



Evaluation of the Observation of Infection Control Protocols in Dental Offices During the COVID-19 Pandemic Based on Centers for Disease Control and Prevention Guidelines in Zahedan in 2020-2021

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Abstract

Introduction: COVID-19 was identified as a significant threat to health worldwide. The common routes for the dissemination of the virus include direct transmission (sneezing, coughing, and inhaling contaminated droplets and aerosols) and contact transmission (the oral and nasal cavity mucosa and conjunctiva). During dental procedures, large amounts of aerosols are produced; therefore, dentists, the staff, and patients are exposed to the virus. Proper knowledge about the infection control guidelines and evaluation of dentists' mistakes in observing them are prerequisites to improve performance regarding preventing COVID-19, especially in areas with a high prevalence of this disease. The present study aimed to evaluate the observation of infection control protocols in dental offices during the COVID-19 pandemic based on the CDC guidelines in Zahedan, Iran, in 2020-2021.

Methods: The present descriptive study was carried out with the collaboration of general dental practitioners and specialists in 11 clinics and 133 private dental offices in the public and private sectors in Zahedan, who were active during the COVID-19 pandemic in 2020-2021. The simple sampling method was used, and the data were collected using a checklist prepared based on the guidelines of the CDC.

Results: The dentists' personal protection score was 63%, with 73% for the patients and clients. The mean scores for the personnel's educational requirements, patients' and clients' educational requirements, screening, and personal protection equipment in the dental centers were 76%, 60.5%, 71.8%, and 81%, respectively.

Conclusion: The observation of the infection prevention protocols in the dental offices and clinics in Zahedan by dentists, staff, and patients was moderate, necessitating further and more appropriate programs to improve it based on the CDC guidelines. In addition, continuous education programs are necessary for dentists, with further information for the general population through the mass media and virtual social networks. In addition, periodic studies are necessary to evaluate the efficacy of these programs so that modifications in the policies can be implemented if necessary.

Keywords: Centers for Disease Control and Prevention Guidelines; COVID-19; Dental Office; Infection Control; Pandemic

Abbreviations

COVID-19: Coronavirus Disease-2019; WHO: World Health Organization; PPE: Personal Protective Equipment; CDC: Centers for Disease Control and Prevention

Introduction

Coronavirus disease-2019 (COVID-19) was reported for the first time on December 29, 2019, in Wuhan, China, and spread worldwide [1]. The World Health Organization (WHO) called it COVID-19 [2], and it was called a pandemic on March 11, 2020 [3]. Based on the statistics reported on March 20, 2022, of 448 cities and towns in Iran, 106 towns were on the red alert, and 156 towns were on the yellow alert [4]. COVID-19 has challenged occupations and health systems worldwide, and new strains of the virus occasionally emerge in different parts of the world. New mutations of the virus are a significant challenge to the general health of the community despite widespread vaccination programs [5]. The recurrence of the disease has been reported during the recuperation period, even after some recovery from the disease [6]. The transmission routes of COVID-19 have not been definitively identified. However, the virus is transmitted through respiratory droplets produced during sneezing and coughing and direct contact with contaminated surfaces. Respiratory droplets are particles measuring $>5 \mu\text{m}$ that are also produced during dental procedures through secretions. The disease transmission through droplets and aerosols requires close contact (<1 meter) [7]. SARS-COV-2 has been isolated from the saliva of COVID-19 patients [8]. In addition, the epithelial cells of the salivary glands can potentially be contaminated by SARS-COV and become the main source of the virus in the saliva [9]. Concerning dental procedures, the highest coronavirus infection and transmission rate is related to asymptomatic patients or those with mild symptoms [10]. In addition to being infected by blood and saliva, instruments like ultrasonic scalers and air-and-water syringes produce significant amounts of droplets and aerosols [11]. Researchers have evaluated samples from the surface and air at different distances, reporting the presence of viral RNA in 63% of the cases [12]. WHO has reported transmission through aerosols as another route for the virus [7]. Airborne contaminated particles are produced when dentists carry out dental procedures, especially when they use rotary instruments [13]. In a study by Houshyar, *et al.* although most dentists participating in the study used Centers for Disease Control and Prevention (CDC) preventive protocol in the clinic, 26% had been affected by COVID-19, which

was significantly higher than the overall prevalence in the Iranian population (1%). Therefore, dentists are at a much higher risk of infection than other healthcare staff. Therefore, it is highly important to prepare effective preventive protocols and strategies for dental practitioners [13,14].

