



## Evaluation of knowledge, attitude, and awareness of dentists in the coronavirus disease 2019 pandemic period

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### Original Article

#### Abstract

**BACKGROUND AND AIM:** Coronavirus disease 2019 (COVID-19) is contagious by respiratory droplets and close contact of individuals, so dentists are at high risk of infection and have become possible carriers of the disease. For this reason, it is of great importance for public health that dentists have sufficient knowledge by increasing their awareness on this issue. This study aimed to evaluate the knowledge level of dentists about COVID-19 [severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2)] and to evaluate the factors affecting their knowledge, and also to investigate their attitudes while performing their profession during the pandemic according to their perception of COVID-19.

**METHODS:** 88 private practice dentists and 222 public dentists participated in this study. In order to prevent the spread of the disease, the individuals participating in the study were asked 17 questions consisting of three parts online.

**RESULTS:** Of the 310 participants, 187 (60.3%) were female and 123 (39.7%) were male. The mean age of the participants was  $29.2 \pm 7.3$  years. In terms of COVID-19 transmission, it was found that dentists who had more than 20 years of professional experience, had more knowledge about transmission routes ( $P < 0.05$ ). It was also found that 46.4% of the dentists with 0-6 years of experience in sterilization preferred the pressurized steam sterilization method, and the same group used 41.5% alcohol and 34.3% sodium hypochlorite for disinfection ( $P < 0.01$ ). More than half of the participants displayed a positive attitude towards the use of the current protective equipment.

**CONCLUSION:** The groups showed a similar attitude and awareness level in terms of the parameters evaluated in the study. However, in order to control the COVID-19 transmission and its process, dentists need to shape their perceptions and attitudes with accurate and up-to-date information.

**KEYWORDS:** COVID-19; Dentists; Awareness; Knowledge; Attitude

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In the last month of 2019, a new coronavirus was detected in animals but not seen in humans before in Wuhan, China.<sup>1</sup> This virus was named by the World Health Organization (WHO) as a new coronavirus (2019-nCov). Structurally, the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), one of the enveloped-ribonucleic acid (RNA) virus species, is 350 kilobase pairs in size.<sup>2</sup> The factors that mainly affect the transmission of this virus, which causes severe acute respiratory tract infection, from

person to person, are surface contact, saliva, aerosol, and hand contact.<sup>3</sup> In infected cases, complaints of upper respiratory tract infection, high fever, dry cough, and shortness of breath are generally observed.<sup>4</sup> Due to the transmission rate of the virus, suspected cases are kept in quarantine (isolation) and under observation until the relevant test results provide an adequate diagnosis. The WHO has declared the COVID-19 outbreak caused by the new type of coronavirus as a pandemic on March 11, 2020. Pandemics cause a variety of changes,

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ranging from regions to change or even disappear. Epidemic diseases that spread across continents and seen in the world are cholera, influenza, ebola, smallpox, plague, and typhus.<sup>5</sup> In an article published by the New York Times in March 2020, dentists were ranked as the occupational group with the highest risk of contracting COVID-19 (Figure 1).<sup>6</sup> The COVID-19 disease is transmitted by the droplets formed in the environment due to the sneeze or cough of the infected person. It can also be transmitted when the infected person touches their nose or mouth and has a hand contact with a healthy person.<sup>7</sup> On March 23, 2020, the Ministry of Health of Turkey identified the precautions that should be taken in clinical practice during the COVID-19 pandemic.<sup>8</sup> Hand hygiene is extremely important in dentistry, as fecal-oral transmission of the COVID-19 disease has been reported. Dentists should know the ways of spread of the COVID-19 and should minimize the risk of infection by applying protective instructions in the clinic. The Infection Control Department of the West China Stomatology Hospital recommended hand hygiene guidelines emphasizing the need to wash hands twice before dental procedures, and then, three times after them.<sup>9</sup> Although COVID-19 has low mortality, it shows high morbidity.<sup>10</sup> This situation leads to an increased risk in a number of the workers such as healthcare workers who require close contact with

