



## The knowledge and attitude of general dentists regarding teledentistry, Isfahan 2022

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### Abstract

**Background:** Teledentistry is a valuable tool, which can be used in various dental specialties for the benefit of both patients and doctors. This study was conducted in Isfahan to determine the level of knowledge and attitude of general dentists regarding teledentistry.

**Materials and Methods:** A total of 96 general dentists from Isfahan City participated in this cross-sectional study. Each dentist was given a questionnaire to assess their level of knowledge and attitude regarding teledentistry. The questionnaire consisted of three sections which included general professional information, questions related to knowledge, and questions related to attitude. The collected data were analysed using Pearson and Mann-Whitney statistical tests ( $\alpha=0.05$ ).

**Results:** The results of the study showed that 56 women (58.3 percent) and 40 men (41.7 percent) with an average age of  $28.20\pm 2.38$  years and an average working experience in dentistry of  $3.30\pm 2.10$  years, participated in the study. In regards to knowledge about teledentistry, 62 people (64.6%) did not know, and 34 people (35.4%) had some knowledge. The level of knowledge of general dentists regarding teledentistry was moderate and unrelated to age, gender, and work experience ( $p>0.05$ ). Also, the level of attitude of general dentists regarding teledentistry was moderate and was not related to participants' age, gender, and work experience ( $p>0.05$ ).

**Conclusion:** This study revealed that the knowledge and attitude of many general dentists toward teledentistry is moderate. Therefore, more training is necessary to create awareness among dentists regarding remote dentistry.

**Keywords:** knowledge, attitude, teledentistry

### Introduction

Nowadays, people are more dependent on social media to search for services, including dental services. Teledentistry also known as remote dentistry, has been used for over two decades in most developed countries for examination, diagnosis, and treatment planning. Remote dentistry facilitates consultation time, and decision-making, (1-3) reduces waiting time, and helps expand dental care to patients in rural areas,

while being more convenient and affordable (4). Also, teledentistry can be used to connect with other dentists or dental health care providers across all specialties. Dentists can share their clinical experiences, conduct discussions and treatment planning sessions, and participate in continuing education sessions through webinars and other online channels (5).

A teledentistry system enables dentists to share patient information, such as radiographs, diagrams, graphs of teeth and hard tissues, applicable treatments, laboratory test results, and other portable information collected by multiple providers. This sharing can be crucial for the patient, especially patients who need expert advice, and the cooperation and interaction of several dentists can make the work easier and improve medical decision-making. The use of computers in dentistry by using software for clinic management,

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creating electronic records for patients, scheduling appointments, completing invasive and non-invasive diagnostic systems, problem-solving software, computer calculation of complex color patterns, compliance with aesthetic requirements, planning for different ways that can be performed in osteotomy surgeries and using them in the main facial jaw bone surgeries, oral surgeries and other surgeries in this field, all supported by intelligent methods (6).

Teledentistry is used in most fields of dentistry, such as maxillofacial surgery, orthodontics, endodontics, pediatrics, oral diseases, and prosthetics (7, 8).

If the dental work required is not an emergency treatment and poses no threat to the patient, it can be effectively managed through remote dentistry (9).

Surveys based on respondents' knowledge, attitudes, and perceptions provide a greater understanding of the community regarding dental issues or problems. These surveys usually identify knowledge gaps and behavioral patterns among socio-demographic groups to implement effective public health interventions (10). These investigations can measure the extent of a known situation and confirm or reject a hypothesis. They can also provide a basis for future evaluations and help measure the effectiveness of the ability of health education activities to change health-related behaviours. Perception studies can suggest an intervention strategy that reflects specific local conditions and cultural factors influencing them, which can help plan activities relevant to the relevant population (11)

The level of knowledge and attitude of dentists about teledentistry has been investigated in different countries, and most of these studies have evaluated the level of knowledge and attitude of dentists positively (5, 9, 12, 13). However, a few studies have reported a weak level of knowledge and attitude (14-16).

