Original paper

Evaluation of knowledge and awareness about teledentistry among dentists and patients living in Turkey

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D – writing the article; E – critical revision of the article; F – final approval of the article

Dental and Medical Problems, ISSN 1644-387X (print), ISSN 2300-9020 (online) *Dent Med Probl*. 2023;60(4):593–599

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Funding sources
None declared

Conflict of interest
None declared

Acknowledgements
None declared

Received on March 21, 2022
Reviewed on May 4, 2022
Accepted on June 9, 2022

Published online on December 22, 2023

Abstract

Background. Teledentistry is a field of telemedicine that combines digital technology and clinical dentistry, enabling remote communication between dentists and patients.

Objectives. The aim of the present study was to evaluate the knowledge and awareness of dentists and patients about teledentistry in Turkey.

Material and methods. This cross-sectional study was conducted among general and specialist dentists in Turkey, and dental patients in Edirne, Turkey. A questionnaire prepared in Google Docs was shared virtually among Turkish dentists, as well as administered to the patients referred to the university dental clinic in Edirne.

Results. Among the 336 dentists participating in the study, 69.9% were female, 39.6% were working in the profession for 1–5 years, and 48.5% were specialist dentists. A total of 86.9% of dentists stated they would like to use teledentistry for radiological examinations, some follow-up examinations, and for follow-up during holidays. There were 21.1% of dentists who thought that teledentistry practices could be the new standard of oral healthcare, and only 34.0% were willing to try such practices. Among the 447 patients in the study, 49.9% were female, 79.0% were aged 20–44 years, and 54.4% had middle income. There were 74.5% of patients who stated that it would be easier to communicate with the dentist via a teledentistry application, 80.3% of patients in underserved regions stated it would facilitate access to the dentist, 76.3% of patients stated that it would reduce costs, and 88.8% of patients thought that this method could help overcome the problem of isolation during the coronavirus disease 2019 (COVID-19) pandemic period.

Conclusions. Based on the results, it can be said that the teledentistry approach could provide convenience for both dentists and patients in terms of dentist–patient communication, cost and efficiency of dental care.

Keywords: oral health, questionnaire, awareness, teledentistry

Cite as
Özveren N, Sevinç B, Sarıalioğlu Güngör A, Baltacı E, Serindere G, Özgür Ö. Evaluation of knowledge and awareness about teledentistry among dentists and patients living in Turkey. *Dent Med Probl.* 2023;60(4):593–599. doi:10.17219/dmp/150834

DOI
10.17219/dmp/150834

Introduction

The rapid development of communication technologies over the years has led to a different dimension of the service exchange between healthcare professionals and patients in the healthcare system. Telehealth encompasses all medical activities, such as diagnosis, treatment, disease monitoring and prevention, continuing the education of healthcare providers and consumers, and research and evaluation.[1] The term 'telemedicine' refers to health services that are provided in the form of synchronous (voice or video calls) or asynchronous (store-and-forward) interactions, using electronic communication technologies instead of the patient and doctor meeting in person.[2,3] Teledentistry is a branch of telemedicine that can be applied in all fields of dentistry, such as oral and dental care, consultation, and remote patient monitoring and treatment planning, in order to improve oral and dental health. It uses health information technology and telecommunication systems.[4,5]

Teledentistry as a novel approach was widely used during the coronavirus disease 2019 (COVID-19) pandemic.[6] It involves several issues, such as consulting potential new patients, reviewing the results of treatment, pre-interviewing emergency patients, and it also can be used as an initial screening tool. The advantages of teledentistry include the remote control of fast and recordable data, simultaneous communication with many people, and the reduction of hospital costs and patient waiting time.[7,8] Through teledentistry applications, shortening the time to reach a specialist can prevent delays in the diagnosis and treatment of diseases.[9,10] Teledentistry also has the potential to address disparities in oral healthcare between rural and urban communities.[11,12] Thus, it can contribute to the improvement of patients' quality of life.

