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Original Article

The Prevalence of COVID-19 in Dentists and Dental Assistants

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ABSTRACT

Introduction: The aim of this study was to investigate the prevalence of COVID-19 in dentists and dental assistants and their associated signs and symptoms.
Methods: A cross-sectional study was conducted using an online survey from 9th to 23th May 2020. The sample size was 385. The questionnaire was registered at Porsline website. The questionnaire included questions about infection of dentists, dental assistants and their families with COVID-19, signs and symptoms, paraclinical tests, and treatments. The data were entered into Excel and SPSS software and analyzed using logistic regression test.
Results: From all responding dentists, 15.8% were suspected of having covid-19. Based on symptoms, only 1.6% of dentists were highly suspicious for COVID-19. Only 0.78% of dentists were definitely positive for COVID-19 based on paraclinical tests. Symptoms were often very mild to moderate in severity. Among dental assistants, 5.5% were suspected of having COVID-19. Based on symptoms, none of dentists' assistants were highly suspicious for COVID-19. None of dental assistants were definitely positive for COVID-19 based on paraclinical tests. Symptoms were often very mild to moderate in severity. Logistic regression showed that the odds of infection with Corona was higher in government-sector dentists than in the private sector (OR: 1.189; 95% C.I: 0.812-1.742), in specialist dentists than in general (OR: 1.903; 95% C.I: 0.532-2.245), and in dentists between the ages of 30-60 years old than under the age of 30 (OR: 3.647; 95% C.I: 0.840-15.835).
Conclusion: Despite the fact that dentistry is a high-risk job for COVID-19 infection, the overall prevalence of COVID-19 in dentists and their assistants might be very low and the severity of symptoms in case of infection is probably mild.

Introduction:

Corona virus disease 2019 (COVID-19) has now spread to almost every country in the world and is transmitted in a variety of ways (1); The virus can be transmitted through sneezing, coughing, contact with contaminated surfaces, blood, saliva and

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aerosols, and can lead to corona disease. The main route of transmission of the virus is through person to person contact. Dentists and their assistants are at greater risk of exposure to the virus during close contact with patients and dealing with blood, saliva, and aerosols produced during dental procedures (2-5).

Cough, fever and dyspnea were common presenting symptoms among COVID-19 patients and the presence of these symptoms may raise suspicions of having Covid-19 (6). Also, the presence of some paraclinical and laboratory signs, such as abnormal findings, especially ground glass opacities, on CT scan of the lungs, lymphopenia, and elevated C-reactive protein (CRP), can be used as screening tools for patients with COVID-19, although the gold standard of diagnosis is still the polymerase chain reaction (PCR) test of nasopharyngeal swabs (7).

The incidence of COVID-19 varies by regions and considerable differences in epidemiology, clinical characteristic, disease severity and mortality rate of patients treated in different parts of the world have been observed (8, 9).

Dentists and their assistants, after the onset of Corona disease, even with the use of personal protective equipment, have a high fear of attending dental centers and providing dental services to patients. Studies to evaluate the prevalence of COVID-19 in dentists and their assistants are necessary to assess the true risk of COVID-19 infection in them and, if this risk is low, to reduce their stress for Corona disease and help them to prepare for re-attending dental centers and providing dental services to patients (2).Therefore the aim of this study was to investigate the prevalence of COVID-19 in dentists and dental assistants and their associated signs and symptoms in Iran.

Methodology:

The study protocol was approved by institutional review board (ethic code: IR.BUMS.REC.1399.046).

In this cross-sectional descriptive-analytical study, conducted 9th to 23th May 2020, the study population included all Iranian general and specialist dentists volunteer to participate in the study who continued to practice dentistry in public and private centers after identifying the first case of COVID-19 in Iran (and before the ban on dental activities).

To estimate the sample size, the sample size formula for estimating the population ratio (n= $\frac{z^2 p\,(1-p)}{d^2}$ was used. To estimate the maximum required sample, the P = 0.5, confidence interval (z) = 95%, and margin of error (d) = 0.05 were considered into account. Therefore, the sample size was obtained equal to 385 people.