The use of remote dental systems provides quick access to dental information maintain legal cases related to individuals based on information recorded in electronic records of patients with dental problems. Teledentistry can solve the issues of the lack of quick access to dentists, especially specialists, and save time and energy on visiting people in person considering the spread of Coronavirus and other respiratory diseases (17). Therefore, teledentistry is important for education, consultation, and referral especially in rural and underprivileged areas, as well as its effective use in epidemics. However, there is a lack of sufficient studies in Iran regarding the acceptance of teledentistry by dentists and their use of this new

technology. Hence, the purpose of this study was to investigate the knowledge and attitude of general dentists in Isfahan regarding remote dentistry through the internet and media.

### Materials and Methods

This cross-sectional study was conducted in 2022, which involved the selection of 96 general dentists aged between 25 to 55 years, who working in Isfahan Specialist dentists and non-collaborating dentists were excluded from the study.

The dentists were given a questionnaire which was divided to 3 parts: general professional information, knowledge-related questions, and attitude questions. The general professional information section included questions about the dentists' age, gender, and years of activity. The knowledge questionnaire had 12 questions related to knowledge, and the attitude questionnaire included 12 questions with 5 point Likert scales ranging from strongly agree, agree, no opinion, disagree, and strongly disagree, which was used to evaluate the opinion of dentists regarding the effectiveness of teledentistry (18).

The attitude questionnaire had five-point for each statement: strongly disagree (DS) 1, Disagree (D) 2, Neutral (N) 3, Agree (A)4, and strongly agree (SA)5. The scoring range for each respondent was between 12 - 60 points. The percentage of points obtained by each dentist from the attitude to teledentistry section was used to classify the attitude as negative (less than 25%), neutral (between 25% and 75%), or positive (more than 75%).

The questionnaire was developed using relevant articles and questionnaires in this field and was customized in accordance to cultural and internet related issues in our country (16, 19).

To determine the validity of the questionnaire content validity index CVI and the content validity coefficient CVR were calculated. Face validity index was measured using the impact factor and reliability was tested with the test-retest method and Cronbach's alpha.

The obtained data were analysed using Pearson and Spearman correlation coefficients and SPSS 24 software. The error level was set at 0.05.

### Results

Ninety-six dentists, including 56 women (58.3%) and 40 men (41.7%) were included in the survey. The age range of dentists was between 24 to 35 years, with an average of  $28.20 \pm 2.38$  years Most dentists were

under 30 years of age (77.1%). The average working experience of dentists was  $3.30 \pm 2.10$  years, and the majority had 1-3 years of working experience (63.5%).

Table 1 shows the frequency distribution of dentists' answers to questions related to knowledge and attitude and Table 2 shows the frequency distribution of dentists' answers to questions related to teledentistry.

**Table 1.** Frequency distribution of dentists' answers to questions related to the attitude towards teledentistry

Question	A & AS	Neutral	D & DS
	No (%)	No (%)	No (%)
As a teledentistry dentist, he can provide me with a good understanding of patient's oral health problems through the Internet	53(55.3)	36(37.5)	7(7.3)
By using teledentistry, I can control the dental problems of my patients well.	38(39.6)	38(39.6)	20(20.9)
I believe dental examinations through computer and intraoral cameras can be as accurate as examinations in the office.	31(32.3)	22(22.9)	43(44.8)
I think that children and their parents are willing to accept dental examinations through computers and intraoral cameras.	34(35.5)	32(33.3)	30(31.3)
Teledentistry is an available oral and dental care method that makes dental examination easier.	49(51.0)	26(27.1)	21(21.9)
Teledentistry is a standard way of providing oral and dental health care	39(40.6)	45(46.9)	12(12.6)
Teledentistry can help with dental follow-ups.	73(76.0)	17(17.7)	6(6.3)
Teledentistry can be a way to reduce the cost of dental procedures	53(55.2)	33(34.4)	10(10.4)
Teledentistry can save the dentist's time.	64(66.7)	23(24.0)	9(9.4)
In my opinion, teledentistry can increase the access of rural and underprivileged communities to specialist dentists to meet their dental needs.	70(72.9)	24(25.0)	2(2.1)
Teledentistry can increase the possibility of diagnostic and therapeutic consultations through contact with colleagues and specialists.	75(78.1)	19(19.8)	2(2.1)
In Iran, the main challenges in teledentistry will be inadequate communication infrastructure, such as high-speed internet and related software for information transfer.	71(73.9)	18(18.8)	7(7.3)