Research has shown that teledentistry has a high level of sensitivity and specificity.[13,14] Queyroux et al. found much consistency between the clinical examination, which is the gold standard, and teledentistry in their study.[15] It has also been reported that the positive predictive value and the accuracy rate in teledentistry, as well as the sensitivity of teledentistry applications, are quite high.[16,17]

Concerns about data quality and security, the reimbursement procedures, necessary technical infrastructure, the licensing of the programs to be used, the risk of violation of the patient's privacy, appropriate and secure Internet support for data, image and voice transmission, and the inherent risk of improper diagnosis are the issues to be considered with regard to the increasing use of teledentistry practices.[18–20] One of the obstacles to the adoption of teledentistry practices by patients and physicians may be the lack of information on this subject.[21]

The aim of the present study was to evaluate the knowledge and awareness of dentists and patients about teledentistry in Turkey.

Material and methods

Methods

Ethics approval for the study was obtained from the medical research ethics committee at the Faculty of Medicine of Trakya University, Edirne, Turkey (TUFT-BAEK 2020/319). The study was conducted in accordance with the tenets of the Declaration of Helsinki. Informed written consent was obtained from the patients and dentists, and the confidentiality of answers was assured.

This cross-sectional study was conducted among general and specialist dentists in Turkey, and dental patients in Edirne. After a questionnaire (Table 1) was prepared in Google Forms, we collected the emails of dentists in Turkey and shared the questionnaire virtually with them. We also asked patients who had been referred to the university dental clinic in Edirne between November 11, 2020 and April 2, 2021 to complete the survey (Table 2). The inclusion criteria for dentists were as follows: residing in Turkey; working within the borders of Turkey; having graduated from any faculty of dentistry in Turkey; and having access to electronic media. The inclusion criterion for patients

Table 1. Questionnaire for dentists

No.	Questions for dentists
1.	Gender
2.	Years of occupation
3.	Employment institution
4.	Professional specialty
5.	Have you heard of teledentistry applications before?
6.	I know the concept of teledentistry.
7.	I think that teledentistry practices can be useful.
8.	In which situations would you prefer to use a teledentistry application?
9.	Teledentistry practices may violate the patient's privacy.
10.	Talking to the patient in person combined with teledentistry practices can be helpful.
11.	Teledentistry practices could be time-saving.
12.	Teledentistry practices could be profitable.
13.	My follow-up appointments could be better with the use a teledentistry application.
14.	Teledentistry practices could be the standard way of providing oral healthcare.
15.	Teledentistry can make it easier for me to communicate with the patient.
16.	If I were using a teledentistry application, I could not always rely on the accuracy of the patient information entered into the system.
17.	At some point in my professional life, I would like to provide health services with the use of a teledentistry application.
18.	I would like the address information of the institution I work for to be shared with the patient through a teledentistry application.
19.	I would like to share information about the patient's treatment needs with other physicians or to guide the patient through a teledentistry application.

Table 2. Questionnaire for patients

No.	Questions for patients
1.	Gender
2.	Age
3.	Educational level
4.	Monthly income
5.	How satisfied would you be if there was an online (teledentistry) remote examination for dental patients?
6.	The teledentistry program can make it easier for me to communicate with the dentist.
7.	Using teledentistry, my dentist can do my check-ups well enough.
8.	Teledentistry can contribute to regular dental examinations.
9.	A dental examination with teledentistry is as accurate as during a face-to-face meeting.
10.	Teledentistry can reduce the cost of dental services.
11.	Teledentistry can be a time saver for me.
12.	Teledentistry can improve access to specialists in rural and underserved communities.
13.	Considering the COVID-19 pandemic, teledentistry, which reduces contact with the patient, can help overcome the problem of isolation.
14.	Can teledentistry violate your privacy?

COVID-19 – coronavirus disease 2019.

was having been examined at the Trakya University Oral and Dental Health Practice and Research Center.

Sample size

According to the Turkish Dental Association and the Turkish Statistical Institute 2019 report, 38,948 dentists were living within the borders of Turkey, and the population of Edirne was 413,903. With a 95% confidence interval (*CI*) and a margin of error of 5%, at least 320 dentists and 394 patients were found to be required as the sample size. Considering the missing data, 370 dentists and 450 patients were planned to participate in the study.

Results

The distribution of the 336 dentists participating in the study regarding gender, the duration of employment and the institutions they were working for is summarized in Table 3. The distribution of dentists according to their specialties is shown in Fig. 1. Among the dentists participating in the study, 69.9% were female, 39.6% were working in the profession for 1–5 years, and 48.5% were specialist dentists.

