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Original Article

Attendance and Distribution Patterns of Patients in a Private Dental Clinic During the COVID-19 Pandemic

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Abstract

Background: To investigate the effects of the COVID-19 pandemic on the patients' attendance/distribution patterns within different departments and the perception of the dental team providing dental services during the COVID-19 outbreak in a private dental clinic. Moreover, the impact of SARS-CoV-2 on dental professionals next to the role of personal protective equipment in the prevention of infection in the corresponding teams was simultaneously investigated.

Methods: A clinic located in the northern part of Tehran was selected. Forty-four dentists with 48 staff members were involved in treatment teams. Preventive strategies, i.e., personnel/operator/patient management comprising full Personal Protective Equipment (PPE), high–volume evacuation suctions, primary screening questions, pulse oximetry, the patient's body temperature measurement as well as administrative controls, e.g. disinfection of surfaces and using stairs instead of lifts, were implemented to manage the prevalence of disease and analyze the impact of COVID-19 on the distribution/attendance patterns of patients.

Results: During 6 months, a 26% reduction in the number of patients was observed after the pandemic; however, men's and women's distributions were not affected. The department of orthodontics reported a 6% increase in new cases whereas the department of pediatric dentistry revealed the least changes in the number of patients. In the departments of operative dentistry, prosthodontics, oral/maxillofacial surgery, and periodontics, the number of patients was reduced by 10-30%. In addition, three dentists and four staff members were affected by COVID-19 during the mentioned period.

Conclusion: It seems that the potential for COVID-19 transmission in dental clinics is relatively low.

Keywords: COVID-19, Dental services, Health care providers, Personal protective equipment

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Introduction

In December 2019, a novel coronavirus, SARS-CoV-2/coronavirus-2, caused the onset of a global pandemic (*i.e.,* COVID-19), which has since affected all aspects of life and claimed many lives with its increased rate of mortality (1). Seemingly, the most important routes for the transmission of disease are aerosols and droplets containing the virus (2). Therefore, it is believed that there is a relevantly high occupational risk for Health Care Workers (HCWs). In fact, HCWs made up 29% of all Chinese cases infected by COVID-19 in January 2020; however, different numbers of HCWs are affected by the disease ranging from 3.8 to 29% (3-7).

Some occupations like dentistry are at the highest risk of COVID-19 disease, since they are more exposed to infections, their routes for transmission and close proximity to others (8,9). Since most dental procedures generate aerosols and droplets when using rotary handpieces, the dental offices have been considered as dangerous places (10). In March 2020, the New York Times published an article showing dentistry as one of the occupations with the highest risk of COVID-19 infection, more than general medicine and nursing (9). An Italian report stated that 11.9% of all COVID-19 positive cases occurred in HCW (11) and 44.1% of the total number of COVID-19 related deaths amongst Italian physicians happened in General Physicians (GPs) (6). Dentists were at the second level after GPs with 9.3% (6) .

In the early stages of the pandemic, the cessation of almost all dental procedures/dental clinics activities was suggested owing to the proximity of dentists to their patients. However, the idea of halting all dental treatments was not obviously practical for a long and unknown period. Consequently, on 16 March 2020, the American Dental Association (ADA) recommended dentists to postpone the elective procedures for about 3 weeks (12). ADA declared that dental practices should be limited only to emergency cases (12). In August 2020, WHO recommended postponing all routine and not emergency dental treatments, and simultaneously evaluating the risk of transmission *via* dental procedures (13).

Since then, and up to this moment, there has been no definite treatment for COVID-19 disease and its different variants, thus the best strategy towards the malady is preventing the infection and minimizing the risk of transmission (3,14). Therefore, it is desired to have specified guidelines for managing dental patients and reducing any risks of contamination for dental team. The aim of all these procedures is to minimize the likelihood of COVID-19 transmission through infected and/or even asymptomatic people.

In April 2020, ADA released a guideline on infection control protocols for minimizing the risk of COVID-19 transmission. In addition, due to its potential for an airborne route of transmission, the education and clinical practices of dentistry have been affected by SARS-CoV-2 virus. It should be mentioned that both patients and dental professionals are at a two-sided risk of COVID-19 infection during dental practices (15). After the COVID-19 pandemic, widespread fear of visiting dentists has been reported amongst different communities (15). Thus, the demand for routine dental treatments has decreased.

