



Evaluation of Attitudes of Dental Professionals Toward Teledentistry During and After the Pandemic

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Abstract

Objective: Teledentistry is the concept of telemedicine in dentistry, dealing with the internet and using information technologies. Teledentistry can be beneficial in minimizing the risk of face-to-face contact in dental practice. This study aims to evaluate the attitude of dentists to teledentistry during the coronavirus disease 2019 pandemic.

Methods: This cross-sectional study was conducted using an online survey questionnaire with 29 questions, to evaluate the demographic information, clinical experience, specialty, and technology usage habits and knowledge, experience, insights, and opinions on general and ethical issues about teledentistry. The criteria for dentists to be able to participate in the study were being graduated and accepting to contribute to the research. Data were analyzed using frequency counts, percentages, and chi-square tests.

Results: A total of 57 dentists completed the survey. One-third of the participants (33.3%) reported using teledentistry in the past. All participants reported to be using mobile phones and having video conferencing experience before. Only 2 participants were not using social media (3.5%). Forty-seven participants (82.45%) reported that they could use teledentistry practices in the future.

Conclusion: Regulations can be beneficial in providing reasonable quality, while including such technologies in the education of dental students might increase the effectiveness of adopting the concepts.

Keywords: Telemedicine, dentistry, pandemics

INTRODUCTION

Telemedicine is the provision of health services based on telecommunication infrastructure over long distances with the use of electronically produced information.¹ Its usage areas are the diagnosis, consultation, treatment, and patient education of diseases.² Teledentistry is the concept of telemedicine in dentistry, dealing with the internet and using information technologies.^{1,3}

The term teledentistry was first described by Cook in 1997 and is defined as, "the practice of utilizing video conferencing technologies to provide advice and diagnosis about the treatment over a distance."¹ Telemedicine can be done in 3 different ways: the patient and the dentist can communicate in real time through a video conference⁴ or a dentist can transfer clinical information and medical images to a specialist for a later consultation.¹ Also, the patients can be monitored remotely in real time either hospital-based or home-based, using specific sensors to track the status of the person.⁵ Coronavirus disease 2019 (COVID-19) can be spread as droplet infection, and the disease has become a pandemic. Social distancing is suggested to avoid the risk of spread through respiratory and salivary secretions, which is in close relationship with the

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concept of teledentistry.^{6,7} While the risk can be reduced by minimizing face-to-face contact with teledentistry applications, the effectiveness of dental practices can be increased.⁸

Use of teledentistry can be beneficial in some issues, especially in developing countries, and in regions where distant rural areas are common, access to oral health services is limited, dental treatment fees are high, rapidly growing and receiving immigration occur, and there are not enough specialists and dentists.⁹⁻¹¹ Therefore, this study aims to evaluate the attitude of dentists to teledentistry during the COVID-19 pandemic by conducting an online survey and also aims to review the literature and information available on the provision and utilization of teledentistry as a method to address oral health needs of patients.

MATERIAL AND METHODS

This cross-sectional study was conducted using an online survey questionnaire. The study design and protocol were approved by the Research Ethics Committee of İstanbul University-Cerrahpaşa, Faculty of Medicine (A-10/01.02.2021).

The survey was distributed via an online form, and informed consent was obtained through the questionnaire's home page before data were collected from the dentists. The criteria for dentists to be able to participate in the study were being graduated and accepting to contribute to the research.

This was a cross-sectional study to include a convenient sample of dentists from all dental specialties currently working in Turkey. The survey consisted of a total of 34 questions to inquire about dentists' demographic information (9 questions), education and current practice (3 questions), possibility of future use (3 questions), and insights and opinions on general and ethical issues about teledentistry (19 questions). The survey was distributed electronically via email and different social media channels to study group.

Nine questions are prepared for demographic data, 3 for education and current practice, and 3 for possibility of future use and 19 questions are asked for the assessment of the general attitude of dentists on the subject.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences version 21 (IBM SPSS Corp., Armonk, NY, USA) software. Data were analyzed using frequency counts, percentages, and Chi-square tests. The level of significance was assessed at $P \leq .05$.

RESULTS

A total of 57 dentists completed the survey. All demographic data of study participants are summarized in Table 1. Participants' responses are summarized in Tables 2 and 3.

All participants in the study use mobile phones. All participants in the study have used video conferencing applications before. One-third of the participants (33.3%) reported using teledentistry in the past. Thirty-one (54.3%) of the participants were female and 30 (52.63%) were within the age range of 21-29 years old. Twenty-six participants (45.61%) reported that they had years of professional work in the range of 3-10 years. Forty participants (70.17%) reported that they had worked in governmental institution. When the participants were analyzed according to the distribution of facilities, it was found that most of them were from university hospitals (70.71%). Only 2 participants did not use social media (3.5%). Forty-seven participants (82.45%) reported that they could use teledentistry practices in the future.

