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Assessment of dental clinics' infection control function using a checklist during the COVID-19 pandemic

Zahra Momeni^{1*}, Hamid Mirshamsi², Nastaran Parviz³ and Mohammad Elyasifard³

Abstract

Introduction The heightened risk of COVID-19 transmission during dental procedures has been a major concern in dentistry. To curb the spread of the virus, breaking the chain of transmission is paramount. This study aimed to assess infection control function in dental clinics using a supervisory checklist developed specifically during the COVID-19 pandemic.

Method In April 2020, Alborz University of Medical Sciences introduced a 46-item checklist to guide infection control. Regular inspections of clinics began in June 2020 and continued every 6 months. Inspectors, accompanied by either the clinic manager or the infection control team, completed the checklist to evaluate protocol adherence. This retrospective cross-sectional study presents findings from the initial round of inspections.

Results Clinics were categorized as adherent or non-adherent based on achieving at least 50% of the total checklist score. Of the 76 clinics evaluated, 66 (86.8%) met the adherence criteria. The highest compliance was observed in question 12 (separation of employee and patient restrooms), with 81.6% adherence. The lowest compliance was in question 31 (use of disposable waterproof shoe covers), with only 26.3% adherence.

Conclusion Over 80% of dental clinics demonstrated satisfactory adherence to COVID-19 infection control protocols. However, to further mitigate the spread of COVID-19, particularly its more contagious variants, enhancing compliance across all infection control measures remains essential.

Keywords Oral health, Dental services, Infection control, COVID-19

Introduction

COVID-19 primarily spreads through direct transmission via respiratory droplets and saliva during coughing, sneezing, and close person-to-person contact. These infectious droplets can transmit the virus when they come into contact with the mucous membranes of the mouth, nose, or eyes [1–3]. Indirect transmission also occurs when surfaces contaminated by the virus _such as door handles, countertops, and dental instruments_ are touched, allowing the virus to be transferred to another person, thereby acting as a secondary source of infection [4].

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The virus can survive on surfaces like metal, glass, and plastic for several days, making surface disinfection crucial [4]. Furthermore, droplets containing the virus can travel beyond six feet, potentially landing on surfaces or directly entering another person's eyes, nose, or mouth [5]. This underlines the importance of mask usage in high-risk environments [4, 6], particularly crowded or enclosed spaces, where transmission is more likely [7].

Dental clinics are particularly vulnerable to COVID-19 due to the proximity required between dentists and patients and the frequent use of rotary instruments, which can generate aerosols and droplets. This puts dental personnel at high risk of exposure to respiratory droplets, blood, saliva, and other body fluids, making stringent infection control protocols essential [8].

COVID-19 spreads more rapidly and easily through person-to-person contact and respiratory droplets than in previous pandemics [9], necessitating strong measures to break the chain of transmission until widespread vaccination can be achieved. Adherence to health protocols by healthcare providers is critical in reducing the spread of the virus.

Recognizing these risks, the Treatment Department of Alborz University of Medical Sciences and Health Services developed a comprehensive checklist based on the "Guidelines for Providing Dental Services and Related Professions in the Conditions of COVID-19 Epidemic." This guideline, prepared and approved by the Corona Dentistry Consultative Committee on April 9, 2020, outlines detailed infection prevention and control measures across 15 sections and 16 pages and has been distributed to all dental clinics over the provinces [10].

Given the high prevalence of oral and dental disease and the increased risk of COVID-19 transmission during dental procedures, it is imperative to implement the checklist's provisions effectively. This study aims to evaluate the adherence to infection control protocols in dental clinics during the COVID-19 pandemic, as outlined by the Alborz University of Medical Sciences and Health Services' guidelines, to ensure the safety of dental practitioners, staff, patients, and the community. Thereby evaluating the performance and knowledge of healthcare personnel and dentists.

Method and material

This retrospective cross-sectional study evaluated infection control functions across dental clinics in Karaj, guided by the "How to Provide Dental Services during the COVID-19 Pandemic" checklist (Attachment 1). This checklist was developed by the Health Department of Alborz University of Medical Sciences during the COVID-19 pandemic in April 2020. Regular inspections were commenced in June and repeated every 6 months.

The first inspection was continuous until July 2020. This study is a report based on the primary inspection results.