patients.<sup>11</sup> Dentists, in particular, not only work in close contact, but also work in a position exposed to aerosols, which play a primary role in virus transmission.<sup>12,13</sup> In addition to being infected, dentists also pose a risk in terms of spreading the infection to other patients and their immediate surroundings.<sup>11</sup> Therefore, dentists' awareness and attitudes play an important role in preventing the spread of the COVID-19. A series of guidelines and measures for dentists and dental personnel have been published by many important institutions and organizations, especially the WHO, in order to prevent the disease spread.<sup>2,14,15</sup> These notifications include hygiene rules, preparations required before dental procedures, detailed assessment methods, isolation rules, modifications for patient treatment, personal protective measures and equipment, and rules to be followed in the clinic.<sup>16</sup> Although it is possible to access relevant guides and publications, the criterion that will ensure success in the pandemic depends on the awareness and attitude of dentists.<sup>11</sup>

Considering the role of dentists in the management of the pandemic process, the aim of this study was to evaluate the knowledge level of dentists about COVID-19 and evaluate the factors affecting their knowledge, and also to investigate the attitudes they develop while performing their profession during the pandemic according to their perception of COVID-19.

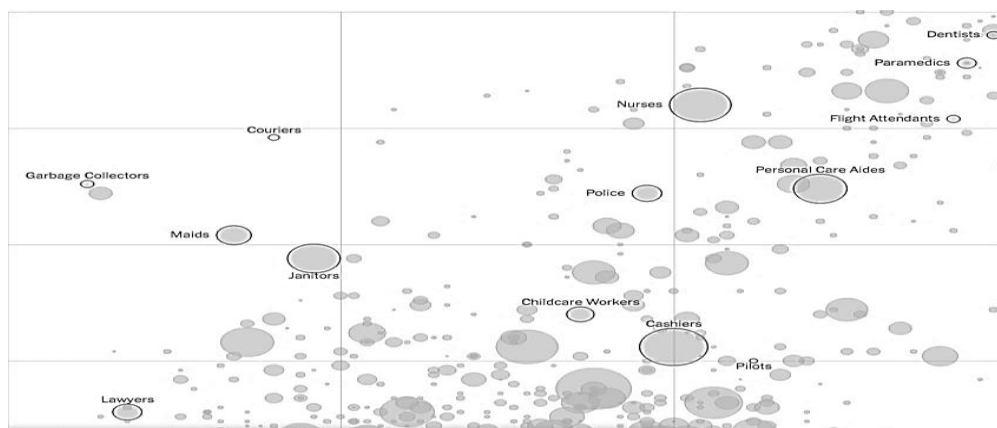


Figure 1. Employees based on the risk of being affected by COVID-19

### Methods

Dentists working in the private practice in Turkey, public institutions and organizations, private polyclinics, and universities participated in the study. The study was conducted using the electronic questionnaire system consisted of 17 items, between June 2 and July 29, 2020. The study protocol was performed in accordance with the Declaration of Helsinki (DoH) principles and the ethical approval was provided by the Clinical Research Ethics Committee (Ethical code: B.30.2.AYD.0.00.00-50.06.04/287).

The G\*POWER 3.1 software package was used to determine the sufficient sample size. Due to the lack of a similar study on the subject, “moderate effect size” was used in the calculation of the sample volume. While calculating the sample size, the first type margin of error was taken as 0.05, the power of the test was 0.90, and the effect size was calculated to be 0.4. As a result of the calculations, the sample size was determined as at least 133 people in each group. The Cronbach's alpha coefficient was used to determine the internal consistency (IC) of the questionnaire. The Cronbach's alpha value for

general information was 0.72, and the scale was at the “highly reliable” level. The Cronbach's alpha value for behaviors was 0.458, and the scale was at the “low reliability” level.