Due to corona crisis and observance of social distance, the research was conducted online. A researcher-made electronic questionnaire consisting of demographic data and questions about definite or suspicious infection of dentists and dental assistants and their families with COVID-19 was prepared and uploaded on the Porsline website; the link of the questionnaire;

(https://survey.porsline.ir/s/KUt7VQB)
shared via Iranian Dental Society channel in

Telegram Messenger (Since most of the dentists in Iran are members of this channel in cyberspace, the results of the studies can be well generalizable) and also via other virtual dental groups and channels. The validity and reliability of questionnaire (Cronbach's alpha=0.82) were confirmed. Questionnaires with duplicate internet protocol address (IP address) or taking less than ten minutes to complete, were excluded from the study. We considered the positive results of the polymerase chain reaction (PCR) test from oropharyngeal or nasopharyngeal swabs to be the diagnostic gold standard in COVID-19. Based on paraclinical tests, we divided suspected cases of COVID-19 into five categories: definite (PCR was positive), highly suspicious (If the CT scan was positive), suspicious (both C-reactive protein [CRP] and lymphopenia were positive), poor (If only one of CRP or lymphopenia was positive) and non-infected (PCR and CT scans were negative and none of the CRP and lymphopenia was positive). Based on reported symptoms, we divided suspected cases of COVID-19 into four categories: highly suspicious (If he/she had three symptoms including fever, dry cough, and shortness of breath), suspicious (If he/she had two of the above-mentioned symptoms), poor (If he/she had only one of the symptoms) and non-infected (If he/she had none of the symptoms).

The obtained data entered into Excel software (version 2010) and analyzed. Logistic regression using enter method was used to investigate the factors related to self-reporting Corona disease infection. In the above analysis, for gender, working place, degree and age, respectively, female gender, working place in the private sector, general dental degree and age under thirty years were considered as the basis and the odds ratio of Corona disease infection accordingly calculated.

Results:

Out of a total of 400 questionnaires received, 381 questionnaires were fully completed. Table 1 shows the demographic information of study participants (table 1). 60 dentists and 21 dentists' assistants had COVID-19 or were suspected to COVID-19; the dentists' perceptions of association of definite or suspected corona disease with dental activity were as follow: definitely yes (20% for dentists, 42.85% for their assistant), probably yes (25% for dentists, 42.85% for their assistant), probably no (35% for dentists, 14.3% for their assistant), definitely no (20% for dentists, 0% for their assistant).

Table 1. Demographic information of study participants

Variable \ Frequency				n
Age (Mean ± SD)	Dentists			44.56 ± 11.72
	Dentists' assistants			34.65 ± 10.27
Gender	Dentists		Male (%)	177 (46.5)
			Female (%)	204 (53.5)
	Dentists' assistant		Male (%)	15 (4)
			Female (%)	366 (96)
Degree	General (%)			297 (77.9)
	Specialist (%)			84 (22.1)
Working place	Private sector (%)			323 (84.8)
	Government sector (%)			58 (15.2)
Suspicious to have COVID-19 infection	Percentage (%)		Dentists	60 (15.8)
			Dentists' assistant	21 (5.5)
	Age (Mean ± SD)		Dentists	40.95 ± 12.13
			Dentists' assistant	30.59±13.12
	gender	Dentists	Male (%)	21 (35)
			Female (%)	39 (65)
		Dentists' assistant	Male (%)	1 (4.77)
			Female (%)	20 (95.23)
	degree		General (%)	48 (80)
			Specialist (%)	12 (20)
	Working place		Private sector (%)	45 (75)
			Government sector (%)	15 (25)

15% of suspected dentists reported fever (high temperature - 38 degrees Celsius or above); 60% dry cough; and 60% shortness of breath or breathing difficulties. 42.9% of

suspected dentist's assistants reported fever; 28.6% dry cough; and 57.1% shortness of breath or breathing difficulties. With regard to severity of dentists' symptoms, mean of severity scores was 2.71 ± 1.16 (based on Likert scale of 1-5) (table 1). With regard to severity of symptoms, mean of severity scores was 1.75 ± 0.82 (based on Likert scale of 1-5). Distribution frequency of the severity of symptoms of dentists were as follows: very mild (50%), mild (25%), moderate (25%), severe (0%) and very severe (0%); Distribution frequency of the severity of symptoms of dentists' assistants were as follows: very mild (14.2%), mild (42.9%), moderate (0%), severe (42.9%) and very severe (0%).