Dental practice has been regarded as an occupation with a high risk of infection due to the proximity of dental professionals to patients' mouth and nose which are usually nested with the virus beside aerosol-producing equipment constantly used in dental treatments.

The aim of this study was to report the incidence of SARS-CoV-2 virus, the effect of COVID-19 on patients' distribution/attendance patterns, the role of personal protective equipment on the prevention of infection in the dental team within a private dental clinic during a 6-month period of the pandemic (from 1 June 2020 to 30 November 2020), and make a comparison with its state at the same time of the previous year. Furthermore, the number of patients, various types of requested dental services, effectiveness of current preventive procedures, modifications in treatment times/models, and the risk of acquiring coronavirus-2 in dental professionals were investigated.

Materials and Methods

Clinic description

A private, specialized dental clinic, founded ~10 years ago, was selected for the current observational descriptive longitudinal study. It is a seven-story building with five levels dedicated to dental departments located in the north of Tehran. The clinic

has different clinical departments; with a central reception, a relatively large waiting room (about 40 m^2), and three to five operating rooms for dental procedures for each department. In each room (about 9-14 m^2), one dental chair has been placed, therefore there are eight dental chairs on each floor. Forty-four dentists and 48 staff members are engaged in the treatment of patients in this dental clinic.

Data Collection

Since patients attending the dental clinic were constantly registered and documented for every appointment within the clinic central processing system, the number of patients in each department and their received dental services were separately obtained. In addition, the data were collected in a 6-month period; from 1 June 2020 to 30 November 2020.

Preventive strategies/measures

Personnel and operator management

After the COVID-19 outbreak, all staff members were reminded of infection control protocols. In addition, their professional behavior was observed, controlled, revised and rectified (if necessary) by the supervisor of the clinic. All staff members were dressed in full Personal Protective Equipment (PPE) in which they had a single-use gown, a disposable hair cover, an expendable N95 or two surgical masks, a full-face shield, protective eye goggles and surgical gloves. At the end of each treatment, PPE was discarded. All staff members were obliged to wash their hands for at least 20 seconds with soap and water before and after all dental procedures. The protective goggles and face shields were thoroughly washed and completely disinfected with ethyl-alcohol solutions (70%) after each dental treatment. Sufficient time was allocated for the disinfection of the operating rooms and replacement of the covers between each procedure. An extended interval between patients was considered for the implementation of the aforementioned protocol.

High–volume evacuation suctions were used during any aerosol-generating processes. Rubber dam isolation was suggested during the procedures carried out by rotary handpieces (16). Switching Intraoral Radiography (IOR) to extraoral imaging was performed unless IOR was the only option.

Patient management

The day before any booked dental appointment, the staff would call patients to remind them of the time of their appointment in addition to asking them screening questions (*i.e.*, having fever, persistent cough and difficulty in breathing within last two weeks) to possibly recognize suspicious patients. If there were any doubt for being positive, having contact with a positive tested person, or any travel history, the appointment would have been postponed for at least 2 weeks. Otherwise, the patient was asked to attend the appointment.

The patients' body temperature was taken at the entrance of the clinic using a contact-free forehead thermometer where the triage was carried out. Moreover, a pulse oximeter was utilized to evaluate the level of blood oxygen. If both variables were in the normal range, the patients were instructed to wash their hands, and then, were re-asked the COVID-19 screening questions. If there was nothing unusual, the patient was guided to the appointed department, where their medical history was obtained. In case of systemic diseases, they would be electronically documented/highlighted for possible further proceedings.

All patients were given a gown, a hair cover and protective goggles before undertaking any dental procedure. The patient was also asked for rinsing their mouth by chlorhexidine mouthwash for ~60 seconds prior to dental procedures to lower the proportion of microorganisms in oral aerosols, although its impact on coronavirus-2 is still unclear (17).

Patients were requested to maintain at least two meters of distance with secretory, staff members and other patients.