The questionnaire items were prepared by compiling from relevant items in the literature and international guides, and data were collected by sending the questionnaire to dentists who were members of the Association of Turkish Dental Association via e-mail.<sup>2,4,17-19</sup> Individuals who were private and public dentists and answered and sent the items online were included in the study. Consent was obtained from the volunteers participating in the study before starting the study. Public dentists working as dentists in the oral and dental health centers or university hospitals and private dentists working in private practice were included in the study. 88 dentists working in private practice and 222 dentists working in the public sector participated in the study. The questionnaire includes multiple choice items about the level of knowledge of dentists about COVID-19 transmission, risk assessment, and their attitude towards in the treatment of these patients (Figure 2).

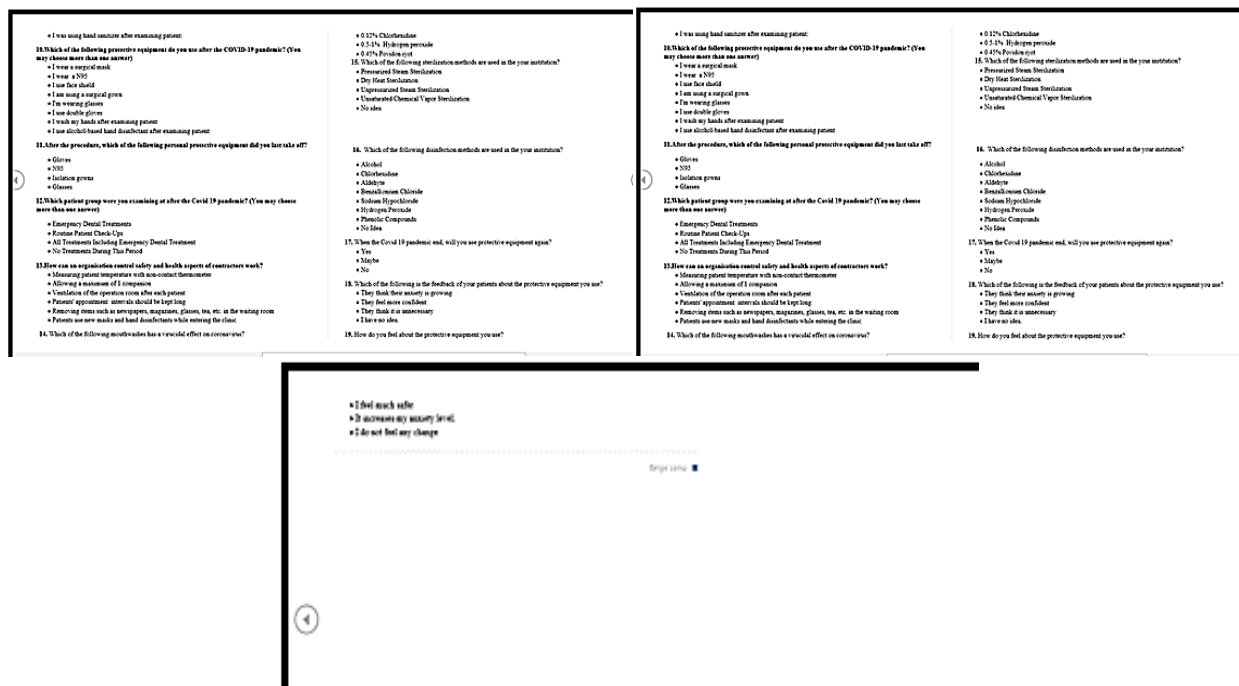


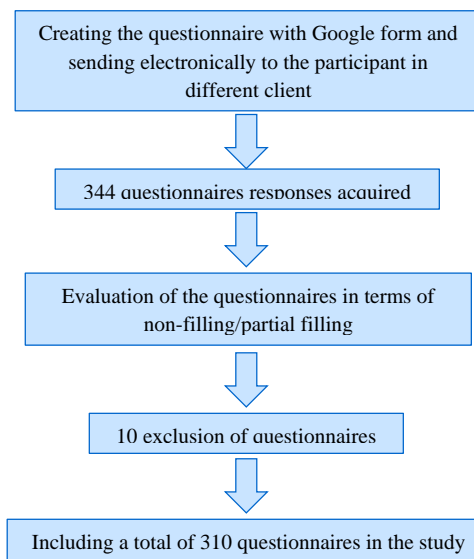
Figure 2. Questionnaire form used in the study