At the beginning of the pandemic, all the routine dental services were suspected in countries affected by COVID-19 [15]. Despite the widespread transmission of COVID-19 during the epidemic in China, requests for emergency dental treatments decreased by only 38% [16], indicating the need for emergency dental care even during this epidemic. In March 2020, since COVID-19 was still spreading, CDC announced that non-emergency (elective) dental services might also be necessary during this period. Therefore, dental services should be able to minimize the risk for the patients and personnel and provide dental services at a reasonable level. CDC has provided a framework for the personnel and healthcare systems to provide emergency and non-emergency dental care during the COVID-19 pandemic, which has been approved by the WHO [17].

The following measures have been recommended during the COVID-19 pandemic: patient triage, identifying patients suspected of having COVID-19, delaying elective procedures, active screening of the dental office or clinic staff before the patients arrive, active screening of the patients, social distancing in the dental office, compulsory use of facemasks for all the patients and clients referring to the office, patient education, use of personal protective equipment (PPE) by the treatment team, and managing the dental operatory [18]. In addition, if the CDC guidelines for infection control are observed properly, the COVID-19 cases and positive test results of dental practitioners will definitely decrease [19].

A study evaluated the dental staff's affliction rate during the first three months after the COVID-19 outbreak in Iran, concluding that the low rate of the dental personnel's definitive positivity shows the efficacy of preventive measures, including disinfecting the environment and sterilizing the tools and equipment and routine use of PPE, in preventing the spread of the disease [20].

Considering the high transmissibility of this disease and a high risk of cross-contamination between dentists and patients, it is necessary for the healthcare system, including dental centers, to more effectively observe preventive measures based on the CDC

guidelines to provide a healthy environment for the patients and staff and break the disease transmission chain for rapid termination of the pandemic [21].

Knowledge about the infection control guidelines and evaluating dentists' mistakes in implementing them are prerequisites to promote performance in preventing COVID-19, especially in areas with a high disease prevalence [22]. In this context, studies are necessary to acknowledge the rights and wrongs of infection control protocols to evaluate these procedures based on CDC guidelines. Therefore, better guidelines and precise implementation of these guidelines can be achieved. In addition, more accurate programs can be published through mass media and social networks. The present study evaluated the implementation of healthcare principles and guidelines in the dental centers in Zahedan, Iran, based on CDC recommendations to achieve the above goals.

Materials and Methods

The present descriptive study was approved by the Ethics Committee of Zahedan University of Medical Sciences under the code IR.ZAUMS.REC.1399.405. The statistical population was the general dental practitioners and specialists in 11 dental clinics and 133 dental offices in private and public sectors in Zahedan, Iran, in 2020-2021, who were active during the COVID-19 pandemic.

- **The inclusion criteria:** General dental practitioners and specialists working in private and public dental centers and patients treated in these dental centers.

A total of 150 patients referring to dental clinics and offices, who needed dental treatments, were selected randomly and included in the study.

- **The exclusion criteria:** A lack of interest in participating in the study.

All the dental practitioners were included in this study due to the limited statistical population. The patients were selected using the simple sampling method.

The data were collected using a checklist. Therefore, it was not necessary to evaluate the validity and reliability. The initial checklist was prepared using the CDC guidelines regarding the prevention of infection in dental offices during the pandemic and by considering the relevant counselors and specialists. The

checklists, based on CDC guidelines, consisted of six sections: the personal protection of the dentist and the healthcare personnel, the personal protection of the patients and clients in the reception and waiting room environment, the educational requirements of the healthcare personnel, the educational requirements of the patients and clients, the number of personal protection equipment required for each working shift at a mean of 8 hours with 5 patients in each shift, and screening the patients and clients referring to dental centers. Each section consisted of several items based on CDC infection control and prevention guidelines.

The Pharmaceutics and Treatment Deputy of the Dental Unit of Sistan and Baluchestan Province provided the required data on the number of dentists and dental offices and clinics in Zahedan and their distribution. These centers were visited in person, and if the dental practitioners, the personnel, and patients were interested in participating in the study, the checklist questions were asked, and the checklists were completed. The data were analyzed with SPSS 23 using descriptive statistics.