A team comprising the director, the responsible expert, and the expert of the treatment monitoring department carried out the inspections and completed the checklist for each clinic. All inspectors were fully aware of infection control principles and checklist scoring and attended during all visits. The clinic's manager or infection control team was present and informed consent was obtained before completing the checklist. Considering that the checklist is related to the intermittent reviews of the upstream organizations, participation and cooperation in completing the checklist are respected as written informed consent. The study encompassed all 76 dental clinics in Karaj, with no exclusions, ensuring comprehensive coverage. All public and private clinics giving general and specialized dental care services were included. Compliance with the infection control protocol was rigorously assessed based on the completed checklists.

The checklist comprised 46 items covering infection control, clinic conditions, environmental factors, personal protective equipment (PPE) for staff, staff familiarity with Health Ministry regulations and protocols, and referring suspected or confirmed COVID-19 cases. Each item was rated on a six-point Likert scale, with possible scores of 0, 20, 40, 60, 80, or 100, eliminating the option of intermediate values. Inspectors assigned scores based on the degree of compliance with established guidelines. For streamlined data analysis, the Likert scale was converted from a 0–100 range to a 0–5 scale. The final clinic score was calculated by summing the scores of all checklist items. Clinics were then categorized into two groups adherent or non-adherent, based on whether they achieved at least 50% of the total possible score. Additionally, the study recorded background data, including the clinic's history, geographic location, type of activity (specialty or general), and classification (private or public).

Mean (standard deviation) was used for describing quantitative, and frequency (percentage) was used for describing categorical variables. t-test and ANOVA were used for comparing two and three means, respectively. The chi-square test was used to compare categorical variables. If the data were not normally distributed, non-parametric tests such as Mann-Whitney and Kruskal-Wallis were used. Data were analyzed using the SPSS-22 software (SPSS Inc., Chicago, IL, USA). The level of significance was set at $p < 0.05$.

The ethics code IR.ABZUMS.REC.1400.230 was obtained from Alborz University of Medical Sciences. The collected scores and information of each clinic were kept confidential by the project executor and were not published in any way. Finally, the report was released in a group format.

Results

Out of a total of 76 clinics, 66 clinics (86.8%) were adherent to the checklist items. Among the 17 clinics established between 2010 and 2011, only 2 (11.8%) were non-adherent. On the other hand, out of the 59 clinics established between 2020 and 2021, 8 (13.6%) were non-adherent to the checklist items.

Based on the type of clinic activity, all dental clinics running by specialists were adherent, while out of 69 general clinics, 10 clinics (14.5%) were non-adherent. On the other hand, 10 private clinics (13.7%) were non-adherent, while all governmental clinics providing primary care were adherent. However; this difference was not statistically significant in the mentioned items (Table 1).

The highest adherence was observed in question 12, which assessed the separation of staff restrooms from patients, with an impressive 81.6% of clinics achieving full compliance. Conversely, the lowest adherence was recorded in question 31, where only 26.3% of clinics utilized disposable waterproof shoe covers, highlighting a significant gap in infection control practices.

Our study highlights significant gaps in safety practices within dental clinics. Concerning face shield usage during procedures (question 24 of the checklist), only 63.2% of clinic staff consistently wear N95 or two-layer surgical masks to effectively prevent aerosol entry during working hours—a practice essential for infection control.

The situation is equally concerning regarding proper mask usage. According to question 25, just 67.1% of staff adhere to the critical guideline of replacing N95 masks on time, either after 8 h of continuous use or upon clear contamination. Alarming, question 26 reveals that only 35.5% of dental clinic staff are fully knowledgeable about performing a proper seal check on valve masks, a crucial step in ensuring mask efficacy.

Patient screening practices are also insufficient. The results of questions 16 and 21 show that only 64.5% of reception staff and a meager 51.3% of dentists accurately screen patients for main symptoms like temperature and cough. These figures expose serious shortcomings in the implementation of essential safety protocols, putting both staff and patients at risk.

Hand hygiene practices were evaluated through three key questions, revealing significant areas for improvement. Question 1 shows that while 75% of dental clinics provide hand sanitizer or disinfectant solutions, the availability of automatic, touchless hand sanitizer dispensers in waiting rooms remains inconsistent. Question 13 reveals that only 69.7% of clinics offer visual guides on proper hand-washing techniques and the use of disinfectant facilities, leaving a substantial portion of clinics without essential educational resources. Most concerning, question 30 indicates that just 52.6% of staff are fully aware of all five hand hygiene moments and correctly perform hand washing and disinfection. These figures underscore the urgent need for enhanced hand hygiene protocols and staff training to ensure effective infection control.

