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COVID-19 Risk Management in Dental Offices: A Review Article

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Abstract

BACKGROUND: As all the dental staff, including nurses and practitioners, are exposed to various routes of contamination due to the novel COVID-19 virus, which is still unknown to the scientific world, developing strategies to reduce the risk of transmission and decontaminate surfaces in a dental office would be of high importance. Although there is still insufficient data on managing this virus in dental offices, several studies have suggested protocols for improving care.

AIM: This study aimed to review present investigations and reach a conclusion on what we know and need to know to combat this virus.

MATERIALS AND METHODS: In this review, Scopus, PubMed, and MEDLINE databases were searched using the keywords "COVID-19," "SARS-CoV-2," "Medical Disinfectants," "Personal Protective Equipment's," and "Surface Decontamination." Articles were reviewed, and finally, relevant articles published during 2000–2022 were included in the final paper.

RESULTS: The present research concluded that using a combination of the face shield and N95 masks protected the eyes, nose, and mouth. To have more efficient protection, water-resistant long-sleeved gowns and gloves were highly suggested. To overcome aerosols, high-performance air filters and ultraviolet were found quite effective. Allowing the patient to use antiseptic mouthwash before starting the treatment could reduce oral microorganisms and the following airborne contamination.

CONCLUSION: This review has gathered all available data regarding dentistry and COVID-19 in order to conclude what has been achieved yet in the prevention of this virus through dental offices; however, more investigations are needed to have a definitive protocol against the virus.

Introduction

The novel coronavirus COVID-19 was first announced in Wuhan, China, in December 2019, and reported as a pandemic by the World Health Organization (WHO) on March 2020 [1], [2]. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes COVID-19 [3]. COVID-19 is known to be the seventh member of the coronavirus category. SARS-CoV and MERS-CoV are also other types of coronaviruses that can infect humans, leading to severe respiratory illness [4]. Coronaviruses are members of the Coronaviridae family in the order Nidovirales. Alphacoronavirus, Betacoronavirus, Gammacoronavirus, and Deltacoronaviruses belong to the Coronaviridae category [5]. They are enveloped, single-stranded, and positive-stranded RNA viruses [6]. Coronaviruses can target various parts of the body, leading to respiratory, enteric, and systemic disease, as well as common cold or pneumonia [7]. COVID-19 outbreak has affected many people globally, especially healthcare workers [8]. Accordingly, 5,297,518 deaths have been reported out of its 268,159,384 confirmed cases until December 2021 worldwide [2]. Respiratory droplets, aerosol particles containing the virus, and exposure to contaminated saliva have been known as the most frequent transmission modes of COVID-19; further, asymptomatic individuals can carry the infection [9]. COVID-19 respiratory symptoms initially appears similar to the common cold and, if untreated, may progress to pneumonia which is life-threatening [10]. Overall, cough, fever, and fatigue have been reported as the most common early symptoms of the disease; the majority of patients may also experience anosmia and ageusia [1]. Dental professionals are heavily exposed to blood, saliva, and aerosols produced from a variety of dental procedures [8]. Due to the difficult and almost infeasible disinfection of dental instruments, such as turbine and saliva ejector, and close contact with patients, infection prevention and control in dentistry could become more of a concern [11], [12].

The ongoing solution for the prevention of COVID-19 spread is to upgrade personal protective equipment and airborne isolation; however, none of the available methods contains devices for reducing aerosol dispersion [13]. Accordingly, various recommendations and protocols have been provided to reopen dental offices, although some are not realistic [1]. These protocols first recommended the cessation of unnecessary dental procedures and

therapeutic measurements, except in an emergency. At the moment, oral health-care professionals face a major challenge as they strive to deal with a huge volume of scientific data to continue their practice promoting oral population health while protecting dental office workers, assistants, and patients from the risks of infection with SARS-CoV-2 [14]. Therefore, this study aims to evaluate the current recommendations and protocols developed to reduce coronavirus cross-contamination in dental offices and prevent transmission of infection among dental professionals.

Materials and Methods

Based on the institutional regulations, this research was granted an exemption regarding approval since it was a literature review. A comprehensive search of the Scopus, PubMed, and MEDLINE databases was performed. All relevant articles published during 2000–2022 were obtained using the keywords "COVID-19," "SARS-CoV-2," "Disinfectants," "Personal Protective Equipments," and "Surface Decontamination." Afterward, articles were reviewed by titles and abstracts. The papers that were less relevant to the subject of study were excluded from the study. The remaining full-text articles were evaluated, and those unrelated to the subject were removed. The filtered papers were further analyzed by the team of authors, and this review was structured.