Results

To score the questionnaires, each 'yes' answer to any item on the questionnaire was given a score of 2, with a score of 1 for each 'no' answer. Therefore, the maximum achievable score in the dentists' personal protection, clients' personal protection, and personnel's educational requirements sections were 18, 24, and 22, respectively. In addition, the maximum achievable scores in the clients' educational requirements, screening, and personal protection equipment sections were 14, 8, and 74, respectively. According to table 1, the mean score of dentists' personal protection equipment was 11.31 out of 18, with mean scores of 17.32 out of 24, 16.66 out of 22, 8.47 out of 14, and 5.74 out of 8 for clients' personal protection, the personnel's educational requirements, the clients' educational requirements, and screening, respectively. Finally, the mean score for personal protection in dental offices was 59.72 out of 74.

The mean percentages for the PPE of dentists and clients, the personnel's and clients' educational requirements, screening, and the number of PPE were 63%, 73%, 76%, 60.5%, 71.8%, and 81%, respectively (Table 2).

Variable	Mean	SD	Min	Max
Dentists' personal protection	11.31	1.77	9	17
Patients' personal protection	17.52	2.05	14	22
The personnel's educational requirements	16.66	1.56	13	20
The patients' educational requirements	8.47	0.95	7	11
Screening	5.74	0.83	5	8
The number of PPE	59.72	3.7	51	69

Table 1: Evaluation of the questionnaire scores and questionnaire subgroups.

Variable	Mean percentage	SD	Min	Max
Dentists' personal protection	63	18.9	50	94
Patients' personal protection	73	32.13	58	92
The personnel's educational requirements	76	33.22	59	91
The patients educational requirements	60.5	28.56	50	79
Screening	71.8	39.38	62.5	100
The number of PPE	81	5.7	69	93

Table 2: The mean percentages of observing infection control measures in dental offices.

In the checklist on the PPE necessary for dentists and healthcare personnel, the item for the optimal disposal of residues resulting from dental procedures, based on the medial byproducts disposal rules and regulations, had the highest frequency, with an implementation percentage of 99%. The item on the disposable nature of facemasks and a new mask for each patient had the lowest observation frequency, with 35% (Table 3).

On the checklist for the PPE of the clients and patients in the reception and waiting room environments, the highest frequency was related to the pedal-operated capped dustbins (without

Checklist of PPE required for dentists and the healthcare staff		Frequency (%)	Frequency (%)
Yes		No	
1	Use of infection control-related covers to minimize contact with the skin, including gowns, head caps, and cuffs	122 (81.25%)	18 (18.66%)
2	Compulsory use of N95 facemask (the surgical facemask is not isolated) to prevent the entry of aerosols into the respiratory system	99 (66%)	51 (34%)
3	The facemasks should be disposable and replaced after each patient's treatment	52 (35%)	98 (65%)
4	Compulsory use of isolated goggles or shields to protect the eyes; they should cover the eyes (to prevent blood, saliva, or respiratory secretions) and the area around the eyes (to prevent the possible contact of aerosols with the eyes)	130 (87%)	20 (13%)
5	Repeated disinfection of eye-protecting tools, especially after treating each patient	126 (84%)	24 (16%)
6	The gowns should extend below the knees (not shorter than the knees) and should be disposable and replaced after treating each patient	87 (58%)	63 (42%)
7	Repeated use of alcohol-based gels to disinfect hands before wearing gloves and after taking them off	115 (77%)	35 (33%)
8	Repeated washing of hands with soap and water for at least 20 seconds	127 (82%)	23 (18%)
9	Proper disposal of residues resulting from dental procedures based on the medical residues disposal regulations	148 (99%)	2 (1%)

Table 3: Evaluation of the frequency distribution of the checklist concerning PPE required for the dental practitioners and healthcare personnel.

the intervention of the hands), with 98%. The frequency of the items regarding negative-pressure isolation room for isolating suspected cases (waiting for the dental procedure) and the items for implementing a negative pressure when the facilities and the necessary funds were available in the entire treatment center, including the reception and waiting rooms, the operatory, etc., was 0% (Table 4).

Provision of a negative-pressure room if the facilities and adequate funds are available for the entire space of the treatment center, including the reception and waiting rooms and the operatory	0.00	150 (100%)
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Table 4: Evaluation of the frequency of PPE requirements for the patients in the reception and waiting rooms on the checklist.