Our evaluation of ventilation systems in dental clinics reveals concerning deficiencies. According to question 11, only 32.9% of clinics maintain strong and appropriate ventilation, particularly in treatment areas—an essential factor for infection control. Moreover, question 15 indicates that just 43.4% of clinics adhere to the critical practice of enforcing a one-hour interval between patient appointments for proper ventilation and thorough environmental disinfection.

Social distancing practices in these clinics are also alarmingly inadequate. Question 4 shows that only 35.5% of clinics fully enforce correct social distancing between patient seats in waiting and reception areas. Even more troubling, only 48.7% of clinics strictly prevent patient companionship, as revealed by question 8. Question 9 highlights that just 43.4% of clinics effectively ensure social distancing between patients and staff—a vital measure for minimizing cross-contamination risks. Finally, the results from question 14 reveal that only 28.9% of clinics offer telephone and internet appointments, and conduct patient triage and screening through non-face-to-face methods like telescreening.

Two critical questions addressed waste management practices in the clinics. The findings from question 36 reveal that only 65.8% of clinics fully adhere to infection control standards for the collection and disposal of infectious and sharp waste - a figure that falls under what is

Table 1 Frequency of adherence of dental clinics in Karaj to the provisions of the “How to provide Dental services during the COVID-19 Pandemic” checklist in 2022

		Adherent clinics		Nonadherent clinics		p-Value
		number	percentage	number	percentage	
Year of establishment of the clinic	2010–2011	15	88.2	2	11.8	0.847
	2020–2021	51	86.4	8	13.6	
Type of Activity	General	59	85.5	10	14.5	0.281
	Specialty	7	100	0	0	
Type of Clinic	private	63	86.3	10	13.7	0.491
	public	3	100	0	0	

acceptable for ensuring safety. On a more positive note, question 37 shows that 73.7% of clinics have secured waste disposal contracts, indicating some commitment level to proper waste management. Detailed results are provided in Table 2.

Discussion

The primary objective of this study is to retrospectively assess adherence to the 'Provision of Dental Services under COVID-19 Pandemic Conditions' checklist, developed by the Deputy Health Department of Alborz University of Medical Sciences, across dental clinics in Karaj. Despite the passage of time, Iran and the global community, continue to grapple with the COVID-19 pandemic as of 2022. Examining COVID-19-related issues remains a critical concern, with significant implications for both medical and dental sciences.

Our study, conducted on 76 clinics in Karaj, found that 66 clinics (86%) adhered to the checklist provisions, while 10 clinics (13%) failed to comply. This suggests that the dentists, staff, and management of dental clinics in Karaj demonstrate a relatively strong awareness and practice of COVID-19 protocols and transmission risk factors.

Given that the protocol adherence was considered at just 50%, this is alarmingly low for managing critical conditions like COVID-19. This represents a significant limitation of the study. Considering the highly transmissible nature of COVID-19 and other infectious diseases, the adherence benchmark should be raised substantially to ensure more rigorous compliance and enhanced safety.

However, a systematic review by Amiri et al. (2019) paints a less favorable picture of dental professionals' performance during the pandemic in Iran, highlighting that adherence to general guidelines was suboptimal [11]. To provide a more precise comparison and analysis, we will individually examine the cases studied in this review. This systematic review analyzed six primary studies, and the results of our current study will be juxtaposed with those findings for a comprehensive evaluation.

Mask use during a dental procedure

According to the study by Amiri et al. [11], among the entire study population (1295 graduates of dentistry and 1156 dental specialists), more than two-thirds of dental professionals (72%) wore facemasks, which is higher compared to our study. In our study, almost two-thirds of all dental clinic staff (67.1%) use N95 masks continuously or two-layer surgical masks if N95 masks are not available to prevent aerosol entry during working hours. In the current study, the performance of all personnel was considered, while in Amiri's study, only dentists were examined. Probably, dentists have realized the importance of using a mask and have followed it.

The study by Golbabaie et al. underscores that mask usage is the most effective measure for preventing COVID-19 transmission [10]. This is particularly crucial in medical settings, such as dental clinics, where the close and direct contact between dentists and patients, coupled with the high likelihood of aerosol transmission, makes mask-wearing imperative. The significance of masks in these environments cannot be overstated and demands heightened attention.

Another serious issue related to mask use is proper use and timely replacement. According to our results, only 67.1% of personnel replaced N95 masks on time after 8 h of continuous use or completely if there was rich contamination. Only one-third of dental clinic staff were aware of performing a seal check of valve masks. Therefore, it can be concluded that although the issue of mask use is relatively well observed among healthcare personnel, and they have almost sufficient knowledge about the timing of its replacement, there is insufficient knowledge about how to use it properly and comply with the mask seal. Therefore, further training should be provided to dental care staff including using personal protective equipment (PPE).