Table 2. Classification of infection of dentists and their assistants suspected of having corona disease based on their reported symptoms and paraclinical tests (signs).

Frequency / Source	Category	group	N (%)	Overall percentage in studied group
symptoms	Highly suspicious	dentist	6 (10)	1.6
		assistant	0 (0)	0
	suspicious	dentist	21(35)	5.5
		assistant	6 (28.6)	1.6
	Poor	dentist	21(35)	5.5
		assistant	15 (71.4)	3.9
	Non-infected	dentist	12 (20)	3.1
		assistant	0 (0)	0
	Total	dentist	60 (100)	-
		assistant	21 (100)	-
Paraclinical tests (signs)	definite	dentist	3 (5)	0.78
		assistant	0 (0)	0
	Highly suspicious	dentist	0 (0)	0
		assistant	0 (0)	0
	suspicious	dentist	0 (0)	0
		assistant	0 (0)	0
	Poor	dentist	6 (10)	1.57
		assistant	0 (0)	0
	Non-infected	dentist	51 (85)	13.38
		assistant	21 (100)	5.5
	Total	dentist	60 (100)	-
		assistant	21 (100)	-

Logistic regression using enter method was used to investigate the factors related to self-reporting Corona disease infection; the results are given in table 3. According to this table, there was no difference in the odds of infection with Corona disease between male and female dentists. The odds was higher in government-sector dentists than in the private sector, in specialist dentists than in general, and in dentists between the ages of 30-60 years old than under the age of 30. The odds of dentists over the age of 60 had no difference from dentists under the age of thirty.

Table 3. Results of logistic regression (enter method) showing factors related to self-reporting Corona disease infection

Variable	OR	P-value	95% Confidence interval
Gender (reference, female)	0.92	0.80	0.473-1.785
Working place (reference, private sector)	1.19	0.37	0.812-1.742
Degree (reference, general)	1.09	0.81	0.532-2.245
Age (reference,<30 years) (1) (2)	 3.65 0.97	 0.08 0.96	 0.84-15.83 0.26-3.57

(1): Age category(1) (30-60 years); (2): Age category(2) (>60 years)

10.2% of dentists reported that they had a family member or first-degree relative infected with COVID-19 1.5% of dentists reported that their dental assistant had a family member or first-degree relative infected with COVID-19. Table 4 shows frequency distribution of dentists' perception of the COVID-19 transmission to family members (of dentists/ dentists' assistants) from their dental activity. Table 5 shows frequency distribution of therapeutic or supportive measures of the dentists and their assistants in cases of Corona disease or suspicion to Corona.

Table 4. Frequency distribution of dentists' perception of the COVID-19 transmission to family members (of dentists/ dentists' assistants) from their dental activity

Variable \ Frequency			N (%)
Dentists' perception	Definitely yes	Dentists	7.7
		Dentists' assistant	50
	Probably yes	Dentists	0
		Dentists' assistant	0
	Probably no	Dentists	38.5
		Dentists' assistant	0
	Definitely no	Dentists	53.8
		Dentists' assistant	50

Table 5. Frequency distribution of therapeutic or supportive measures of the dentists and their assistants in cases of Corona disease or suspicion to Corona

Variable \ Frequency			N (%)
Therapeutic or supportive measures	Do nothing	Dentists	30
		Dentists' assistant	28.6
	Non-pharmacological measures at home	Dentists	30
		Dentists' assistant	28.6
	Medication at home	Dentists	35
		Dentists' assistant	28.6
	hospitalization in the infectious disease ward of the hospital	Dentists	5
		Dentists' assistant	14.2
	hospitalization in the intensive care unit of the hospital	Dentists	0
		Dentists' assistant	0

Discussion:

The overall incidence of COVID-19 in dentists and their dental assistants was very low and the severity of symptoms was often mild. According to our knowledge, there is no article that specifically reports COVID-19 incidence in dentists and their assistants, so it is not possible to compare with other studies.