Checklist for personal protection for patients in the reception or waiting room	Frequency (%)	Frequency (%)
	Yes	No
Minimize the possibility of close contact between the patients or patients and the personnel	88 (59%)	12 (41%)
Proper distances between the patients' chairs in the waiting room	97 (65%)	53 (45%)
Proper distance between the patients and the reception personnel	118 (79%)	32 (21%)
Periodic disinfection of all the surfaces in the reception and waiting rooms and elevators and the door knobs	83 (56%)	67 (44%)
Providing facemasks for all the patients at the office or clinic door	83 (56%)	67 (44%)
Providing the printed self-screening form prepared by the Ministry of Health at the office or clinic door	24 (16%)	126 (84%)
Providing disinfecting gel for the hands of all the patients at the office or clinic door	127 (85%)	23 (15%)
Pasting the necessary visual warnings with proper visibility concerning infection control	108 (72%)	42 (28%)
Use of foot-operated capped dustbins (with no need for the hands)	147 (98%)	3 (2%)
The patients' belongings and accessories (handbags, umbrellas, hats, etc. should not be brought into the operatory)	94 (63%)	56 (37%)
Providing a proper space for implementing an isolation room with negative pressure for isolating suspected individuals (during the waiting period for dental procedures)	0.00	150 (100%)

On the checklist concerning the healthcare personnel's educational requirements, the highest frequency with 100%, was related to the more stringent observation of infection control guidelines compared to non-critical conditions, with the least frequency with 0% related to maintaining proper conditions in the isolated room with negative pressure to isolate suspected individuals (Table 5).

Checklist for the personnel's educational requirements	Frequency (%)	Frequency (%)
	Yes	No
Verification and re-evaluation of the self-screening form completed by the patients	22 (15%)	128 (85%)
Verification and re-evaluation of the medical file completed by the patients	130 (87%)	20 (13%)
Evaluation of the observation of personal protection principles using up-to-date sources	147 (98%)	3 (2%)
More stringent observation of infection control principles compared to non-critical conditions	150 (100%)	0.00
Educating patients in infection control and personal protection principles	76 (51%)	74 (49%)
Educating the mechanisms of preparing chlorine-based disinfecting agents under emergency conditions	42 (28%)	108 (72%)
Educating how to dilute chlorine-based disinfecting agents under emergency conditions	42 (28%)	108 (72%)
Supervision of maintaining favorable conditions in the isolation room with negative pressure for isolating suspected cases	0.00	150 (100%)

Educating how to use a high-volume saliva ejector and place a rubber dam under a completely isolated condition	57 (38%)	93 (62%)
Observing the order of wearing PPE: 1) washing the hands; 2) wearing a gown; 3) wearing a facemask; 4) wearing a cap; 5) wearing goggles; 6) wearing gloves	67 (45%)	83 (55%)
Observing the order of removing PPE: 1) gloves; 2) goggles; 3) cap; 4) facemask; 5) gown; 6) washing the hands	67 (45%)	83 (55%)

Table 5: Evaluation of frequency of the healthcare personnel's educational requirements on the checklist.

On the checklist concerning the patients' educational requirements, the item on honesty in completing the patients' center-specific file, especially concerning the medical history, had the highest frequency with 97%, with the lowest frequency with 16% related to honesty in completing a self-screening form by the patient before the center-specific file was completed (Table 6).

The checklist for the patients' educational requirements	Frequency (%)	Frequency (%)
	Yes	No
Honesty in completing the self-screening form by the patient before completing the center's patient file	24 (16%)	126 (84%)
Honesty in completing the center's patient file, especially concerning the medical history	145 (97%)	5 (3%)
Investigating the signs and symptoms of COVID-19 and awareness of the similarity of the symptoms and signs with those of the flu and common cold	114 (76%)	36 (24%)
Observing the rules of washing the hands	132 (88%)	18 (12%)
Observing the rules of wearing facemasks	136 (91%)	14 (9%)
Observing the rules of coughing and sneezing	136 (91%)	14 (9%)
Observing the hygienic rules for attending public places	(94%)141	(6%)9

Table 6: Evaluation of the frequency of clients' educational requirements on the checklist.

Concerning screening the patients' referral to the dental centers under COVID-19 pandemic conditions, screening the patients by the dentist had the highest frequency with 92%, with 0% for self-screening by the patients using the form recommended by the Ministry of Health (Table 7).

Screening the patients in dental centers during the COVID-19 pandemic	Frequency (%)	Frequency (%)
	Yes	No
Distant screening (tele-screening) using an audio or video call by the reception personnel	99 (66%)	51 (44%)
Self-screening of the patients using the form recommended by the ministry of health	0.00	150 (100%)
Screening the patients by the reception personnel based on the protocol of the Ministry of Health	100 (67%)	50 (33%)
Screening the patients by the dental practitioner	138 (92%)	12 (8%)

Table 7: Evaluation of the frequency of clinics' screening under COVID-19 pandemic conditions.