There were 86.9% of dentists who stated that they would like to use teledentistry for radiological examinations, some follow-up examinations, and for follow-up during holidays; 82.4% stated they would like to discuss patients with other dentists or use the function of asking for opinions through teledentistry applications. However, 66.1% of dentists thought that follow-up with a teledentistry

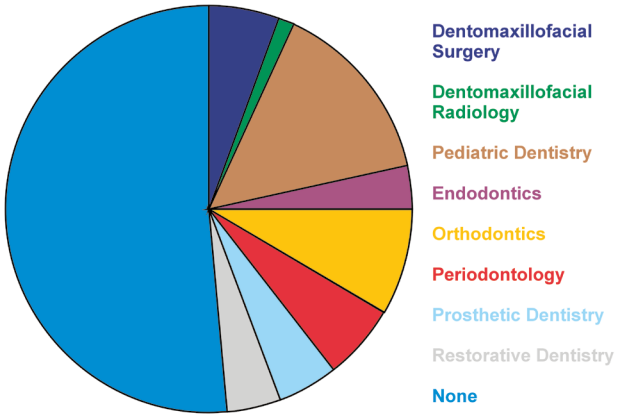

Fig. 1. Distribution of the dentists according to their specialties

application would not be sufficient, 85.4% thought they would have a problem of trust in the patient information obtained in this way, and 46.4% thought they might experience patient confidentiality violation.

As a result, 21.1% of dentists thought that teledentistry practices could be the new standard of oral healthcare, and only 34.0% were willing to try these practices.

The effects of gender, years of experience, institution, and specialization on the dentists' awareness of teledentistry practices, their willingness to try teledentistry practices, as well as the possibility of employing teledentistry as a standard practice in oral healthcare were evaluated. The effects of these factors are summarized in Table 3.

Accordingly, while there was no difference between genders in terms of being aware, it was observed that those who had worked longer, were specialist dentists,

Table 3. Distribution of the dentists included in the study by gender, years of occupation and employment institution, and the effects of these factors on the awareness of teledentistry

Factors		Percentage of all dentists [%]	I am aware of teledentistry [%]	*p*-value
Gender	male	30.1	30.7	0.654
	female	69.9	33.2	
Years of occupation	1–5	39.6	20.3	0.002*
	6–10	19.9	43.3	
	11–15	10.4	45.7	
	16–20	6.8	43.5	
	>20	23.3	34.6	
Employment institution	university	31.3	42.9	0.010*
	PHDODHC	10.1	41.2	
	polyclinic	29.8	22.0	
	private clinic	27.1	27.5	
	other	1.7	50.0	
Specialty	yes	48.5	41.1	0.001*
	no	51.5	24.3	

PHDODHC – Provincial Health Directorate Oral and Dental Health Center; * statistically significant ($p < 0.05$).

or were working at a university or the Provincial Health Directorate Oral and Dental Health Center (PHDODHC) were more likely to be aware of teledentistry practices.

It was determined that the same factors did not have a significant effect on the dentists' views regarding the possibility of teledentistry becoming a standard practice in oral healthcare and their willingness to try teledentistry practices ($p > 0.05$).

The distribution of the 447 patients who participated in the study regarding gender, age, the educational status, and the income status is summarized in Table 4. There were 49.9% of participants in the study who were female, 79.0% were aged 20–44 years, and 54.4% had middle income. The educational status of the patients is shown in Fig. 2.

Among the patients, 74.5% stated that it would be easier to communicate with the dentist via a teledentistry application, 80.3% of patients in underserved regions responded that it would facilitate access to the dentist, 71.4% of patients stated that teledentistry practices would contribute to regular dental examinations, 79.0% of patients indicated that teledentistry could save time, 76.3% of patients stated that it would reduce costs, and 88.8% of patients thought that this method could help overcome the problem of isolation during the COVID-19 pandemic period. However, 51.0% of patients stated that follow-up with the use of teledentistry would not be sufficient, 62.2% of patients indicated that the interviews conducted through a teledentistry application would not be as accurate as face-to-face interviews, and 24.8% of patients

Table 4. Distribution of the patients included in the study by gender, age, educational level, and income level, and the effects of these factors on a positive attitude toward teledentistry practices

