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Epidemiological characteristics of the coronavirus disease 2019 in healthcare providers of the School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran: A prospective cohort study

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Original Article

Abstract

BACKGROUND AND AIM: The coronavirus disease 2019 (Covid-19) has become a public health emergency of worldwide concern. In addition to the serious impacts of this disease, it has caused numerous problems for dental treatments. Here, the findings on the first phase of the cohort study on reopening the School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran and its subordinate clinics during the COVID-19 pandemic were reported.

METHODS: Data were collected via a 100-item self-administered online questionnaire from June 2 to June 20, 2020. A total of 1,110 members from the academics, students, and personnel of the school participated in the study. The questionnaire included demographic data, socio-personal patterns, systemic conditions, COVID-19 infection information, and personal protective equipment (PPE).

RESULTS: Since the outbreak of the pandemic, 87.4% of the professors, 49.0% of the students, and 29.0% of the personnel of the school used personal vehicles other than public transportation. In addition, over 50.0% of the students and about 70.0% of the other two groups had not attended any gatherings. Moreover, 83.0% of the academics, 93.0% of the students, and 84.0% of the personnel had no systemic conditions. Furthermore, about 16.0% of the professors, 14.0% of the students, and 22.0% of the personnel had tested for the COVID-19 infection, of whom only about 1.0% reported positive results. Fatigue, dry coughs, and shortness of breath were the most common symptoms reported by the respondents.

CONCLUSION: Dental offices are high-risk environments for the transmission of air-borne diseases. Considering the low percentage of the participants with positive test, it may be concluded that the safety protocols could effectively limit the spread of the COVID-19 infection.

KEYWORDS: Coronavirus Disease; Dental Care; Epidemiological Studies; Healthcare Provider

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The coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first recognized in Wuhan, China, and has affected more than 60 million people worldwide to date.[1] The

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World Health Organization (WHO) reported the COVID-19 outbreak as a pandemic on March 11, 2020.[2] COVID-19 can result in hospitalization, admission to intensive care unit (ICU), and bereavement, especially in adults older than 65 years old.[3,4]

During the interval between February 19 and February 23, 2020, Iran's officials reported the first 43 cases with eight deaths. Furthermore, three exported COVID-19 positive cases were identified, giving the idea that the underlying burden of the disease in Iran was greater than what was indicated in the reported cases.[5] At the beginning of the pandemic, propositions made for the continuation of routine dental treatments were controversial. The New York Times reported that compared to other professionals, dental professionals were at higher risk of being infected by the COVID-19 virus.[6] The National Health Service (NHS) of the United Kingdom suggested that routine dental treatments had to be applied, except for patients with symptoms related to SARS-CoV-2 or for those reporting a close-contact history.[7] Approximately one month after the outbreak, reports were published on the detection of some virus strains in saliva.[8] Moreover, some evidence on the transmission of asymptomatic COVID-19 carriers was reported.[9] Dentists and dental personnel face splashed droplets and bioaerosol, which are the major resources of SARS-CoV-2 and can be regarded as occupational hazards in dental treatments.[10,11] On February 21, 2020, National/Iranian authorities prohibited dentists from elective dental services and allowed them to manage only emergency cases. Nevertheless, and despite concerns over financial consequences, all routine dental procedures were suspended at the School of Dentistry, Shahid Beheshti University of Medical Sciences (SBMU) and its subordinate clinics/centers/hospitals except for emergency dental care. Consequently, on June 6, 2020, a protocol was designed especially for the conditions of the COVID-19 outbreak (PDSCO) consisting of 3 phases for reopening of the school of dentistry during the COVID-19 outbreak. The phases of PDSCO were i) assigning two work shifts to the existing schedule, ii) monitoring patients' body temperature and blood oxygen saturation level, and iii) providing all staff with personal protective equipment (PPE) for therapeutic purposes. PDSCO mainly focused on reducing the number of attending staff as well as patients in each work shift. The PDSCO has since been available online.[12]

A prospective cohort study was designed to closely monitor the applicability, limitations, and effectiveness of PDSCO. This article aimed to report the findings of the first phase of the cohort study on reopening the school of dentistry and its subordinate dental clinics during the COVID-19 pandemic in Iran.