The questionnaire applied consisted of items related to the knowledge level of dentists about infection of the COVID-19 pandemic and their awareness of infection control in clinical practice. To measure the knowledge level of the participating dentists about COVID-19, among the multiple choice items, questions were asked about the materials they had to use while caring for the patients, and the appropriate products that could be used for hand and surface disinfection. The total score of these questions measuring the level of knowledge about COVID-19 was calculated and the variable of the level of knowledge of dentists on COVID-19 was created. Professional experience, gender, age, region of residence, workplace, the way to be informed about COVID-19, anxiety during the epidemic and whether to practice the profession during the epidemic, if so in what situations, the state of thinking about using protective equipment after Covid-19, science The questions to measure their knowledge, perceptions and attitudes on mouthwashes, sterilization and disinfection recommended by the Board of Directors were also coded, and it was tested whether the COVID-19 knowledge level differed according to these variable groups.

The obtained data were analyzed using the Number Cruncher Statistical System (NCSS) 2007 (Kaysville, Utah, USA) program. The chi-square test was used to compare categorical data. The categorical data were presented as frequency (percentage). Statistical significant levels were considered at  $P < 0.01$  and  $P < 0.05$ .

## Results

Based on the the survey forms filled in and submitted, a total of 334 questionnaire responses were obtained. Evaluation of the forms in terms of not filling or partial filling, it was revealed that 10 questionnaires were not filled and 14 contained partial information. Therefore, 24 questionnaires were excluded and the remaining 310 questionnaires were included in the study (Figure 3).



**Figure 3.** Flowchart of the study

The demographic information of the dentists participating in the study, their professional experiences, the institution they worked in, the main sources they obtained information about the COVID-19 outbreak from, the level of their anxiety, and the way of performing their profession during the pandemic are shown in table 1. In COVID-19, there is a significant difference between the groups ( $P < 0.050$ ), while there is no statistically significant difference ( $P > 0.050$ ) between the age and gender in terms of sufficient information about the transmission routes of the disease (Table 1). Given the data obtained, a total of 334 dentists from different cities of Turkey participated in the study. The majority of the dentists participated in the survey were female (60.3%) and dentists older than 30 years. Table 1 also shows that there was a homogeneous distribution in terms of professional experience in the groups. It was observed that the dentists participated in the study were mostly working in state institutions or universities (50.6%). Regarding the main sources of information on the COVID-19 pandemic, it was determined that 24.3%, 19.7%, and 17.3% of the dentists obtained information from social media, television, and academic publications, respectively. Most of the dentists (77.3%) stated that they were very concerned about the pandemic.

**Table 1.** Correlation between physicians' occupational experience and sufficient knowledge about the transmission routes of coronavirus disease 2019 (COVID-19)

Variable	Having Sufficient knowledge about the transmission routes of Covid-19		P
	Yes [n (%)]	No [n (%)]	
Occupational experience (year)	0-6	127 (80.3)	0.005**
	6-10	37 (94.8)	
	11-20	51 (89.4)	
	Over 20	54 (96.4)	
Gender	Female	163 (87.2)	0.937
	Male	106 (86.2)	
Age (year)	< 30	134 (40.0)	0.587
	> 30	176 (60.0)	

Chi-square test, \*P < 0.05, \*\*P < 0.01  
 COVID-19: Coronavirus disease 2019

During this period, most of the dentists reported that they mostly worked only on emergency treatment (61.2%) as recommended by the Ministry of Health. After analysing the answers given to the questions determining the knowledge level of dentists, it was revealed that all dentists knew that COVID-19 caused an infection affecting the respiratory system. It was also revealed that 48.2% of the dentists were using all three medical equipment such as visors, protective gowns/overalls, and N95/FFP2/FFP3 masks at the same time, which must be used while caring for the patients during the COVID-19 pandemic, and 36.6% of the dentists did not use at least one equipment. It was found that 13.0% of the dentists used only one material and 3.1%

of the dentists continued the standard procedure and stated that they did not use any additional materials. According to the opinion of the groups, the number of public dentists (80.3%) who gave the correct answer to the questions related to the knowledge level of dentists about COVID-19 infection was significantly higher than that of private dentists (63.1%) (P < 0.050, Chi-square test).