Factors		Percentage of all patients [%]	I would be satisfied with the use of teledentistry by dentists [%]	*p*-value
Gender	male	50.1	43.8	0.036*
	female	49.9	34.1	
Age [years]	20–44	79.0	38.0	0.019*
	45–54	14.5	32.3	
	55–64	4.5	65.0	
	>64	2.0	66.7	
Educational level	uneducated	1.8	37.5	0.126
	primary school	24.2	47.2	
	high school	33.6	34.0	
	university	32.9	35.4	
	PhD/master's degree	7.5	50.0	
Income level	low	19.5	40.2	0.001*
	middle	54.4	39.9	
	high	26.1	38.9	

* statistically significant ($p < 0.05$).

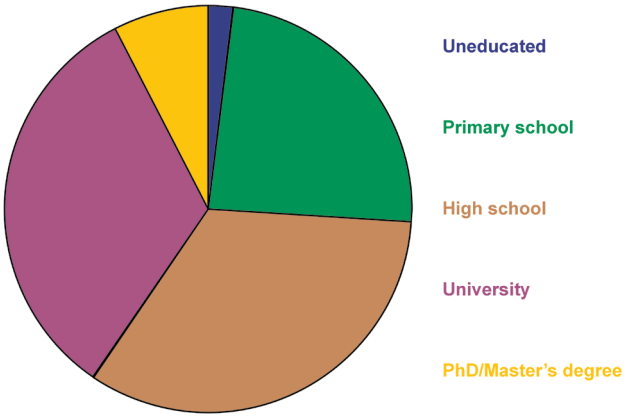

Fig. 2. Educational status of the patients

marked that they might experience personal information privacy violation.

As a result, 38.9% of patients reported that they would be satisfied with the use of teledentistry applications.

The effects of gender, age, educational level, and income level on the positive views of patients regarding teledentistry practices were examined. They are summarized in Table 4.

Accordingly, different income and education levels did not significantly affect the attitude toward teledentistry; however, it was observed that males and those who were relatively older had a more positive perspective.

Discussion

To the best of our knowledge, this is the first study to evaluate the perceptions of patients and clinicians in Turkey regarding teledentistry. It provides insight into the level of knowledge, awareness and experience of teledentistry among Turkish dentists and patients. This questionnaire study included 336 dentists from different regions of the country and 447 patients from one city in Turkey.

Teledentistry is a novel method of health service delivery that enables dentists to triage patients and conduct follow-up,[21] as well as to give advice and reassurance when necessary.[22] Consistent with other studies in the literature,[22–27] our results show positive and promising results for the future of teledentistry, as both patients and dentists alike seem to find merits in this service.

In the present study, 33.2% of the participating female dentists and 30.7% of the male dentists reported that they were aware of teledentistry. There were 86.9% of dentists who stated that they would like to use teledentistry for radiological examinations, some follow-up examinations, and for follow-up during holidays. Among the dentists, 66.1% thought that follow-up with a teledentistry application would not be sufficient, 85.4% thought they would have a problem of trust in the patient information obtained in this way, and 46.4% thought they might

experience patient confidentiality violation. There were 21.1% of dentists who thought that teledentistry practices could be the new standard of oral healthcare, and only 34% were willing to try these practices. Among specialists, 41.1% were aware of teledentistry.

In a study by Subhan et al., it was observed that 62.5% of dentists did not know about teledentistry before COVID-19, but most of them (68.6%) now have knowledge about it.[24] Almazrooa et al. reported that 83.0% of dentists were sure that teledentistry could improve daily dental practice.[25] Al-Khalifa and AlSheikh reported that more than 70.0% of respondents agreed that teledentistry would improve dental practice by increasing peer communication, mentoring and the referral of new patients.[26] There were 80.0% of respondents who were concerned about confidentiality.[26] In a study by Abbas et al., 72.4% of dentists reported that they were aware of teledentistry, and 76.0% reported that teledentistry could be really helpful in health education.[28] According to the opinion of 35.9% of dentists, teledentistry could be used in every branch of dentistry, and 88.2% of respondents stated that teledentistry could be useful in improving access to oral health services.[28] Raucci-Neto et al. reported that 89.5% and 81.4% of general practitioners and specialists, respectively, had no previous experience with teledentistry.[29] There were 38.9% of dentists who also had superficial information. Among the dentists, 37.7% believed that there would be difficulties when using teledentistry, and 48.9% thought that teledentistry would not be fully effective.[29] In a study by Pradhan et al., 96.1% of postgraduate students were aware of teledentistry.[30] There were 58.4% of respondents who thought that teledentistry helped with consulting a specialist about a particular patient's problem.[30]