Methods

All steps in conducting the present cohort study were according to the Declaration of Helsinki (DoH) and its later amendments,[13] and were approved prior to the commencement of the study by the Ethics Committee, Shahid Beheshti University of Medical Sciences (ethical code: IR.SBMU.RIDS.REC.1399.038). The participants were individually presented with the study steps on the phone and were asked to sign an electronic informed consent form before participating in the study. Reports of the present study complied with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[14]

In the first phase of the study, information over 18 days, from June 2, 2020 to June 20, 2020, were obtained using a 100-item self-administered online questionnaire. The questionnaire comprised of demographic data, socio-personal patterns, systemic health conditions,[15] COVID-19 infection information,[16] health behaviors, and PPE[17] in the format of multiple choices and short answer questions. The principal portion of the queries remained the same, although the questionnaire was specified for three types of respondents, i.e., the academics, students at

all levels, and personnel working for the School of Dentistry, Shahid Beheshti University of Medical Sciences. Demographic information included gender, occupational status, and level of education. The socio-personal section made queries on transportation, gathering attendance, and traveling status. Moreover, lifestyle habits of the respondents (e.g., quality of sleep for a minimum of 7 hours/night, staying hydrated with drinking 8 glasses of water a day, intake of at least 2 pieces of fresh fruit/vegetables daily, using less than a teaspoon of salt daily, having a low-fat diet, eating out, taking dietary supplements, and smoking) were questioned in the above-mentioned section. Variables related to this part of the questionnaire were developed based on similar studies and using the guidelines of international health institutions such as the WHO on the factors affecting the severity of COVID-19 disease.[18-24]

The questioned PPE used by the participants included N95 respirator, surgical masks, safety glasses/shields, disposable covers (e.g., caps, sleeves, shoe covers), and gowns.[17] Moreover, the COVID-19 symptoms were thoroughly examined based on the protocols outlined by centers for disease control and prevention as well as close contact (i.e., proximity to an infected person within 1.8-meter distance or less for a total of 15 minutes since 2 days before the onset of the malady).[25]

To examine the validity, the questionnaires were sent to 17 academics of the school of dentistry. The obtained critiques and comments on the simplicity, clarity, necessity, and relevance of the questions were analyzed and modified if necessary. Furthermore, the reliability of the questionnaire was tested based on the pilot study of 20 random respondents. The Cronbach's alpha coefficient for assessing the internal consistency (IC) was calculated to be 0.83 with an acceptable range ≥ 0.7.[26]

The COVID-19 infection was specified via the self-reported testing date and the positive result of the molecular diagnostic test (RT-ase kit, Roje technologies, Iran). The diagnostic tests were performed with the throat, nasal, or nasopharyngeal swabs. The test results were reported using the real-time reverse transcription-polymerase chain reaction (RT-PCR) method.[27] Besides, each participant was controlled with a finger oximeter and a non-contact thermometer before the entrance (triage) of the school. The suspicious patients were requested to test for COVID-19. The test positive participants were monitored twice weekly through phone-based follow-ups.

Results

A total of 1,110 participants were registered in the first phase, of whom 832 contributors answered the questions completely (response rate = 74.95%). The respondents included 510 women and 322 men with different levels of education, who were comprised of 103 academic members, 511 students, and 218 personnel. The demographic information of the respondents is presented in table 1.

Table 1. Demographic information of the respondents

Variable	Academics [n (%)]	Students [n (%)]	Personnel [n (%)]
Total	103 (12.0)	511 (61.0)	218 (26.0)
Women	62 (7.0)	287 (34.0)	161 (19.0)
Men	41 (5.0)	224 (27.0)	57 (7.0)
Level of education			
Professor	19 (2.0)		
Associate professor	20 (2.0)		
Assistant professor	64 (7.0)		
PhD			12 (1.0)
Master's degree			22 (2.0)
Bachelor's degree			101 (12.0)
Associate degree			13 (1.0)
Diploma or lower			70 (8.0)

Table 2. Socio-personal patterns of the participants since the onset of the coronavirus disease 2019 (Covid-19) pandemic

Variable	Participant		
	Academics (n = 103) [n (%)]*	Students (n = 511) [n (%)]*	Personnel (n = 218) [n (%)]*
Transportation			
Public transportation	17 (6.7)	199 (39.0)	46 (21.0)
Personal vehicle	89 (87.4)	250 (49.0)	63 (29.0)
Others	6 (5.9)	62 (12.0)	109 (50.0)
Gathering attendance			
Monthly	21 (21.0)	174 (34.0)	58 (27.0)
Weekly	5 (5.0)	61 (12.0)	10 (5.0)
Not attending any event	76 (74.0)	276 (54.0)	150 (69.0)
Travelling status			
Travelling inside the province of residence	27 (27.0)	116 (23.0)	33 (16.0)
Travelling out of the province of residence	10 (10.0)	50 (10.0)	15 (7.0)
No trips at all	66 (64.0)	345 (68.0)	170 (79.0)
Residency status (students only)			
Dormitory	N/A	148 (29.0)	N/A
Private residence	N/A	363 (71.0)	N/A
Physical activity			
At least 3 times a week	83 (80.6)	304 (59.5)	122 (56.0)
No regular activities	20 (19.4)	207 (40.5)	96 (44.0)
Lifestyle habits			
Quality sleep (at least 7 hours/night)	22 (22.0)	317 (62.0)	48 (22.0)
Drinking at least 8 glasses of water a day	31 (70.0)	225 (56.0)	92 (58.0)
Intake of at least 2 units/day of fruit/vegetables	65 (63.0)	266 (52.0)	122 (56.0)
Salt intake less than a teaspoon/day	90 (88.0)	388 (76.0)	174 (80.0)
Low-fat diet	87 (85.0)	322 (63.0)	168 (77.0)
Eating out	37 (36.0)	312 (61.0)	52 (24.0)
Taking dietary supplements	66 (56.0)	286 (64.0)	126 (58.0)
Smoking	7 (7.0)	41 (8.0)	15 (7.0)

