2.7
	A little	175	13.4
	Somewhat	522	39.9
	Very	576	44
Q10- What is your level of knowledge about Covid-19? (n=1308)	Inadequate	23	1.8
	Medium	266	20.3
	Sufficient	788	60.2
	Comprehensive	231	17.7
Q11- What are the 3 most evident symptoms of coronavirus?	Fever	1289	98.4
	Cough	1184	90.4
	Myalgia	148	11.3
	Dyspnea	1236	94.4
	Diarrhea	59	4.5
	Runny nose	30	2.3
Correctly identified 3 symptoms of coronavirus	True	1109	84.7
	False	201	15.3
Q12-What are the most important measures to protect against coronavirus?	Mask	1247	95.3
	Glove	486	37.2
	Social distancing	1293	98.9
	Hand hygiene	1230	94
Correctly identified 3 prevention methods of coronavirus	Face shield	429	32.7
	True	1186	90.5
Q13- Which of the following measures do you implement in your daily life against Covid-19?	False	124	9.5
	Mask	1283	97.9
	Glove	243	18.5
	Hand hygiene	1239	94.6
	Social distancing	1233	94.1
	Frequent ventilation of the environment	1008	76.9
Q14- Where do you get information about Covid-19 from? (multiple choice) (n=1304)	Websites / social media accounts of official institutions such as Ministry of Health, WHO, and professional organizations	1221	93.6
	Physicians' personal websites / social media accounts	482	37
	Medical books, journals or articles	228	17.5
	Seminars / meetings / congresses organized by institutions	119	9.1
	Communication groups such as WhatsApp, Viber	262	20.1

Table 1 Continuing

Q15- Howmuch has coronavirus changed your daily routine? (n=1307)	Not at all	8	0.6
	A little	74	5.7
	Somewhat	405	31
	Very	820	62.7
Q16- Have you changed your plans because of coronavirus? (n=1308)	Yes	1276	97.6
	No	32	2.4
Q17- Has your faculty made any changes in patient recruitment policy due to Covid-19? (n=1309)	Only urgent patients are accepted	689	52.6
	No patients were admitted during this period	49	3.7
	Patient admissions partially reduced	143	10.9
	No changes were made	9	0.7
	I do not know	419	32
Q18- Are you afraid of getting infected with COVID-19 if formal education is started again? (n=1309)	Yes	1011	77.2
	No	298	22.8
Q19- How confident are you that your faculty can prevent coronavirus transmission?	Not at all	331	25.3
	A little	490	37.4
	Somewhat	368	28.1
	Very	121	9.2
Q20- Do you think that the transition to distance education is necessary? (n=1304)	Yes	912	69.9
	No	392	30.1
Q21- Do you think your education is disrupted? (n=1309)	Not at all	62	4.7
	A little	182	13.9
	Somewhat	456	34.8
	Very	609	46.5
Q22- If distance education prolongs, would you consider to suspend the school? (n=1305)	Yes	132	10.1
	No	1173	89.9
Q23- What kind of problems did you experience with distance education? (n=1308)	I had problems due to technological incompetency	379	29
	I had problems due to the school's distance education system	347	26.5
	I had no problems	693	53
Q24- Do you think that theoretical courses in distance education are sufficient? (n=1309)	Yes	829	63.3
	No	480	36.7
Q25- Do you think that practical courses in distance education are sufficient? (n=1309)	Yes	129	9.9
	No	1180	90.1
Q26- What do you think about the efficiency of courses in distance education? (n=1307)	Inadequate	256	19.6
	Medium	488	37.3
	Sufficient	465	35.6
	Comprehensive	98	7.5
Q27- Do you think remote exams are reliable? (n=1302)	Yes	665	51.1
	No	637	48.9

As 77.2% were afraid of getting infected with COVID-19 if formal education was resumed, 25.3% did not believe that their faculty could prevent coronavirus transmission while 37.4% believed weakly. On the other hand 69.9% of the students thought transition to distance education was necessary, 53% did not have

any problems in distance education, others had difficulties due to technological deficiencies or problems arising from the school's distance education system. Although 63.3% thought that theoretical courses in distance education were sufficient, only 9.9% thought that practical courses were sufficient (Table 1).