DISCUSSION

Telehealth applications, where digital technologies can be used in the diagnosis and follow-up of many diseases, have moved to a more advanced stage with the COVID-19 pandemic.¹² Telemedicine applications in the field of health provide ease of use and economic advantages in providing health services.¹³ Teledentistry is a part of telemedicine applications, and it has been useful in reaching those who were unable to access dental services during the COVID-19 pandemic.⁷ It has been reported that dentists' opinion about the teledentistry applications is positive.¹⁴ However, this positive approach may differ according to countries or regions.¹⁵ In our study, the rate of those who find teledentistry applications useful in pandemic conditions is higher than the rate of those who do not find it useful. However, we think that the participants show that it is important to provide training on teledentistry applications due to the higher ratio of participants with previous teledentistry experience to those without.

The majority of the participants in the research report that they are unprepared to use teledentistry applications and that they will feel insecure when they use teledentistry applications. Problems such as the lack of clear standards in keeping and sharing patient records and the storage of personal data are some of the problems faced by the user in the use of teledentistry.^{7,12} Experts who have been working for 10 years or more may be more prepared for the use of teledentistry than general dentists, as they have more knowledge in their field, as well as the fact that experienced employees have more confidence in their treatment.^{16,17} The results obtained show that newly graduated physicians have more awareness about teledentistry than dentistry students who have not graduated.¹⁸ In our study, it was revealed that the participants did not consider teledentistry applications sufficient for diagnosis. The majority of those who do not consider teledentistry applications sufficient are those who have not used teledentistry applications before. However, all participants stated that radiographs needed clinical support. In addition, two-thirds of the participants have not used teledentistry applications before.

Table 1. Participants' Demographic Information, Technology Usage Habits, and Information About Teledentistry Is Given with the Experience of the Method in Question

		Total (%)	Have You Ever Practiced Teledentistry?		P
			Yes (%)	No (%)	
Age	21-29	30 (100.0%)	9 (30.0%)	21 (70.0%)	.092
	30-39	15 (100.0%)	4 (26.7%)	11 (73.3%)	
	40-49	9 (100.0%)	3 (33.3%)	6 (66.7%)	
	50-59	3 (100.0%)	3 (100.0%)	0 (0.0%)	
Gender	Male	26 (100.0%)	10 (38.5%)	16 (61.5%)	.319
	Female	31 (100.0%)	9 (29.0%)	22 (71.0%)	
Distribution of experience in profession (in years)	1-3	13 (100.0%)	6 (46.2%)	7 (53.8%)	.048
	3-10	26 (100.0%)	6 (23.1%)	20 (76.9%)	
	11-20	11 (100.0%)	2 (18.2%)	9 (81.8%)	
	20+	7 (100.0%)	5 (71.4%)	2 (28.6%)	
Distribution of specialists in dentistry	Surgery	29 (100.0%)	8 (27.6%)	21 (72.4%)	.606
	DMFR	5 (100.0%)	3 (60.0%)	2 (40.0%)	
	Pedodontics	9 (100.0%)	3 (33.3%)	6 (66.7%)	
	Orthodontics	1 (100.0%)	1 (100.0%)	0 (0.0%)	
	Periodontology	1 (100.0%)	0 (0.0%)	1 (100.0%)	
	Prosthetics	4 (100.0%)	1 (25.0%)	3 (75.0%)	
	Restorative	1 (100.0%)	0 (0.0%)	1 (100.0%)	
	General practitioner	7 (100.0%)	3 (42.9%)	4 (57.1%)	
Distribution of the sectors	Government	100.0%	11 (27.5%)	29 (72.5%)	.131
	Private	17 (100.0%)	8 (47.1%)	9 (52.9%)	
Distribution of facility	Hospital/center	6 (100.0%)	1 (16.7%)	5 (83.3%)	.199
	Clinic/office	1 (100.0%)	0 (0.0%)	1 (100.0%)	
	Polyclinic	10 (100.0%)	6 (60.0%)	4 (40.0%)	
	University	40 (100.0%)	12 (30.0%)	28 (70.0%)	
Mobile phone use	Yes	57 (100.0%)	19 (33.3%)	38 (66.7%)	.000
	No	0 (0%)	0 (0%)	0 (0%)	
Social media use	Yes	55 (100.0%)	19 (34.5%)	36 (65.5%)	.440
	No	2 (100.0%)	0 (0.0%)	2 (100.0%)	
Video conference applications use	Yes	57 (100.0%)	19 (33.3%)	38 (66.7%)	.000
	No	0 (0%)	0 (0%)	0 (0%)	
Do you know teledentistry?	Yes	46 (100.0%)	19 (41.3%)	27 (58.7%)	.007
	No	11 (100.0%)	0 (0.0%)	11 (100.0%)	
Do you think teledentistry is useful?	Useful	15 (100.0%)	10 (66.7%)	5 (33.3%)	.008
	Limited use	33 (100.0%)	8 (24.2%)	25 (75.8%)	
	Useless	6 (100.0%)	0 (0%)	6 (100.0%)	
	Legal handicaps	3 (100.0%)	1 (33.3%)	2 (66.7%)	
Have you ever attended to a meeting of seminar about teledentistry?	Yes	16 (100.0%)	10 (62.5%)	6 (37.5%)	.005
	No	41 (100.0%)	9 (22.0%)	32 (78.0%)	
Can you integrate teledentistry to your workflow in your workplace?	Yes	11 (100.0%)	5 (45.5%)	6 (54.5%)	.515
	No	46 (100.0%)	14 (31.1%)	32 (68.9%)	
Can teledentistry be used for oral health education?	Yes	42 (100.0%)	16 (38.1%)	26 (61.9%)	.170
	No	15 (100.0%)	3 (20.0%)	12 (80.0%)	
Can patients have enough information and proper diagnosis using teledentistry?	Yes	19 (100.0%)	9 (47.4%)	10 (52.6%)	.115
	No	5 (100.0%)	0 (0.0%)	5 (100.0%)	
	Insufficient compared to clinical evaluation	33 (100.0%)	10 (30.3%)	23 (69.7%)	