In addition, the knowledge level of the dentists working in the state hospital/oral and dental health center (ODH) was higher. Considering the level of anxiety, it was found that the dentists were mostly anxious. Moreover, the dentists working in government institutions were found to be more anxious (Table 2).

**Table 2.** Statistical analysis of coronavirus disease 2019 (COVID-19) demographic data and COVID-19 knowledge level by multiple variables analysis

Variable	Covid-19 knowledge level	n (%)	F	P
Experience (year)	< 6	158 (51.0)	0.706	0.494
	6-11	64 (18.4)		
	> 11	88 (30.6)		
Workplace	Public hospitals	157 (50.6)	3.557	0.014*
	Private practice	26 (4.8)		
	Policlinics	62 (20.1)		
	Universities	65 (24.5)		
Basic way to get information about Covid-19	Newspaper	8 (5.6)	1.003	0.406
	Internet/social media	105 (17.2)		
	Professional chambers	40 (13.2)		
	Ministry of Health	181 (24.3)		
	Scientific publications	73 (19.7)		
Status of performing the profession	Emergency dental treatments	208 (59.2)	1.548	0.201
	No	54 (35.7)		
	With protective equipment	48 (18.9)		
	Continue the routine	40 (4.1)		
	Yeah, I'm so worried.	205 (75.2)		
Anxiety levels	Sometimes I'm anxious.	76 (18.9)	7.441	0.001*
	No I am not worried.	29 (9.2)		

Chi-square test, \*P < 0.05, \*\*P < 0.01  
 COVID-19: Coronavirus disease 2019

**Table 3.** The relationship between years of experience in profession and use of protective equipment, more effective mouthwashes, and the sterilization method in the healthcare institutions in the coronavirus disease 2019 (COVID-19) period

		Professional experience (year) [n (%)]				P
		0-6	6-10	11-20	More then 20	
Use of protective equipment in the COVID-19 period	Yes	90 (61.6)	14 (9.6)	30 (15.2)	39 (19.8)	0.166
	Partially	65 (42.5)	24 (15.7)	10 (20.0)	12 (24.0)	
	No	3 (27.3)	1 (9.1)	17 (27.0)	5 (7.9)	
More effective mouthwash	Chlorhexidine	45 (71.4)	6 (95.0)	9 (14.3)	3 (4.8)	0.006**
	Hydrogen peroxide	63 (44.4)	16 (11.3)	30 (21.1)	33 (23.2)	
	Povidone-iodine	50 (47.6)	17 (16.2)	18 (17.1)	20 (19.0)	
Sterilization method used in the healthcare institution	Pressurized Steam sterilization	124 (46.4)	36 (13.5)	56 (21.0)	51 (19.1)	0.001**
	Dry heat Sterilization	6 (60.0)	0 (0)	0 (0)	4 (40.0)	
	Unpressurized steam sterilization	3 (100)	0 (0)	0 (0)	0 (0)	
	Unsaturated chemical vapor sterilization	0 (0)	1 (50.0)	0 (0)	1 (50.0)	
	No idea	0 (0)	2 (7.1)	1 (3.6)	25 (89.3)	

Chi-square test, \*P < 0.05, \*\*P < 0.01  
 COVID-19: Coronavirus disease 2019

Considering the years of professional experience, it was found that the dentists significantly preferred using protective equipment as their professional experience increased (P < 0.010) (Table 3). In terms of professional experience in dental treatments, 71.4% of the dentists who chose the use of chlorhexidine as the most effective mouthwashes during the pandemic, were those with a professional experience of 0-6 years. A statistically significant difference was found between the groups and between the professional experience and effective mouthwash (P < 0.010) (Table 3). A statistically significant difference was found between the groups in terms of the sterilization and disinfection methods used in the institutions where the dentists worked in (P < 0.010) (Tables 3 and 4).