Table 2. Evaluation of questionnaire questions according to grade levels

		Grade Level					p
		Grade 1 n (%)	Grade 2 n (%)	Grade 3 n (%)	Grade 4 n (%)	Grade 5 n (%)	
Q5-Thinking Covid-19 is a serious public health threat or not	Impossible	2 (1)	0 (0)	1 (0.3)	3 (0.9)	1 (0.6)	0.345
	Possible	8 (3.9)	16 (5.4)	15 (5.2)	19 (5.6)	13 (7.3)	
	Probably	41 (20.1)	74 (24.9)	66 (23.1)	66 (19.3)	26 (14.6)	
	Definitely	153 (75)	207 (69.7)	204 (71.3)	254 (74.3)	138 (77.5)	
Q6-Thinking he/she is in a high-risk population for Covid-19	Yes	98 (48) ^{d,e}	134 (45.3) ^{c,d,e}	154 (53.8)	201 (58.8)	111 (62)	0.001*
	No	106 (52)	162 (54.7)	132 (46.2)	141 (41.2)	68 (38)	
Q7-Concern about getting Covid-19	Not at all	6 (2.9)	3 (1)	11 (3.8)	11 (3.2)	2 (1.1)	0.148
	A little	38 (18.6)	58 (19.5)	51 (17.8)	50 (14.6)	30 (16.8)	
	Somewhat	104 (51)	180 (60.6)	154 (53.8)	192 (56.1)	99 (55.3)	
	Very	56 (27.5)	56 (18.9)	70 (24.5)	89 (26)	48 (26.8)	
Q8-Concern about transmitting Covid-19 to the immediate environment	Not at all	6 (3)	5 (1.7)	4 (1.4)	5 (1.5)	1 (0.6)	0.464
	A little	11 (5.4)	11 (3.7)	12 (4.2)	7 (2)	6 (3.4)	
	Somewhat	34 (16.7)	53 (17.8)	47 (16.4)	46 (13.5)	31 (17.3)	
	Very	152 (74.9)	228 (76.)	223 (78)	284 (83)	141 (78.8)	
Q9-Thinking that he/she is spiritually affected by current events about Covid-19	Not at all	8 (3.9)	11 (3.7)	7 (2.4)	6 (1.8)	3 (1.7)	0.235
	A little	26 (12.7)	33 (11.1)	45 (15.7)	46 (13.5)	25 (14)	
	Somewhat	75 (36.8)	135 (45.6)	97 (33.9)	139 (40.6)	75 (42.1)	
	Very	95 (46.6)	117 (39.5)	137 (47.9)	151 (44.2)	75 (42.1)	
Q18-Fear of becoming infected with Covid-19 if formal education is started again	Yes	152 (74.5)	219 (73.7)	208 (73)	279 (81.6) ^{b,c}	151 (84.4) ^{a,b,c}	0.005*
	No	52 (25.5)	78 (26.3)	77 (27)	63 (18.4)	28 (15.6)	
Q19-How much is believed that the faculty can prevent coronavirus transmission	Not at all	40 (19.6)	66 (22.2)	69 (24.1)	94 (27.5)	60 (33.5)	0.001*
	A little	68 (33.3)	107 (36)	102 (35.7)	138 (40.4)	75 (41.9)	
	Somewhat	75 (36.8)	85 (28.6)	89 (31.1)	83 (24.3) ^{a,b}	36 (20.1) ^{a,b,c}	