DS = Disagree strongly, D = Disagree, N = Neutral, A = Agree, AS = Agree strongly

**Table 2.** Frequency distribution of dentists' answers to questions related to knowledge and awareness regarding teledentistry

Questions	correct answer	wrong answer	total
	No (%)	No (%)	No (%)
Definition of teledentistry	30(31.3)	66(68.8)	96(100.0)
Can teledentistry replace in-person diagnosis and treatment?	21(21.9)	75(78.1)	86(100.0)
Can teledentistry be useful in improving access to oral health care?	12(12.5)	84(87.5)	96(100.0)
Does teledentistry have the potential to integrate with our current dental services?	10(10.4)	86(89.6)	96(100.0)
Teledentistry can be used in which of the following branches?			
Teaching oral hygiene	5(5.2)	91(94.8)	96(100.0)
Scheduling and follow-up of patients' dental treatments	7(7.3)	89(92.7)	96(100.0)
Diagnosis of caries, oral lesions, etc.	43(44.8)	53(55.2)	96(100.0)
Providing emergency suggestions	17(17.7)	79(82.3)	96(100.0)
Making dental devices such as orthodontic plates and prosthetics	5(5.2)	91(94.8)	96(100.0)
Consultation with a specialist about the specific problem of patients	57(59.4)	39(40.6)	96(100.0)
Examining the oral health status of patients	21(21.9)	75(78.1)	96(100.0)

The level of knowledge of general dentists regarding teledentistry was weak in 3 (3.1%) dentists, average in 54 dentists (56.3%), and 39 dentists (40.6%) had good knowledge. The knowledge of 6 dentists (6.3%) was

related to before the covid 19 pandemic, and in 28 dentists (35.4%) it was related to after the covid 19 pandemic. The attitude of general dentists regarding teledentistry was neutral in 79 people (82.3 percent) and positive in 17 people (17.7 percent) (Table 3).

**Table 3.** Knowledge score and attitude of general dentists regarding teledentistry

Variable	No (%)	Mean $\pm$ SD	Min	Max
knowledge	weak	3(3.1)		
	normal	54(56.3)	7.84 $\pm$ 1.94	2.00
	Good	39(40.6)		10.00
attitude	Negative	0(0.0)		
	Neutral	79(82.3)	42.29 $\pm$ 6.31	25.00
	Positive	17(17.7)		54.00

- Less than 25% negative attitude

- 25 to 75% neutral

- 75 to 100 percent positive

Using the results of the Spearman test, no significant relationship was observed between the age of dentists and their knowledge ( $p=0.456$ ) or attitude ( $p=0.673$ ) regarding teledentistry.

According to the results of the Spearman test, it was observed that there is no significant relationship between the work experience of dentists and their knowledge ( $p=0.221$ ) and attitude ( $p=0.997$ ) towards teledentistry.

In comparing the knowledge and attitude of general dentists towards teledentistry based on gender using the Mann-Whitney test, no significant difference was observed between the knowledge scores of male and female dentists ( $p=0.762$ ) and their attitude scores ( $p=0.800$ ). (Table 4).

**Table 4.** Comparison of knowledge score and attitude of general dentists regarding teledentistry based on gender

Variable	Sex	No	Mean $\pm$ SD	P value
knowledge	Female	65	8.04 $\pm$ 1.61	0.762
	Male	40	7.57 $\pm$ 2.32	
attitude	Female	56	42.14 $\pm$ 6.89	0.800
	Male	40	42.97 $\pm$ 5.45	

## Discussion

According to the results of the present study, most of the dentists examined did not have sufficient knowledge about teledentistry. Additionally, the dentists' knowledge levels about teledentistry varied before and after the coronavirus pandemic, and after the pandemic, their knowledge levels increased by eight times. Therefore, it is evident that the coronavirus pandemic has influenced the need for teledentistry among general dentists. Plaza-Ruíz et al. (20) found that the COVID-19 pandemic had a significant impact on increasing knowledge and use of teledentistry. Similarly, Zahra et al. (9) stated that the use and research on teledentistry among dentists increased significantly after the coronavirus pandemic.