## Discussion

This study provided information about the knowledge level of Turkish dentists about the COVID-19 infection, their awareness about the infection control, as well as their perception and attitude levels. It was observed that the majority of the participants in the survey were female and the age of the dentists was over 30 years. This is an expected finding because women have started to prefer dentistry faculties more in recent years and the graduation age of dentistry education is higher than that of other occupational groups. In addition, the higher knowledge levels of female dentists on COVID-19 can be explained by the fact that women are more likely to research on health-related issues.<sup>19,20</sup>

**Table 4.** Correlation between the years of occupational experience and the disinfection method used in the healthcare institution

		Professional experience (year) [n (%)]				P
		0-6	6-10	11-20	Over 20	
Disinfection Method used in the healthcare institution	Alcohol	39 (41.5)	13 (13.8)	25 (26.6)	17 (18.1)	0.001**
	Chlorhexidine	3 (50.0)	0 (0)	0 (0)	3 (50.0)	
	Aldehyde	7 (25.0)	6 (21.4)	13 (46.4)	2 (7.1)	
	Benzalkonium chloride	4 (80.0)	1 (20.0)	0 (0)	0 (0)	
	Sodium hypochloride	24 (34.3)	12 (17.1)	12 (17.1)	22 (31.4)	
	Hydrogen peroxide	8 (72.7)	0 (0)	0 (0)	3 (27.3)	
	Phenolic compounds	1 (33.3)	0 (0)	0 (0)	2 (66.7)	

Chi-square test, \*P < 0.05, \*\*P < 0.01  
 COVID-19: Coronavirus disease 2019

Considering the knowledge levels of dentists based on the professional experience, it was observed that they gave correct answers to the basic questions about which virus family the COVID-19 virus belonged to, the longest incubation period, whether it had a proven treatment, and how it was transmitted. However, the level of knowledge about the questions that required more detailed research and reading articles was found to be low. It is thought that the reason for this is that dentists do not undertake detailed research on this subject only because they are satisfied with the information and what they hear from the media. The reason for the high rate of this answer among women is that the number of female participants was higher than that of male participants. Due to constantly updated researches and a new type of infection, dentists also follow this new information that will affect their professional lives and when the ways of getting information are evaluated, the Ministry of Health is the most frequently used information tool (43.4%), followed by the internet/social media (30.2%). The Ministry of Health is trying to share the most accurate information and protocols with all healthcare professionals, which are constantly updated due to the COVID-19 outbreak.<sup>21</sup>

It was thought that the significantly higher COVID-19 knowledge level of dentists working in public hospitals or ODH was a result of the active participation of dentists working in these institutions in the information activities carried out by the Ministry of Health. The use of social media, which is a benefit of the digital age, and especially, false information spread over the internet can make the process more difficult for the control and treatment of the virus. The source of the information obtained from social media and internet tools should be questioned and the most accurate information should be reached.<sup>22-24</sup> Immediately after the pandemic was declared in our country, all dental treatment services, except emergency dental

treatments were recommended to be stopped with the recommendation of the Ministry of Health and the Scientific Committee.<sup>23</sup> It has been observed that this situation causes dentists to be anxious while performing their profession. Given the answers given to this question, it was observed that 73.5% of the dentists were concerned about the pandemic. Considering the number of dentists who continued to perform their profession during the epidemic, it was observed that the vast majority (59.2%) provided only emergency treatment services, 12.8% worked with protective equipment, and 15.4% stopped providing clinical services altogether. However, it was determined that 10.2% of them continued their routine clinical practices without any additional measures. It is obvious that this situation can facilitate the spread of the infection and pose a very serious risk for the dentists and patients due to the lack of observance of the preventive measures. In a study by Khader et al. on 368 dentists, 82.6% of the dentists reported that they would avoid treating a patient with suspected COVID-19.<sup>17</sup> 80.3% of the dentists who think that special clothes are an important part of the treatment of patients in COVID-19 pandemic are dentists working in private centers with 0-6 years of professional experience, and 19.7% are dentists working in the public sector, especially those who think that wearing special cloths is necessary during the pandemic. It has been observed that dentists with 0-6 years of professional experience care more about the patient's pain condition than the spread of the infection. In the study conducted by Khan et al.,<sup>25</sup> it was reported that healthcare workers showed positive behavior by using protective equipment against the Middle East respiratory syndrome (MERS) infection.