DMFR, Dentomaxillofacial Radiology.

Table 2. Participants' Opinion and Statements About the Teledentistry Concept Is Given With the Experience of the Method in Question

		Total (%)	Have You Ever Practiced Teledentistry?		
			Yes (%)	No (%)	
Teledentistry is beneficial for triage in the period of pandemic	Yes	49 (100.0%)	19 (38.8%)	30 (61.2%)	.030
	No	8 (100.0%)	0 (0.0%)	8 (100.0%)	
Teledentistry is beneficial for patient follow-up	Yes	49 (100.0%)	19 (38.8%)	30 (61.2%)	.030
	No	8 (100.0%)	0 (0.0%)	8 (100.0%)	
Teledentistry is beneficial for screening places such as schools or senior centers	Yes	43 (100.0%)	17 (39.5%)	26 (60.5%)	.075
	No	14 (100.0%)	2 (14.3%)	12 (85.7%)	
Teledentistry is beneficial to improve dentist-laboratory technician communication	Yes	44 (100.0%)	18 (40.9%)	26 (59.1%)	.023
	No	13 (100.0%)	1 (7.7%)	12 (92.3%)	
Teledentistry is beneficial to improve communication among dentists	Yes	55 (100.0%)	19 (34.5%)	36 (65.5%)	.440
	No	2 (100.0%)	0 (0.0%)	2 (100.0%)	
Do you plan to use teledentistry in future?	Yes	47 (100.0%)	18 (38.3%)	29 (61.7%)	.083
	No	10 (100.0%)	1 (10.0%)	9 (90.0%)	
Teledentistry saves time	Yes	46 (100.0%)	18 (39.1%)	28(60.9%)	.055
	No	11 (100.0%)	1 (9.1%)	10 (90.9%)	
Instant messengers are safe to be used in teledentistry practice	Yes	24 (100.0%)	8 (33.3%)	16 (66.7%)	.614
	No	33 (100.0%)	11 (33.3%)	22 (66.7%)	
I have enough time for teledentistry practice	Yes	34 (100.0%)	16 (47.1%)	18 (52.9%)	.007
	No	23 (100.0%)	3 (13.0%)	20 (87.0%)	
Teledentistry should be a paid service	Yes	44 (100.0%)	13 (29.5%)	31 (70.5%)	.215
	No	13 (100.0%)	6 (46.2%)	7 (53.8%)	
Artificial intelligence systems can be enough for teledentistry practice and human-human interaction is not mandatory	Yes	16 (100.0%)	5 (31.2%)	11 (68.8%)	.548
	No	41 (100.0%)	14 (34.1%)	27 (65.9%)	
Radiographic examinations can be justified using teledentistry	Yes	23 (100.0%)	9 (39.1%)	14 (60.9%)	.315
	No	34 (100.0%)	10 (29.4%)	24 (70.6%)	
In teledentistry, radiographs should always be supported with clinical data	Yes	57 (100.0%)	19 (33.9%)	38 (66.1%)	.667
	No	0 (0%)	0 (0%)	0 (0%)	
Teledentistry applications are adequate for proper diagnosis	Yes	10 (100.0%)	6 (60.0%)	4 (40.0%)	.058
	No	47 (100.0%)	13 (27.7%)	34 (72.3%)	