Screening patients (measuring body temperature and checking for coughing)

Amiri et al. reported that two-thirds of participants measured patients' temperatures upon admission during the COVID-19 pandemic, and more than two-thirds postponed dental procedures for patients presenting with a cough [11]. Similarly, our study revealed that two-thirds of the reception staff and half of the dentists in the reviewed clinics conducted accurate patient screenings. Kazeminia et al. underscored the significance of fever and cough as key indicators for identifying COVID-19 patients, emphasizing the critical need for thorough screening upon arrival at healthcare facilities, particularly dental clinics [12]. This reinforces the necessity of including such measures in monitoring checklists. Dentists must treat every patient as a potential carrier and implement all necessary precautions to prevent transmission.

Hand hygiene

Amiri et al. reported that 91% of participants regularly washed their hands after each dental treatment or surgery [11]. Our study looked at this topic from different aspects. Three-quarters of dental clinics in Karaj had hand sanitizer gel or solution in the waiting or reception room. Nearly three-quarters of dental clinics had hand washing and disinfecting facilities. They had visual aids or posters for visitors. So, they had suitable equipment to wash and sanitize their hands properly. Effectively providing hand sanitizing options to staff and employees contributes to improved adherence to health protocols.

Table 2 The frequency of options for each of the 46 questions

Level of adherence		20%		40%		60%		80%		100%	
score	0	0	1	2	3	4	5	6	7	8	9
Question/ Statement	number	%	number	%	number	%	number	%	number	%	number
1	4	5.3	2	2.6	1	1.3	3	3.9	9	11.8	57
2	10	13.2	5	6.6	5	6.6	9	11.8	13	17.1	34
3	5	6.6	8	10.5	3	3.9	13	17.1	20	26.3	27
4	10	13.2	7	9.2	3	3.9	13	17.1	16	21.1	27
5	8	10.5	1	1.3	4	5.3	6	7.9	8	10.5	49
6	9	11.8	3	3.9	10	13.2	6	7.9	16	21.1	32
7	1	1.3	1	1.3	5	6.6	6	7.9	6	7.9	57
8	1	1.3	3	3.9	4	5.3	10	13.2	21	27.6	37
9	1	1.3	4	5.3	7	9.2	12	15.8	19	25	33
10	0	0	1	1.3	4	5.3	6	7.9	21	27.6	44
11	1	1.3	2	2.6	5	6.6	17	22.4	26	34.2	25
12	0	0	3	3.9	1	1.3	3	3.9	7	9.2	62
13	6	7.9	2	2.6	8	10.5	2	2.6	5	6.6	53
14	0	0	1	1.3	4	5.3	24	31.6	25	32.9	22
15	1	1.3	4	5.3	0	0	15	19.7	23	30.2	33
16	4	5.3	1	1.3	6	7.9	7	9.2	9	11.8	49
17	24	31.6	8	10.5	2	2.6	1	1.3	15	19.7	26
18	25	32.9	4	5.3	5	6.6	4	5.3	12	15.8	26
19	3	3.9	8	10.5	6	7.9	17	22.4	14	18.4	28
20	3	3.9	2	2.6	9	11.8	20	26.3	17	22.4	25
21	2	2.6	3	3.9	5	6.6	13	17.1	14	18.4	39
22	10	13.2	10	13.2	8	10.5	5	6.6	13	17.1	30
23	17	22.4	3	3.9	2	2.6	2	2.6	7	9.2	45
24	5	6.6	4	5.3	8	10.5	6	7.9	5	6.6	48
25	2	2.6	4	5.3	6	7.9	6	7.9	7	9.2	51
26	5	6.6	8	10.5	4	5.3	13	17.1	19	25	27
27	3	3.9	2	2.6	3	3.9	5	6.6	7	9.2	56
28	0	0	0	0	3	3.9	6	7.9	12	15.8	55
29	1	1.3	5	6.6	6	7.9	6	7.9	18	23.7	40
30	8	10.5	4	5.3	6	7.9	7	9.2	11	14.5	40
31	22	28.9	2	2.6	7	9.2	14	18.4	11	14.5	20
32	22	28.9	4	5.3	7	9.2	12	15.8	9	11.8	22
33	3	3.9	2	2.6	2	2.6	8	10.5	7	9.2	54
34	0	0	1	1.3	2	2.6	8	10.5	7	9.2	58
35	0	0	2	2.6	5	6.6	11	14.5	9	11.8	49
36	1	1.3	5	6.6	2	2.6	8	10.5	10	13.2	50
37	3	3.9	5	6.6	0	0	4	5.3	8	10.5	56