Discussion

Awareness of the infection control guidelines and evaluation of dental practitioners' mistakes in implementing them are the prerequisites to improve performance regarding the prevention of COVID-19, especially in areas with a high prevalence of the disease [22]. Therefore, the present study evaluated the implementation of preventive protocols for COVID-19 as recommended by the CDC in public and private sector treatment centers in Zahedan, Iran. The CDC guidelines regarding COVID-19 infection are effective in dental offices, and it is necessary to observe them even in areas with widespread vaccination programs [23]. In a study by Bashir, *et al.* the majority of participants were dental students and dental practitioners in Jazan, Saudi Arabia, and were highly aware of COVID-19 prevention guidelines [24].

Coulthard, *et al.* reported the importance of PPE for dental office patients during the COVID-19 pandemic [15]. In the present study, the mean percentage of the use of PPE by the patients was 73%, with 51% for PPE education for patients.

Sarkarat, *et al.* reported that the low prevalence of the infection among dental personnel shows that disinfecting the environment

and using PPE routinely can effectively prevent the spread of the disease [20]. In the present study, the percentage of using PPE by dental practitioners was 63%, which is considered a moderate level. In addition, the personnel received education on preparing and diluting chlorine-based disinfecting agents under emergency conditions in 38% of cases. In a study by Duruk., *et al.* on general dental practitioners and specialists in Turkey, dentists did not observe the required preventive precautions to protect themselves, the staff, and patients properly. In that study, the rate of the use of N95 facemasks by dentists was only 12% [25].

In a cross-sectional study by Houshyar., *et al.* the link of a designed questionnaire was distributed among dental practitioners in Iran through social networks. The questionnaire consisted of questions on infection control during the COVID-19 pandemic and affliction with the disease. It was reported that most dental practitioners in Iran used protective shields and facemasks during clinical procedures (89.5% and 79.7%, respectively). Almost half of the dentists replaced their facemasks at the end of the day, and only 36% replaced them after each dental procedure [14]. In the present study, in 81% of the cases, PPE, such as gowns and head covers, were used, and N95 facemasks were used in 99% of the cases. Disposable facemasks were distributed in 56% of the cases at the door before the patients and clients entered the office. Disposable facemasks were replaced only in 35% of the cases at the end of each procedure, consistent with a study by Houshyar., *et al.* indicating the importance of further education in this respect. Ahmed., *et al.* reported that dentists should make further efforts to educate dental patients about the mechanisms involved in the possible transmission of COVID-19 infection through airborne particles and aerosols during dental procedures [17]. In the present study, 91% of patients observed hygienic measures during sneezing and coughing and when attending public places, which is a high level, indicating patients' proper awareness about the routes of transmission of COVID-19.

Mahmood., *et al.* showed that the patients were most worried about the transmission of the virus from other patients in the waiting room in the dental office and preferred that only three patients be present in the waiting room to decrease the risk of disease transmission [26]. Bhanushali., *et al.* reported that during the COVID-19 pandemic, the patients' appointments should be made so that social distancing is observed in the waiting room. In addition, the patients should be warned against being accompanied

by someone else to the dental offices and clinics [27]. In the present study, the clients and patients observed PPE use in 73% of the cases, and in 65% of the cases, the chairs in the waiting room were reasonably distanced. Therefore, more attention should be paid to this issue.

Ahmadi., *et al.* (2020) evaluated dentists' attitudes toward COVID-19 infection and its effect on personal life, financial status, and the quality of dental services for patients. Based on the results, more than half of the participants believed that patient triage had to be performed concerning the symptoms and signs of COVID-19, and 70% of the participants did not provide elective procedures during the pandemic [28]. Marta Nia., *et al.* compared the dental services provided in dental offices before and after the COVID-19 pandemic. The most important difference was the screening of dental patients in the dental office after the pandemic [29], which was an important consideration in that study, and was also evaluated and reported in the present study: 71.8 of the dental centers in Zahedan carried out patient screening, which is acceptable. Although dentists carried out screening at a very high level (91%), patients' self-screening with the Ministry of Health form was not carried out at all, indicating that further awareness is necessary.

Conclusion W

The observation rate of preventive measures based on CDC guidelines was moderate in the dental centers by dentists, the staff, and patients in Zahedan. It is necessary to prepare further programs and policies for better education of CDC guidelines in dentists' continuous education programs. The mass media and virtual social networks can be used to increase community members' awareness. In addition, it is necessary to evaluate the efficacy of the implemented programs and modify policies, if necessary, through periodic programs and undertake similar studies.

Conflict of Interest

No conflict of interest exists.

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