Regardless of the specialty, the dentists participating in the study consider teledentistry as less efficient. According to the information revealed in previous studies, the reasons for the slowness in the adoption of teledentistry applications are the cost, the lack of appropriate intraoral imaging, and the impossibility of using radiological examination

techniques.^{19,20} Limited education in medicine and dentistry may be the reason for the low trust in teledentistry.⁷

In studies conducted in various countries, it is seen that dentists are undecided in their approaches to some teledentistry applications.^{11,21-23} The financial requirements for establishing

Table 3. Participants' Insights and Opinions on the Area of Usage of the Teledentistry Is Given With the Experience of the Method in Question

			Total (%)	Have You Ever Practiced Teledentistry?		
				Yes (%)	No (%)	
Which of these subjects have great potential in teledentistry?	Treatment planning	Positive	21 (100.0%)	9 (42.9%)	12 (57.1%)	.191
		Negative	36 (100.0%)	10 (27.8%)	26 (72.2%)	
	Patient education	Positive	40 (100.0%)	14 (35.0%)	26 (65.0%)	.465
		Negative	17 (100.0%)	5 (29.4%)	12 (70.6%)	
	Online consultation in pandemics	Positive	47 (100.0%)	15 (31.9%)	32 (68.1%)	.440
		Negative	10 (100.0%)	4 (40.0%)	6 (60.0%)	
	Reaching people with disadvantages	Positive	33 (100.0%)	12 (36.4%)	21 (63.6%)	.390
		Negative	24 (100.0%)	7 (29.2%)	17 (70.8%)	

a clinic for teledentistry, the necessary technological equipment, the time spent with the patient, and the security of the data obtained are the subjects that the participants approach with suspicion. No more concerns were found, with Australia and Saudi Arabia being different from the UK and Canada on pricing technology and security issues.^{11,21,23} This result requires dentists who will use teledentistry applications to make the highest level of effort in protecting the obtained data. The system to be used must also ensure the security of patient data in the electronic environment.

With the COVID-19 pandemic, dentists have expanded their practice to focus on tele-consultation and tele-education.^{24,25} In this period, when routine treatments were postponed in order to prevent the spread of the virus, the use of teledentistry applications to protect public health has been very useful in continuing the provision of health services.²⁶⁻²⁸

Potential applications of teledentistry during COVID-19 are suggested as screening for triage, diagnostics, treatment planning, screening tool for possible COVID-19 patients, specialist and interprofessional consultation, and infectious disease consultation.²⁹ Also, teledentistry applications can be used for management of oral care in elderly people, who cannot attend to the dental clinics due to the risk of infection.³⁰ Zahra et al³¹ conducted a questionnaire and reported that 76.6% of the participants had a knowledge of teledentistry and 89.9% agreed that the method is effective in triage during the pandemic. However, 80.8% had never used it, while 79.6% did not implement such methods in their workflow. Limited use is attributed to unavailability of resources, lack of education, and training. Haider et al¹⁹ reported that low adaptation to telehealth services might be due to lack of experience, and such concepts should be included in the curriculum and postgraduate accreditation. Studies regarding the dental students' knowledge and attitudes toward teledentistry suggested that the knowledge of the technology is not at the desired stage, and more attention should be paid in the dental schools to increase the likelihood.^{32,33}

Using teledentistry in dental practice requires adequate provision of necessary infrastructure such as networking, appropriate equipment, intraoral cameras, and digital images. However, it is not yet clear to what extent dental clinics are ready to implement teledentistry.^{19,34} Teledentistry guidelines and regulations have been published to ensure a certain service quality standard in some regions around the world.³⁵ Future qualitative research may address preparation, current barriers, and potential mechanisms for wider integration of teledentistry in the arming of oral health services.

The small number of participants can be considered among the limitations of our study. With the widespread use of teledentistry applications, conducting surveys with more participants may be the subject of future studies. As another

limitation of our study, it can be suggested that the subject be handled comprehensively. While the aim of this study is to evaluate the general opinion of dentists against teledentistry applications, more detailed analyses in specific branches and subjects can provide a better analysis of the subject.

In conclusion, teledentistry is a newly developing concept, and it is thought that it can be useful in reaching groups with limited access to dentists and reducing face-to-face contact. In case of including teledentistry applications in dentistry education, adaptation to clinical workflow may become more efficient.

Ethics Committee Approval: Ethics committee approval was received for this study from the Research Ethics Committee of İstanbul University-Cerrahpaşa, Faculty of Medicine (A-10/01.02.2021).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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