*The percentage for each group is calculated based on the number of all members in that group as the fraction denominator.

Table 2 shows the socio-personal patterns of the participants since the onset of the pandemic. Regarding the transportation mode, 87.4% of the professors, 49.0% of the students, and 29.0% of the personnel used personal vehicles, whereas a lesser percentage of each group used the public transportation system to get to the school of dentistry. At the time of the study, 29.0% and 71.0% of the students stayed in their dormitories and private residences, respectively. More than 50.0% of the students and about 70.0% of the academics and personnel had not attended any social/private gatherings, while others had turned up weekly or monthly for a meeting. Furthermore, 64.0% of the academics, 68.0% of the students, and 79.0% of the personnel had not traveled, however, the remaining participants had taken trips inside/outside their province of residence. In addition, 80.6% of the professors and > 55% of members of the other groups were engaged in regular weekly physical activity, therefore, the rate of physical activity was high amongst the respondents.

Most of the group members took eight glasses of water, used less than a teaspoon of salt, followed a low-fat diet, and had at least two pieces of fresh fruit or vegetables daily (Table 2). Dietary supplements such as vitamin B complex, vitamin D, zinc, iron, calcium, and omega-3 were favored by more than half of the members in each group. Moreover, the rate of smoking was as low as about 7.0% for each of the study groups. Only about 60.0% of the students and 22.0% of members of the other groups had a minimum of 7-hour sleep overnight.

Regarding the general health of the respondents, 83.0% of the academics, 93.0% of the students, and 84.0% of the personnel had no underlying systemic diseases. However, hypertension was the most common systemic condition amongst the academics (10.0%) and personnel (7.0%), respectively. Chronic respiratory diseases (CRDs) were more common amongst the students with a prevalence of 3.0%. Other diseases with a minimal prevalence were anemia, migraine, lupus, psoriasis, and fauvism. Furthermore, 6 professors, 1 student, and 8 personnel were pregnant or breastfeeding during the study period.

Table 3 shows the information about the status of the COVID-19 infection amongst the participants. In the present study, 16.0% of the academics, 14.0% of the students, and 22.0% of the personnel had tested for the infection, of who only about 1.0% in each group reported positive results. The most common symptoms experienced by the respondents (regardless of being positively tested or not) were extreme tiredness/fatigue, dry coughs (without phlegm), and shortness of breath (Dyspnea).

The safety equipment worn by the healthcare staff is listed in table 3. The most commonly used PPE among the professors and personnel were protective shields (52%) and masks (40%), respectively. The present investigation showed that about 50.0% of the professors and 80.0% of the personnel regularly washed their hands. In addition, over 30.0% of the academics had not attended their personal offices since the outbreak to the time of collecting the current information.

Discussion

In the present cohort study, merely 16.0% of the participants tested for COVID-19 infection, of whom only 1.5% reported to be positive. Most participants followed social distancing and did not enter any gatherings. Moreover, most of them had already chosen healthy lifestyle habits. Based on the findings, it seemed likely that if legislations were seriously taken and the protocols were strictly followed, the prevention of the disease could be facilitated even in threatening environments, e.g., our school of dentistry.

Table 3. Information about probable coronavirus disease 2019 (Covid-19) infection and personal protective equipment (PPE) worn by each group members

Variable	Participant		
	Academics (n = 103) [n (%)]*	Students (n = 511) [n (%)]*	Personnel (n = 218) [n (%)]*
Testing			
Being tested for the infection (antibody/molecular)	16 (16.0)	72 (14.0)	48 (22.0)
Positive test results (molecular method only)	1 (1.0)	10 (2.0)	2 (1.0)
Close contact with an infected person	7 (7.0)	66 (13.0)	4 (2.0)
Symptoms			
Fatigue and malaise	3 (3.0)	92 (18.0)	21 (10.0)
Dry cough	5 (5.0)	41 (8.0)	13 (6.0)
Shortness of breath	3 (3.0)	31 (6.0)	15 (7.0)
Productive cough	1 (1.0)	36 (7.0)	9 (4.0)
Fever	1 (1.0)	5 (1.0)	0 (0.0)
Loss of taste	1 (1.0)	15 (3.0)	4 (2.0)
Loss of smell	1 (1.0)	20 (4.0)	4 (2.0)
Chills	0 (0.0)	5 (1.0)	2 (1.0)
PPE			
Respirators/masks	51 (50.0)		85 (40.0)
Protective glasses/shields	54 (52.0)		31 (37.0)
Gowns	45 (44.0)		59 (27.0)
Disposable covers	43 (42.0)		85 (39.0)