At the same time, it was shown by Thu et al. that healthcare workers display a positive attitude towards wearing personal protective equipment in health-related infections.<sup>26</sup> In the present study, it was observed that dentists with more professional experience

thought that protective clothing was effective in preventing infection and displayed a positive attitude. Regarding the question about the wrong behavior option in the use of mouthwash, chlorhexidine gluconate was an effective mouthwash in COVID-19 infection, and the rate of dentists with 0-6 years of professional experience (71.4%) who chose the incorrect answer was significantly higher than the rate of other dentists with 0-6 years of experience. This situation is thought to be due to the fact that dentists with less professional experience do not know that mouthwash with povidone-iodine is very effective in such infections and they have insufficient knowledge about the mechanism of action of mouthwashes. Sterilization destroys all microorganisms, including viruses and spores, and is usually provided by the use of heat. Steam pressure sterilizers (autoclaves) are generally used at 250 °C and 15 psi for 15 minutes.<sup>27</sup> Laboratory tests have shown that chemiclave and steam autoclave show a bactericidal effect against *Bacillus Stearothermophilus*1, viruses against hepatitis B, influenza, and poliovirus.<sup>28</sup> In the present study, dentists (46.4%) with 0-6 years of professional experience preferred autoclave chemical steam and dry air. Dentists (60.0%) with professional experience of 20 years or more preferred the dry hot air route. This method is not very suitable for dental instruments due to the long duration of the procedure, high temperature damage to the instruments over time, and incompatible with other materials in dental clinics. However, dry heat sterilization method was used by 80.0% of the dentists as an important method for sterilization of heat-resistant instruments in the past,<sup>29</sup> which is consistent with the results of the present study.

Most microorganisms are destroyed by disinfection, but resistant spores are not included. Although phenol is not a disinfectant by itself, many disinfectants are phenol derivatives. Alcohol is a moderate disinfectant, and generally, acts as a bactericidal against vegetative forms.

However, the American Dental Association (ADA) does not recommend alcohols, quaternary ammonium compounds (QAC), and phenolic compounds for dentistry because they do not have sporicidal effects and are not effective against the hepatitis B virus.<sup>30</sup> To ensure maximum disinfection, the appropriate solution should be used for the time and case recommended by the manufacturer. In a study conducted by Kulekci et al. among the dentists participating in the study, 74.0%, 54.0%, 17.8%, 17.8%, and 10.0% used chemical sterilization method, glutaraldehyde, only alcohol, alcohol-glutaraldehyde, and sodium hypochlorite, respectively.<sup>31</sup> In the present study, 30.3% of the participants chose alcohol as a disinfection method. It is thought that the participants did not know which materials were used as an effective disinfectant and they had insufficient knowledge about the mechanism of action of chemicals.

### Conclusion

Given the findings, the knowledge level of most of the dentists participating in this study about COVID-19 was above average. It was observed that most of the dentists were aware of the symptoms of the disease, the ways of transmission, the equipment necessary to protect against the infection, and the precautions necessary to be taken in clinical conditions, and this awareness was reflected in their attitudes. The limitations of this study are as follows: the results cannot be disseminated to the general public since it includes only a certain part of Turkish dentists, and since it was an online study, only dentists who could use the internet well could be examined. It should not be forgotten that these dentists had more information about the epidemic on different platforms.

### Conflict of Interests

Authors have no conflict of interest.

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