	Very	21 (10.3)	39 (13.1)	26 (9.1)	27 (7.9)	8 (4.5)	
Q20-Thinking that transition to distance education is necessary	Yes	138 (68.7)	189 (63.6)	176 (62)	259 (76) ^{b,c}	148 (82.7) ^{a,b,c}	0.000*
	No	63 (31.3)	108 (36.4)	108 (38)	82 (24)	31 (17.3)	
Q21-Thinking that education is disrupted	Not at all	5 (2.5)	9 (3)	9 (3.1)	15 (4.4)	23 (12.8)	0.000*
	A little	25 (12.3)	32 (10.8)	37 (12.9)	53 (15.5)	35 (19.6)	
	Somewhat	76 (37.3)	118 (39.7)	87 (30.4)	120 (35.2)	54 (30.2) ^{a,b,d}	
	Very	98 (48)	138 (46.5)	153 (53.5)	153 (44.9)	67 (37.4)	
Q22-Considering to suspend the school due to the interruption of practical training in case of prolonged distance education	Yes	25 (12.4)	43 (14.6)	28 (9.8)	31 (9.1) ^b	5 (2.8) ^{a,b,c,d}	0.001*
	No	176 (87.6)	252 (85.4)	258 (90.2)	311 (90.9)	174 (97.2)	
Q23-Problems related to distance education	Due to technological incompetency	37 (18.1) ^{b,c,d,e}	97 (32.7)	73 (25.7) ^d	113 (33)	59 (33)	0.001*
	Due to distance education system	37 (18.1)	72 (24.2)	107 (37.7) ^{a,b,d,e}	93 (27.2) ^a	37 (20.7)	0.000*
	No problems	141 (69.1) ^{b,c,d,e}	158 (53.2)	131 (46.1)	165 (48.2)	97 (54.2)	0.000*
Q24-Thinking that theoretical courses in distance education are sufficient	Yes	111 (54.4)	185 (62.5)	167 (58.4)	232 (67.8) ^{a,c}	133 (74.3) ^{a,b,c}	0.000*
	No	93 (45.6)	111 (37.5)	119 (41.6)	110 (32.2)	46 (25.7)	
Q25-Thinking that practical courses in distance education are sufficient	Yes	14 (6.9)	21 (7.1)	17 (5.9)	41 (12) ^{a,b,c}	35 (19.6) ^{a,b,c,d}	0.000*
	No	190 (93.1)	275 (92.9)	269 (94.1)	301 (88)	144 (80.4)	
Q26-The efficiency of the courses in distance education	Inadequate	48 (23.5)	65 (22.1)	66 (23.1)	51 (14.9)	26 (14.5)	0.014*
	Medium	81 (39.7)	118 (40.1)	101 (35.3)	116 (33.9)	71 (39.7)	
	Sufficient	63 (30.9)	90 (30.6)	104 (36.4)	141 (41.2) ^{a,b,c}	67 (37.4)	
	Comprehensive	12 (5.9)	21 (7.1)	15 (5.2)	34 (9.9)	15 (8.4)	
Q27-Thinking that remote exams are reliable	Yes	101 (49.8)	147 (50)	130 (45.6)	191 (55.8)	95 (54)	0.117
	No	102 (50.2)	147 (50)	155 (54.4)	151 (44.2)	81 (46)	