Table 2 (continued)

Level of adherence score	0	20%		40%		60%		80%		100%	
		1	%	2	%	3	%	4	%	5	%
Question/ Statement	number	number	%	number	%	number	%	number	%	number	%
38	0	0	0	3	3.9	9	11.8	15	19.7	49	64.5
39	1	3	1.3	1	3.9	10	13.2	17	22.4	44	57.9
40	6	3	7.9	4	3.9	12	5.3	21	27.6	30	39.5
41	9	4	11.8	5	5.3	11	6.6	10	13.2	37	48.7
42	3	5	3.9	5	6.6	7	9.2	13	17.1	43	56.6
43	4	5	5.3	8	6.6	5	10.5	15	19.7	39	51.3
44	3	4	3.9	7	5.3	10	9.2	11	14.5	41	53.9
45	5	3	6.6	3	3.9	7	9.2	13	17.1	45	59.2
46	5	3	6.6	5	3.9	15	19.7	27	35.5	21	27.6

Only half of the staff were fully aware of the five steps of hand hygiene, highlighting a critical gap in knowledge that must be addressed. Comprehensive training should be provided to dental practitioners and all individuals involved in dental care to ensure adherence to these essential protocols. Mohaghegh et al. emphasized the importance of repeated hand washing with soap and water as an effective measure to prevent the spread of the virus [13]. While Amiri et al. [11] found that dentists' performance during the COVID-19 pandemic was generally satisfactory, our study suggests that dental professionals require additional training on health guidelines specific to pandemic conditions.

Moreover, it is imperative to increase awareness among dental practitioners and all personnel involved in dental care to improve compliance with these protocols. The results indicate that a significant portion of dental staff did not adequately follow COVID-19 prevention protocols, underscoring the urgent need for enhanced education and stricter adherence to safety measures.

In conclusion, the significant role of examining health protocol compliance in dental clinics in reflecting the performance of personnel and staff indicated their knowledge and awareness regarding COVID-19 during the pandemic has been highlighted by previous studies and current research. Our findings are similar to those of Indu et al. [14] Their study included interns and residents, but our study focused on graduates in the dental profession working in dental clinics.

Our findings are consistent with Huynh et al. [15]. In our study, just over two-thirds of clinics adhered to the protocols, and the staff had sufficient knowledge about infection control in COVID-19. Furthermore, Huynh et al. showed that almost three-quarters of healthcare workers took suitable measures to prevent COVID-19, which indicates a correlation between knowledge level and compliance with preventive measures. It is worth noting that in Huynh's study, those who had sufficient knowledge about the disease were 1.24 times more likely to take proper measures. This highlights the importance of training healthcare personnel and dental professionals about adhering to health protocols during the COVID-19 pandemic. Ultimately, better adherence to health guidelines shows a decrease in virus transmission.

One of the key challenges in combating COVID-19 is its higher transmissibility compared to other virus strains, which makes strict adherence to preventive protocols even more crucial to breaking the transmission cycle [16]. By doing so, we aim to improve the quality of management in dental clinics and increase awareness of transmission modes and preventive measures against this highly infectious disease. A previous study on the MERS epidemic [17] demonstrated superior management among dentists in preventing MERS-CoV transmission,

which was closely linked to heightened awareness of transmission modes and effective patient identification. This underscores the importance of a robust management system that enhances the knowledge of dental professionals and staff, leading to better adherence to health protocols and a significant reduction in the transmission cycle.

Social distancing in dental clinics was a critical aspect examined in our checklist, with four questions assessing the proper distancing between patients in waiting and reception areas. Despite the clear importance of maintaining social distancing to disrupt the transmission cycle during the COVID-19 pandemic, our findings reveal that just over one-third of clinics fully adhered to these guidelines. Maintaining social distancing is not just recommended but essential, as emphasized in numerous studies. This necessitates the implementation of an enforceable system to ensure compliance.

Afrahshteh et al. [18] confirmed the critical role of social distancing in their study, which explored its various dimensions and highlighted similar concerns. Their research also found that slightly more than a quarter of clinics offered phone or online appointment scheduling, with patient triage and screening conducted via tele-screening. The lack of options for non-face-to-face appointments can increase the number of in-person visits, reduce social distancing, and ultimately heighten the risk of transmission. Addressing these gaps must be a priority in future strategies to effectively control the spread of infectious diseases.