According to the results of the present study, it was reported that the level of knowledge and attitude of general dentists regarding teledentistry is average, and older dentists tend to have more knowledge about teledentistry. Also, the level of knowledge of female dentists was higher than that of men, but it did not lead to a significant difference in their level of knowledge. There was no negative attitude regarding teledentistry among dentists, and as the age of dentists increased, their attitude towards it decreased. The attitude was not related to work experience or gender. Plaza-Ruíz et al. (20) and Al-Khalifa and AlSheikh (16) found the knowledge level of dentists to be good, which differs from the present study's results. Compared to the present study, this difference can be due to the larger

statistical population in the study by Plaza-Ruíz et al. (20). Also, Alipour et al. (21), evaluated the knowledge and attitude of dental students towards remote dentistry and found their knowledge and attitude to be weak, which is contrary to the results of the present study. This difference may be due to the study's focus on general dentists rather than dental students.

In reviewing past studies, some studies have reported that dentists have a positive attitude and good knowledge regarding dentistry (5, 9, 12, 13). However, some other studies have reported that the level of knowledge and attitude of dentists is weak has been reported (14-16). This difference can be due to the cultural, economic, and social differences between the countries being studied. Nevertheless, studies conducted during the coronavirus pandemic period (20, 9, 21, 8, 6), have observed a better knowledge and attitudes of dentists, which is consistent with the results of the present study.

Most of the general dentists in the present study did not define teledentistry correctly, which indicated their lack of knowledge. These dentists stated that they mostly use teledentistry to consult with specialists about specific patient needs.

Work history, age, and gender of dentists can be a factor in changing their knowledge and attitude regarding teledentistry. In the present study, gender and work experience were not related to the level of knowledge and attitude, which is consistent with the results of several other studies (12-15). One possible reason for this is the widespread use of teledentistry among all dentists, leading to an average level of knowledge and attitude among them. However, in the study of Ramesh et al. (18), work experience was significantly related to the average scores of knowledges and attitude, which is contrary to the results of the present study. Participating in training courses is one of the reasons for increasing the knowledge of dentists regarding the use of teledentistry. Perhaps the reason for the difference in the results obtained with Ramesh et al.'s study (18) is participation in training and retraining courses by dentists with more work experience.

Interestingly in the present study, as the age of dentists increased, their knowledge level increased, but the attitude level decreased. This relationship between age and knowledge/attitude has not been reported by previous studies. (15, 16).

. Many dentists believe that teledentistry is most useful for consultation with a specialist, according to a recent

study. Alawwad et al. (12) also found teledentistry effective for health education, and Sen et al. (13) stated that teledentistry can be more effective in counseling dental examinations, which is consistent with the results of the present study. However, the results of the study by Plaza-Ruíz et al. (20) showed that teledentistry could be more useful in the clinical practice of dentists. Zahra et al. (9) have suggested that teledentistry could be used to limit patients' office visits during the outbreak of COVID-19, which is contrary to the results of the present study. It is important to note that teledentistry is primarily used to investigate, identify, and propose treatment for tumours, lesions, and oral health issues. The opinions regarding the effectiveness of teledentistry may vary depending on the needs of the society examined in the studies.

In general, teledentistry is an effective examination method for evaluating the condition of patients' mouth and teeth. It helps to prevent unnecessary visits, identifies and treats oral lesions, and explains the appropriate treatment plan to patients. Referrals to general dentists and specialists are made, as necessary.

### Conclusion

The results of this study indicate that the level of knowledge and attitude of many general dentists towards teledentistry is average. Therefore, this highlights the need to create more awareness among dentists for future development in teledentistry. It is essential to explore the ability and feasibility of teledentistry for oral and dental health education, scheduling and following up with patients' dental treatments, diagnosing caries, and oral lesions, providing emergency suggestions, creating dental appliances such as orthodontic plates and prosthetics, consulting with experts about the specific patient problems and examining the oral health status of patients and provided the dentists with all the necessary information to support the effective implementation of teledentistry.

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