Chi-Square Test *p<0.05

a: significantly different from Grade 1
c: significantly different from Grade 3
e: significantly different from Grade 5

b: significantly different from Grade 2
d: significantly different from Grade 4

Findings According to Grade Levels: When the responses regarding concern levels of COVID-19 were evaluated according to grade levels, all answers were similar except 6th question. For 1st grade students, the rate of thinking that they were in a high-risk population for COVID-19 (48%) was significantly lower than 4th and 5th grades (58.8% and 62% respectively; $p < 0.05$). The rate for 2nd grade students (45.3%) was significantly lower than 3rd, 4th and 5th grades (53.8%, 58.8% and 62% respectively; $p < 0.05$) (Table 2).

When education-related thoughts and problems were evaluated according to grade levels, fear of being infected with COVID-19 for grade 5 (84.4%) in case of formal education is started was significantly higher than grades 1 (74.5%), 2 (73.7%) and 3 (73%) ($p < 0.05$). Also, grades 4 and 5 stated (76% and 82.7% respectively) more than other grades that transition to distance education was necessary ($p < 0.05$). On the contrary, 4th and 5th grades' rate of believing that the faculty could prevent coronavirus transmission (24.3% and 20.1% respectively) was significantly lower than the others ($p < 0.05$). 5th grade students considered to suspend the school due to the interruption of practical training in case of prolonged distance education at a significantly lower rate (2.8%) when compared to 1st, 2nd, 3rd and 4th grades

(12.4%, 14.6%, 9.8% and 9.1% respectively). 4th grade students considered to suspend the school at a lower rate (9.1%) than grade 2 only (14.6%) ($p < 0.05$). Both 4th and 5th graders thought that theoretical and practical courses in distance education were sufficient at a significantly higher rate than other grades ($p < 0.05$) (Table 2).

Findings According to Opinions on Transition to Distance Education: In Table 3 both concern levels about COVID-19 and education-related thoughts and problems are evaluated according to opinions on transition to distance education. Students, who think that transition to distance education is necessary, regard COVID-19 as a serious public health threat (95.5%), worry about getting coronavirus (83.6%) and transmitting it to their immediate environment (96.8%) at a significantly higher rate than those who do not consider the transition essential ($p < 0.05$). The majority of the students (88.3%) who think that transition to distance education was necessary were afraid of getting infected with COVID-19 if formal education is started again, 29.7% of them never believed that the faculty could prevent coronavirus transmission, 41.8% believed a little (Table 3).

Table 3. Evaluation of questionnaire questions according to opinions on transition to distance education

		Whether transition to distance education is necessary or not		p
		Yes	No	
		n (%)	n (%)	
Q5-Thinking Covid-19 is a serious public health threat or not	Does not think	41 (4.5)	37 (9.4)	0.001*
	Considers	870 (95.5)	355 (90.6)	
Q7-Concern about getting Covid-19	Unconcerned	150 (16.4)	110 (28.1)	0.000*
	Concerned	762 (83.6)	282 (71.9)	
Q8-Concern about transmitting Covid-19 to the immediate environment	Unconcerned	29 (3.2)	39 (9.9)	0.000*
	Concerned	882 (96.8)	353 (90.1)	
Q9-Thinking that he/she is spiritually affected by current events about Covid-19	Does not think	146 (16)	64 (16.3)	0.899
	Thinks	764 (84)	328 (83.7)	
Q18-Fear of becoming infected with Covid-19 if formal education is started again	Yes	804 (88.3)	202 (51.5)	0.000*
	No	107 (11.7)	190 (48.5)	
Q19-How much is believed that the faculty can prevent coronavirus transmission	Not at all	271 (29.7)	59 (15.1)	0.000*
	A little	381 (41.8)	108 (27.6)	
	Somewhat	211 (23.1)	154 (39.3)	
	Very	49 (5.4)	71 (18.1)	
Q21-Thinking that education is disrupted	Not at all	56 (6.1)	6 (1.5)	0.000*
	A little	163 (17.9)	18 (4.6)	
	Somewhat	346 (37.9)	108 (27.6)	
	Very	347 (38)	259 (66.2)	
Q23-Problems related to distance education	Because of technological incompetency	235 (25.8)	141 (36)	0.000*
	Because of the school's distance education system	211 (23.2)	136 (34.7)	0.000*
	No problems	522 (57.4)	168 (42.9)	0.000*
Q26-The efficiency of the courses in distance education	Inadequate	102 (11.2)	154 (39.3)	0.000*
	Medium	325 (35.8)	160 (40.8)	
	Sufficient	393 (43.2)	70 (17.9)	
	Comprehensive	89 (9.8)	8 (2)	

Chi-Square Test * $p < 0.05$

Discussion

This survey study provides information about the awareness of dental students related to COVID-19 outbreak, which has been spreading in our country since March 2020, and sheds light on making necessary measures and arrangements for the education of students as soon as possible.