In the United States, until April 9, 2020, Most of COVID-19 positive health care personnel (HCP) were female. This finding is consistent with the result of our study as more female dentists infected with COVID-19 than male dentists in our study. Nearly all of HCP reported having at least one symptom among fever, cough, or shortness of breath; this finding is consistent with the result of our study about the symptoms of dentists and their assistants. In their study most HCP with COVID-19 (90%) were not hospitalized; this frequency is in accordance with the result of our study with respect to not to hospitalization. In their study, however, severe outcomes, including 27 deaths, occurred. This finding is inconsistent with the results of our study because in our study there was no death from Corona disease. The reason for this discrepancy can be related to the very high sample size in their study, racial differences between the people included in the two studies, and the limited nature of our study to dentists.(6).

Lian et al. (11) in a prospective study involving 2810 patients treated over a six month period during the pandemic in New York, reported that these dental offices were recorded no transmission of COVID-19 to the dental healthcare workers or patients during the study. These findings are consistent with the results of our study.

Ramírez-Mora et al. (12) mentioned perspectives on the COVID-19 pandemic and its incidence in dentistry. They stated that the dental profession is facing a major challenge during this pandemic. Also, due to the nature of dental centers, the risk of cross infection is high between patients and dental staff. They stated that the guidelines adopted by governments and international organizations also request all dental associations to protect the health of the community and to contain the spread of COVID-19 infection until an effective treatment becomes available.

Estrich et al. (13) in a study to estimate COVID-19 prevalence among US dentists reported that most of the dentists were asymptomatic for 1 month before the survey; this finding is consistent with the result of our study because most dentists in our study did not infect with COVID-19. . In their study, totally, 0.9% of dentists had confirmed or probable COVID-19. This frequency is to some extent similar to confirmed COVID-19 infection in Iranian dentists (0.8%); however, the results of their study were based on a definitive PCR positive test for Covid-19, while our study was based on self-report of individuals. They concluded COVID-19 prevalence was low among US dentists and this indicates that the infection control protocols are sufficient to prevent infection in dental settings. Their conclusion is consistent with the results of our study.

Referring to the results of paraclinical tests, most of the reported suspicious cases in dentists and their assistants were negative, which show that dentists and dental assistants, due to the working conditions in dental centers and the high probability of transmission of corona virus infection, have considered the occurrence of any physical symptoms such as fever, cough and shortness of breath as a reason for this disease, while these symptoms can be also observed in other diseases and are caused by other infectious agents.

Although dentistry is one of the high-risk occupations, the reason for the low incidence of corona in dentists and their assistants can be related to observance of the principles of infection control and the use of personal protective equipment.

The prevalence of COVID-19 in dentists was higher than that of dental assistants, which could be related to the dentist's closer contact with patients and the dentist's greater contact with infectious secretions, including saliva, blood, and aerosols.

The prevalence of family members and first-degree relatives of dentists was relatively high. This high level can also be due to the reporting of suspicious (uncertain) cases. However, if these reports are true, the incidence of these cases could be related to getting the disease from various sources in the community other than the dentist, as reflected in the answers given by the dentists.

In our study, the odds was higher in government-sector dentists than in the private sector; this finding could indicate more compliance with Corona-related health and safety protocols in dentists in private centers and less compliance with these protocols in government centers. The odds ratio was higher in in specialist dentists than in general dentists; the reason for this finding is not very clear and needs further investigation, but it points out that in the field of corona-related health protocols, specialist dentists should be given priority as the target group of training. The odds ratio was higher in dentists between the ages of 30-60 years old than under the age of 30; this finding could indicate less compliance with Corona-related health and safety protocols in 30-60 years old dentists and points out these category of dentists should be given priority as the target group of training. The odds ratio of dentists over the age of 60 had no difference from dentists under the age of thirty; this finding could be related to the observance of more health protocols in this age group.

The most important limitation of the study was the sampling method and the Method of confirmation of COVID-19 infection in our study.

Conclusion

Despite the fact that dentistry is one of the high-risk jobs in the field of COVID-19, probably, the overall prevalence of COVID-19 infection in dentists and their assistants is low among Iranian dentists and dentists' assistant and the severity in symptomatic cases is often mild. It can be concluded that observance of infection control protocols and use of standard personal protective equipment are enough to prevent infection with COVID-19 in dental settings. This conclusion can help dentists and their

assistants return to the workplace and provide dental services to patients away from any fear of COVID-19 infection.

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Author contributions

NA Have made substantial contributions to conception and design; HS and HA contributed in statistical analysis and wrote the manuscript; HA critically reviewed the manuscript.

Competing Interests

There is no competing interest

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