PPE: Personal protective equipment

*The percentage for each group is calculated based on the number of all members in that group as the fraction denominator.

Lifestyle and COVID-19 disease may interact with one another reciprocally.[28] In a large-scale cohort study conducted by Hamer et al., it was shown that unhealthy lifestyle habits [e.g., smoking, obesity, and physical inactivity via elevating the risk of non-communicable diseases (NCDS)] worked as risk factors for severe grades of the COVID-19 infection with a population attributable fraction of 51%.[29] Furthermore, long periods of lockdown have adversely affected the lifestyle patterns. Staying home for a long time has acted as a weight-gain factor,[30] particularly in adults aged over 40 years,[31] and has reduced physical activity in children.[32] However, most of the participants followed healthy lifestyle habits. Adopting a healthy lifestyle may help them against NCDS acting as risk factors for the COVID-19 infection.[33]

Since the pandemic onset, governments have applied strict policies to ban unnecessary domestic and international travel worldwide. In a study by Pullano et al., it was revealed that lockdown caused a 65% reduction in nationwide transportation.[34] It seems that the travel limitations applied by the local government may justify participants' low rate of travel in the present study.

Several variables, i.e., duration of exposure, airflow ventilation, and population density, could determine the risk of infectivity when using public transportation.[35] In an investigation conducted by Heald et al., it was shown that public transport platforms had an insignificant role in spreading the disease.[36] Additionally, in the same study, it was demonstrated that only about 7% of deaths and hospital admissions in the United Kingdom were related to using public transport. Nevertheless, compulsory use of masks had a minor effect on the reduction of the disease, although it was followed by everyone in society. Despite taking all protective measures and risk of being infected, the effects of public transportation on the spread of COVID-19 disease remain unclear.[35]

In the beginning, droplets and aerosols produced by routine dental procedures caused anxiety amongst dental professionals and staff. However, there has been no strong evidence on the clusters of respiratory-transmitted diseases, including COVID-19, in dental service providers and/or patients in a dental setting. Centers for disease control and prevention (CDC) presumed that the nature of aerosols splashed during dental procedures is equivalent to those induced during anesthesia or tracheal and nasopharyngeal procedures.[37] Nevertheless, three critical questions have been raised on this concept by Epstein et al.: i) Can dental care-related aerosols usually produced due to irrigation be compared with those generated without irrigation during medical procedures?, ii) Is there strong evidence of the presence of potentially infectious virus in dental care-related aerosols?, and iii) With current strict precautions in dental care and minimizing person to person contamination, what evidence supports the spread of COVID-19 in dental settings?[38]

Besides, the Chinese National Health Commission (NHC) has recommended the use of N95 respirators, protective gloves, full-face shields, eye protection goggles with side shields, isolation gowns, and head covers during dental procedures generating aerosols.[39] To the best of our knowledge, there is no report published proving the infection of the staff or patient with COVID-19 in dental clinics across China to date.[40-42] Similarly, since April 30, 2020, American Dental Association (ADA) permitted dental treatments other than emergency care with a strict focus on prevention of the disease.[43] At the time, dentists were facing different challenges for their practice, mainly including the shortage of efficient PPE and psychological anxiety arising from the risk of getting infected.[44-46] So, the settlement was not initially easy to accept due to the challenges discussed.

Owing to the nature of online surveys and a large number of answered questions, giving wrong information deliberately and/or

replying by chance was not unlikely. This phenomenon is known as "Response Bias" and may happen due to the fear of disclosing personal information. Finally, one-fourth of the expected respondents did not answer the questionnaire imposing attrition bias. All limitations, as already mentioned, may have negatively affected the validity of the results.

Conclusion

The dental working atmosphere is, by nature, a high-risk environment for the transmission of air-borne diseases. Considering the low percentage of test-positive participants, it may be concluded that safety protocols could effectively limit the spread of the COVID-19 infection. However, further steps of this study may hinder the limitations. Based on the lack of long-term prospective studies on the relationship between COVID-19 and dental settings, strict precautions must be taken into account.

Conflict of Interests

Authors have no conflict of interest.

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