Dentistry is one of the professions where the problems are felt exceedingly due to the pandemic. Dental practices increase risk of coronavirus transmission because of aerosol generating procedures and close distance working within confined areas. This risk increases and is of high importance especially when the patients are mildly symptomatic or asymptomatic. Concerning that dental healthcare professionals are at high risk, Chan et al. (8) reported that 29% of COVID-19 patients hospitalized were healthcare professionals. Therefore, dentists and dental students should be very careful and strictly implement the measures to protect against COVID-19 such as hand hygiene, use of personal protective equipment, and application of procedures to prevent cross-infection. Unfortunately, knowledge and awareness of dental health care workers on blood-borne diseases were reported to be insufficient (9). In order to control the spread of the virus, awareness and attitudes of dental students, future candidates of healthcare staff, should be determined and developed in terms of COVID-19 and possible outbreaks that may occur thereafter.

While 78% of our participants stated that their knowledge level about COVID-19 was sufficient and comprehensive, their answers regarding the 3 most important clinical signs of the virus and the most important measures to be taken indicated that their level of knowledge was sufficient. The students' responses to how much their daily routine was affected by the virus and how their plans have changed can be interpreted as high awareness. In order to obtain the most accurate and reliable information, it is extremely important to get information only from official institutions. The majority of our participants (93.6%) reported that they obtained information about COVID-19 from official institutions such as the Ministry of Health, WHO, and professional organizations.

Almost all dental students participated in our study thought that the pandemic was a serious public health problem. In a study conducted with dentists, it was reported that dentists who were worried about being infected with COVID-19 were over 90% and those who were concerned about carrying the virus to their families were above 95% (10). In our study it was seen that dental students have the same concerns as graduated dentists. A study conducted in Turkey reported that both clinical and preclinical students were afraid of infecting themselves and their relatives with COVID-19, with a higher proportion of preclinical students than the others (11). A recent study reported that the students were only moderately worried about being infected and the virus keeping on spreading (12). However, when dental and non-dental students were compared, dental students

were more worried than the others. This result involves a very significant message that dental schools should implement cautions for the safety of dental students.

On the other hand, one of the measures applied to manage the pandemic was the closure of schools, as in previous outbreaks (5, 13, 14). It is estimated that almost 107 countries had decided to close the schools on March 18, 2020 and dental students were affected nearly worldwide (15). In Turkey, the distance education model was put into practice in order to manage the process effectively and to relieve the students. However, it is thought that this situation may cause many negativities (16). It is anticipated that dental education which is based on clinical practices, will have some problems with the distance education system, and that dental students will have less professional knowledge and experience compared to formal education. Besides, there is a concern that the risk of transmission of the virus to the students and their immediate environment will increase when formal education is initiated.

The fear of being infected with COVID-19 if formal education is started back, the rate of thinking that they were in the high-risk group and the rate of thinking that distance education was necessary were found to be higher among 4th and 5th-grade students than the 1st, 2nd and 3rd grades. We think that this difference is due to the fact that the practical training of the 4th and 5th-grade students is on the patient. It was seen that the students' belief that faculties could prevent virus transmission was extremely low with 9.3%. Although infection prevention and control strategies are part of our training, they should now be included more effectively in the dentistry curriculum. We need to improve existing infection prevention and control strategies to combat possible similar infectious diseases in the future. We should be aware of the infectious hazards that can increase the risk of contamination, especially during dental practice. Besides, students may be mentally affected by the fear of becoming infected, so dental schools should also provide psychological support to those in need. Efficient communication and sharing information are essential to alleviate the fears of students, academic members, staff, and even patients. We need to manage the issues of reorganizing classes, caring for patients, fear of infection, and providing the clinical requirements for graduation. Effective changes in teaching and learning methods are essential to ensure continuity of education, and temporary protocols and policies should be implemented to keep everyone safe.