Administrative tools and controls

Disposable plastic covers were used to protect electronic devices in operating rooms and were discarded and then replaced by new ones for each patient. All surfaces considered "potentially infected", *e.g.,* desks/chairs/doors/water taps/washing sinks/floors, were carefully wiped down and disinfected in the intervals between patients using ethanol 70% (18). The building lift was frequently disinfected. All the dental professionals and staff members were asked to use stairs rather than the lift. The lift was utilized only by patients who were asked to avoid

Table 1. Descriptive data of the patients in a 6-month period of 2019 and 2020

Department	Woman / Man	June		July		August		September		October		November		Total (6 months)	
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Orthodontics	w	131	124	188	186	171	168	134	209	222	202	150	143	996	1032
	m	92	83	114	109	122	100	85	133	137	121	93	102	643	648
Endodontics	w	248	104	436	217	413	245	415	245	412	224	255	154	2179	1189
	m	186	74	328	175	310	155	249	162	250	160	182	109	1505	835
Prosthodontics	w	240	184	596	437	449	360	445	403	486	404	231	174	2447	1962
	m	175	124	444	339	338	261	360	312	404	264	193	122	1914	1422
Periodontics	w	101	143	290	234	276	195	289	253	282	253	102	92	1340	1170
	m	75	103	236	183	207	130	210	180	222	156	85	47	1035	799
Operative dentistry	w	185	221	554	476	547	446	517	447	544	465	211	161	2558	2216
	m	93	140	385	279	362	249	298	292	330	249	112	94	1580	1303
Oral medicine	w	150	250	538	312	437	280	475	347	443	402	140	98	2183	1689
	m	112	164	382	232	364	197	328	244	365	267	99	75	1650	1179
Oral & maxillofacial surgery	w	76	86	181	181	198	160	190	160	204	159	50	46	899	792
	m	51	43	159	125	150	103	105	99	157	82	37	32	659	484
Paediatric dentistry	w	81	84	140	118	124	138	126	141	139	156	84	85	694	722
	m	80	56	157	101	127	117	130	112	156	150	71	74	721	610
Radiology	w	180	61	377	106	295	116	306	137	278	115	108	73	1544	608
	m	112	49	208	74	231	65	188	69	191	88	82	62	1012	407
Total	w	1392	1257	3300	2264	2910	2104	2897	2335	3010	2373	1331	1018	14840	11351
	m	976	827	2413	1611	2211	1368	1953	1593	2212	1527	954	708	10719	7634
	w+m	2368	2084	5713	3875	5121	3472	4850	3928	5222	3900	2285	1726	25559	18985

direct contact with the buttons inside the lift. No magazine, newspaper or book had been placed in the waiting room.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) 22.0 (IBM Corp., Armonk, NY, USA) with descriptive procedures including the "Table".

Results

Total Number of Patients (NOP) after COVID-19 pandemic (in a period of 6 months) was 18,985; which showed a reduction of ~26% when compared with the similar period of last year (25,559). There were 7,634 male (~40%) and 11,351(~60%) female patients, which did not show any difference in the percentage when compared with the same period before COVID-19 outbreak. Furthermore, no difference was observed in the number of patients with systemic problems before and after COVID-19 pandemic. 15 patients self-declared their involvement with COVID-19 infection; nevertheless, they claimed that they were successfully treated afterwards. As shown in table 1, the distribution pattern of dental services did not show major changes. In other words, the departments of operative dentistry and prosthodontics had the most NOP before and after the pandemic (except for November indicating a ~50% reduction). Furthermore, the number of female patients was more

than that of males in all departments at all times. Additionally, patients without dental insurance as well as patients with specific dental insurance plans accepted by the clinic were treated according to their treatment needs.

In the first 5 months after the pandemic outbreak, in comparison with the same time period in the previous year, it was reported that there was a 6% increase in new cases in the department of orthodontics possibly due to the closed primary and/or high schools, and thus, the opportunity was created to conduct their treatment. Nevertheless, the department of pediatric dentistry recorded the least changes in NOP in the same period. The departments of operative dentistry, prosthodontics, oral and maxillofacial surgery and periodontics disclosed that the NOP had reduced by 10%-30%. Another high drop in NOP (~50%) was reported in the department of endodontics.

A total of 7 confirmed that SARS-CoV-2 positive cases were registered in the clinic from June 1, 2020 to November 30, 2020. Furthermore, three dentists and four staff members were affected by COVID-19 during the mentioned period. Two of the dentists had contracted the disease from their partners, while the third dentist, who is an oral and maxillofacial surgeon, was probably infected at the hospital since all the oral and maxillofacial surgery team had shown positive tests at the time. A staff member was infected at a gathering. Another staff member claimed that she had been infected where the triage was carried out. Despite the claims, the source of infection for the remaining two staff members stayed unclear. However, one of the latter needed to be hospitalized. Consequently, all of them were asked to present evidence of negative tests prior to returning to work. No deaths have been reported in the study period. HCW did not represent a proportion of individuals with SARS-CoV-2 infection in this dental clinic. There was no difference in the risk of acquiring SARS-CoV-2 between staff and dentists.