When evaluated in terms of patients, the results of the current study were as follows: 74.5% of patients mentioned that it would be easier to communicate with the dentist via a teledentistry application; 80.3% of patients in underserved regions responded that it would facilitate access to the dentist; 71.4% of patients said that teledentistry practices would contribute to regular dental examinations; 79.0% of patients indicated that teledentistry practices could save time; 76.3% of patients stated that it would reduce costs; and 88.8% of patients thought that this method could help overcome the problem of isolation during the COVID-19 pandemic period. However, 51.0% of patients stated that follow-up with teledentistry would not be sufficient, 62.2% of patients indicated that the interviews conducted through a teledentistry application would not be as accurate as face-to-face interviews, and 24.8% of patients marked that they might experience personal information privacy violation. There were 38.9% of patients who reported that they would be satisfied with the use of teledentistry applications.

In a study by Byrne and Watkinson, 76.0% of patients said that remote consultation was more convenient than face-to-face consultation, and 66.0% stated that they would like more such appointments to be made in the future, if appropriate.[31] In a study by Menhadji et al., the majority of patients (83.4%) agreed that it was easy to make an appointment online, and 84.9% of patients found it easy to follow appointment instructions.[23] The majority of patients (70.7%) strongly agreed that their video consultation was uneventful. Only a small number of patients (2.1%) strongly disagreed about a better understanding of their dental condition. The majority (59.2%) strongly agreed that the dentist told the patient everything they needed to know, and thus answered all questions. Among the patients, 64.0% thought that the consultation was comprehensive.[23] Rahman et al. stated that patients using the virtual clinic and telephone consultation were satisfied with their experience at 97% and 94%, respectively.[27] All participants agreed with the statement that teledentistry would be very useful in saving time, and a significant proportion (96.0%) would use it again in light of COVID-19.[27]

Based on the literature review, different results were found among studies. The reason for this situation may be that the studies were carried out in different countries, under different conditions (infrastructure, dental education curriculum, etc.) and with different characteristics of the participants included in the study (the educational status, the income status, etc.).

Based on the results of the present study, the use of the teledentistry approach can enable earlier access to healthcare, provide specialist care, minimize work time, and reduce traveling long distances for consultation.[26] For healthcare providers, it has the potential to eliminate inappropriate referrals[31] and reduce long waiting lists.[32] Thanks to teledentistry applications, which allow remote communication, the risk of infection, specifically cross-infection between patients, healthcare workers and other people, can be reduced.[33] However, there are some challenges, limitations and legal issues to be considered with regard to teledentistry, as there are concerns about reimbursement, logistics, licensing regulations, costs, the lack of a physical examination, and data quality and security according to each country's rules.[1,34,35] While applying teledentistry, it is necessary to comply with state laws and the principles of practice.[34] It is very important to establish a well-equipped technological infrastructure system to ensure adequate service and security regarding the exchange of patient data.[35–38]

Limitations

The strengths of this study are a large sample size with different employment institutions, a high response rate, and the recording of opinions for both dentists and patients. However, there are also some limitations associated with the characteristics of survey studies. This study provided information about the teledentistry knowledge and awareness of patients living in Edirne. Thus, our findings cannot be generalized to the whole population of Turkey.

This survey shows a positive attitude toward teledentistry as a general concept. Detailed research is needed to target specific aspects, such as the use for patient screening, diagnosis, referral, or other implementations.

Conclusions

It is important to conduct future comprehensive studies on teledentistry with a larger number of participants to try to minimize difficulties in practice, strengthen the infrastructure technologically, and increase the knowledge level of dentists by including this subject in dentistry undergraduate and postgraduate education in Turkey.

Ethics approval and consent to participate

Ethics approval for the study was obtained from the medical research ethics committee at the Faculty of Medicine of Trakya University, Edirne, Turkey (TUFT-BAEK 2020/319). Informed written consent was obtained from all the participants.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

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