A study by Yu et al. emphasized the importance of proper ventilation in healthcare settings during the COVID-19 pandemic [19]. In one-third of dental clinics, in our study, strong and appropriate ventilation was present in the entire treatment area, especially in the waiting area and treatment section. Also, observing a one-hour interval between patient appointments for optimal ventilation and disinfection was fully complied with in almost half of the dental clinics examined, highlighting the importance of proper ventilation and creating an enforceable system for these requirements.

Our results also showed that in two-thirds of the dental clinics, staff used isolating goggles or shields to cover their eyes, surroundings, and face. Results of a systematic review by Byambasuren et al. demonstrated that protective shields or goggles usage significantly reduced SARS-CoV-2 infection [20]. Therefore, compliance with clause 27 of the executive guidelines seems promising for shortening the transmission cycle.

In the study by Das et al., the importance of solid waste management during the pandemic based on World Health Organization (WHO) guidelines was emphasized [21]. This issue was also highlighted in our study. The results showed that only in two-thirds of the clinics

examined, the collection and disposal of infectious and sharp waste were entirely compliant with infection control standards, which is not very satisfactory. However, fortunately, contracts for waste management exist in three-quarters of dental clinics.

Furthermore, our study showed that out of 76 dental clinics, seven were specialty-based, and 69 were general. Our findings indicated that all specialty clinics adhered to the guidelines, but ten general clinics did not adhere to the guidelines. The Ministry of Health's law from 2009 regarding the prohibition of naming clinics as "specialty clinics" can justify this difference between the statistics of specialty and general clinics.

Previously, in the article by Huynh et al., the relationship between the level of knowledge and sufficient awareness about COVID-19 and the level of adherence to preventive measures was reported to be significant [15].

Among the 76 clinics studied, 73 were private, and only three were public. Notably, all public clinics and 63 private clinics adhered to the guidelines. The higher adherence observed in public clinics may be attributed to more comprehensive education, stricter enforcement measures, and stronger executive oversight within the government sector, which could explain the disparity in results between public and private clinics. To inform future management decisions, it is crucial to evaluate the adherence levels across all dental clinics.

This study stands out from similar research by utilizing a checklist and inspector evaluations, which adds a layer of rigor to the findings. However, a key limitation was the challenge of coordinating efforts between the faculty, the university, and the treatment deputy. We recommend that the deputy of health reconsiders the scoring method, replacing numerical ratings with a 5-point Likert scale ranging from poor to excellent. This would simplify the interpretation of data and provide a clearer understanding of clinic conditions. To improve decision-making, similar studies should be conducted in other cities, with results analyzed and compared at a macro level. Additionally, frequent inspections and the referral of non-compliant clinics to authorities could significantly reduce COVID-19 transmission.

Conclusion

Over 80% of dental clinics demonstrated an acceptable adherence to the COVID-19 infection control protocols. Following these guidelines is not just recommended but a fundamental responsibility of dental clinics. This study highlights the generally good compliance with the 'Guideline for Providing Dental Services During the COVID-19 Pandemic' in Karaj's dental clinics, reflecting the relatively solid performance of dentists and staff in these centers.

However, given the high transmissibility of COVID-19, particularly with its mutated strains, it is crucial to further enhance adherence across all dental clinics. Increasing compliance, coupled with frequent inspections and the referral of non-compliant clinics to judicial authorities, could play a critical role in reducing disease transmission during pandemics.

To maintain high standards, dental professionals must stay updated on COVID-19 protection protocols, aligning their practices with the latest standards and treatment guidelines. Since saliva and droplets are primary sources of infection, it is imperative that dentists strictly follow essential protocols to control droplet and aerosol contamination within dental practices.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12903-024-05094-9>.

Supplementary Material 1

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Author contributions

ZM and HM conception and design of the study, literature search, data analysis, drafting and revising the manuscript; NP and ME literature search, data collection, and manuscript drafting. All authors reviewed the results and approved the final version of the manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethical approval and consent to participate

Participants were informed about the purpose of the study and assured they would receive routine care. They were ensured the privacy and confidentiality of information were reserved. The study protocol was approved by the Ethics Committee of Alborz University of Medical Sciences based on written informed consent (code: IR.ABZUMS.REC.1400.230). All methods used in this study have been performed following the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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