Discussion

The current study reported the effect of SARS-CoV-2 pandemic on patients' attendance and distribution in a private dental clinic in Tehran, Iran, demonstrating that in a period of 6 months, the number of patients slightly reduced (~26%), without affecting the patients' distribution pattern; which indicated a low possibility of COVID-19 transmission in a dental clinical setting.

It has been claimed that dentists, dental nurses and related personnel are at a high risk of being infected by COVID-19 virus due to their type of practice. However, dentists may be infected by SARS-CoV-2 virus in their community as well as at their dental centers, nevertheless, a dental office by nature could be a potential route for COVID-19 transmission even during nonclinical activities (19). In addition, the fear of COVID-19 infection did not stop patients with systemic problems from pursuing their dental treatment. Although several patients voluntarily declared their infection with the virus, there were presumably more infected patients who were not aware of their involvement or remained unnoticed by the dental personnel.

Studies have revealed that there are apparent differences between "Aerosol Generating Medical Procedures" (AGMP) and "Aerosol Generating Dental Procedures" (AGDP) (20,21). In AGMP, aerosols contain a large number of viruses, whereas the viral concentrations are much lower in AGDP. However, PPE may create an effective shield against aerosols generated in operative areas (17). In addition, the clinic control systems completely followed "Centers for Disease Control and Prevention" (CDC) protocols in which professional staff and patients were involved (22). It seems that the implemented protective management systems, including but not limited to staff training, patient screening at the entrance (triage), infection protocols directives, increased elapsed time between appointments, physical distancing between patients, mask mandate, sufficient ventilation in waiting/operating rooms, PPE use and so forth, resulted in a successful outcome for approaching the transmission rate of COVID-19 disease between dental patients and dentists/staff members to a desirable number in the 6-month period of the investigation.

Moreover, the fact that HCW experienced a high incidence of infection after unprotected exposures (23) might be related to insufficient information, awareness and training during early stages of the pandemic. Thus, it appeared that protective procedures, professional training and committed dental team/staff members resulted in lower risk of SARS-CoV-2 infection in this

clinic. Although it was hypothesized that the number of non-emergency treatments might decrease due to the fear of transmission of the disease, the reduction in NOP was not reported in the departments of orthodontics and pediatric dentistry in the same period. The reduction in the total number of patients might be attributed to people's fears of getting infectiously involved (Table 1). However, the drop in the NOP in the department of endodontics could be associated with the reduced number of endodontists which was the consequent of their own problems. Furthermore, the dentists, who were not present at the clinic, were engaged in dental practices elsewhere.

However, all staff members attended the clinic and none of them left their work following COVID-19 outbreak. In November 2020, the total number of patients showed a sudden decline (50%) in comparison with the previous months. It could be related to the increased number of new cases of COVID-19 disease in Iran, higher mortality rate simultaneously and/or as a consequence of lockdown and an increase in the charges of dental services in the clinic. Therefore, it could be concluded that the potential for COVID-19 transmission in a dental office/clinic is relatively low. A limitation to the current study was that the distributing factors, *e.g.*, social, economic, managerial strategies and so forth, and their direct/indirect effects were not investigated; which could be of further examination in future inspections. Additionally, in the current study, the 7 confirmed that SARS-CoV-2 positive cases were the ones openly reported to the managerial section of the clinic; and there were no other members with positive tests openly reporting their possible involvement to the clinic during the 6-month period at which the study was conducted.

However, further well-designed multicenter studies will be required to obtain more specific data reporting COVID-19 prevalence and incidence in dental teams. Further specially-designed investigations are desired for the identification of risk values and occupational hazards in dentistry.

Conclusion

With a 6-month study of a dental clinic in Tehran, Iran, it could be assumed that PPE would play an important role in the prevention of SARS-CoV-2 infection in dental professionals. Furthermore, the risk of coronavirus-2 transmission *via* dental procedures is not as much as it was assumed at the onset of COVID-19 pandemic.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

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