Although it was showed that there was no significant difference regarding student performance between online and on-site learning (17), Amir et al. (18) indicated that more students felt lower learning satisfaction and more difficulty in communication both with trainers and their peers during online learning. A study conducted in Pakistan reported that approximately 77% of the students had negative perceptions of online learning (19). In another study, it was found that students experienced increased levels of stress and felt their clinical education has suffered (20). According to Hattar et al. (21), 87% of students defined the most

negatively affected experience as clinical training. They relatively appreciated the online system, but did not think it could replace face-to-face clinical practice. Similarly, Chang et al. (22) stated that online learning was found practicable for both dental and non-dental students, but not for courses with laboratory formats (12). A recent multinational study which evaluated the effects of online courses reported that dental school students preferred blended learning and thought it had better learning efficiency (22).

While 63.5% of our participants stated that theoretical courses given in distance education system were sufficient, only 9.8% of them stated that practical courses were. The rate of thinking that distance theoretical courses were sufficient was found higher among 4th and 5th-grade students. We think that this difference is due to the fact that 4th and 5th-grade students have already completed most of their theoretical education with formal education. While approximately half of the participants thought that remote exams were reliable, the other half thought otherwise. For the reliability problem of the distance exams, homework can be given instead of the exams. In this context, it is considered important to find alternative methods to distance education. After a certain level of vaccination, the relevant curriculum can be changed and/or updated (23). It was reported by 90% of our participants that they would not suspend their education if this process is prolonged, although there are negative points about distance education. The rate of thinking to suspend was significantly lower especially among 5th-grade students. We think that this is due to economic reasons and students' worry about wasting time. In parallel with these data, the necessity of the distance education model seems acceptable by 70% of students. The vast majority of students (over 90%) think that their practical training is disrupted due to the pandemic. In the future, students' shortcomings can be eliminated with an accelerated program, but the uncertainty of the pandemic process may prevent this.

Distance education model has been reported to cause some problems in the literature (5, 16). Although 53% of our participants stated that they did not experience any difficulties regarding distance education, 47% reported that they had problems due to technological deficiencies and the school's distance education system. Similarly, in a study conducted in China, where the COVID-19 pandemic broke out, it was reported that university students experienced anxiety in this process due to being in the countryside and uncertainty in the level of family income (24). Students living in rural areas without internet access need to be supported by universities in order to receive equal

education with others (23). The distance education infrastructure can be improved, and opportunities can be created for students with limited internet access. Exam system, homework presentation and grading policies should be rearranged in a way that does not cause anxiety among students. For many faculties, the digital tools, technical infrastructure, academic members' technology integration levels and ability of distance education management should be improved. The success of digital learning depends on lecturers' interactive teaching styles and attitudes, as well as students' technology-related experience and behavior. Faculty management should do what is necessary to increase the adequacy of the faculty, set priority objectives, and rearrange the course materials related to distance education. For laboratory courses, blended learning or virtual reality education may be considered.

Although the survey was applied to 1310 students in 7 dental faculties, the limitation of this study is that it did not reflect the opinions of dental students from all over the country. Furthermore, it would also be useful to compare educational outcomes with those of previous years while making plans for the future.

Currently, challenges related to dental education remain as an important issue to be managed during this pandemic. Dental schools urgently need to improve their education policies and protocols and develop an emergency plan to maintain practical training safely as well as to combat against possible future pandemics. The level of sufficiency based education should be appraised, different kinds of distance learning implementations should be permanently included in the curriculum. Investment should be made to use virtual technologies such as haptic technology and augmented reality especially in practical applications. Although COVID-19 has brought new challenges in education, the results of this study shows that most students appear comfortable with technology and favor taking protective measures. A combination of online and physical classes, named blended learning, seems to be the future trend for dental education as we experience the 'new normal'.

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