Literature Review

Methods to reduce surface contamination

Disinfectants

Contaminated objects can transfer infection microorganisms [15]; however, there is no compelling evidence to show coronavirus's transformation from surface to hands [16]. All disinfectants have been active against SARS-coronavirus disregarding the type of organic load [17]. Coronaviruses can be inactive in the face of alcohol-based or sodium hypochlorite due to their disinfectant feature, so not only the chair but also all surfaces contacted with aerosol should be sprayed [18]. The 0.1% concentration of sodium hypochlorite sprayed for about 1 min has been illustrated to be effective on coronavirus in large surfaces, while for small areas, ethanol 70% have shown similar efficacy [16]. In addition, UV is counted as a method to deactivate coronavirus; as UV dose increases, the more viral reduction is witnessed [19]. It has been shown that 30% humidity at the room temperature had a better effect on the virus than 50% [20]. Hydrogen peroxide (0.5%, HP) and hypochlorite-oriented (0.1%, HC) disinfectants (common biocides) are suggested by the WHO for reducing coronavirus dissemination in clinics. These disinfectants are toxic to fish and aquatic non-target organisms [21]. Ethanol (70–95%) or isopropanol (50−100%) are recommended as disinfectants that could inactivate SARS-CoV-2 [22]. Although hydrogen peroxide, 0.5%, could be exclusive by heat, it can inactivate SARS-CoV-2 [16].

Rabenau *et al*. conducted experiments on eight different disinfectants for their activity against SARS-coronavirus and selected four handrubs to test at 30 s (Sterillium based on 30% n-propanol, 45% isopropanol, and 0.2% mecetroniumetilsulfate; SterilliumRub based on 80% ethanol; Sterillium Virugard based on 95% ethanol; and SterilliumGel based on 85% ethanol). Three surface disinfectants were scrutinized at 0.5% for 30 and 60 min (Kohrsolin FF based on benzalkonium chloride, Mikrobac forte based on lauryl amine and benzalkonium chloride; glutaraldehyde and didecyldimonium chloride; DismozonPur based on magnesium monoperphthalate). Further, an instrument disinfectant was assessed at 4%, 3%, and 2% for 15, 30, and 60 min, respectively (Korsolex basic based on glutaraldehyde and (ethylenedioxy) dimethanol). Furthermore, 10% fetal calf serum, 0.3% albumin, and 0.3% albumin + 0.3% sheep erythrocytes were used on three types of organic load. Tests showed that different types of organic load could be inactivated with many commonly used disinfectants [17]. Subpiramaniyam *et al*. investigated the toxicity of HP and HC on the environment and concluded that both have toxicity against the reproduction and growth of non-target organisms [21].

Personal protective equipment (PPE)

Some devices should be implemented in the immediate environments to protect them from droplets and aerosol spread; thus, devices such as helmets, gloves, face shields, safety glasses, respirators, and plastic shoes are designed to decrease the rate of injury and infection or disease [23], [24]. Our knowledge about COVID-19 is insufficient; however, it is shown that the available control recommendations can decrease infection in dental clinics [25]. Estrich *et al*. asked licensed US dentists to participate in a web-based survey (in private and public dental offices). They concluded low levels of COVID-19 outbreak and a positive test in US dentists, illustrating that the available infection management recommendations can prevent infection in dental offices [25].

Surgical masks and N95/PFF2 respirator masks

A surgical mask makes a loose physical fit in the face, thus unable to provide suitable protection

against contaminations and germs [15], [26], [27]. It can protect people from large particle splashes and sprays [15]. Furthermore, some evidence shows that it could defend against viral respiratory infection in health-care personnel during non-aerosol-generating care [28]. No clinical trial has been found on comparing the effectiveness of N95 respirators and surgical masks in preventing COVID-19 in healthcare workers. Two meta-analyses reached the similar conclusion: Surgical masks and N95 respirators provide the same protection against respiratory viral infection in healthcare workers while providing non-aerosol-generating care [29]. The Centers for Disease Control and Prevention (CDC) introduces N95 or equivalent as well-fitting mask in all health-care personnel with a higher risk for transmission; it should be changed after treating patients with droplet precautions (CDC Updates COVID-19 Infection Prevention and Control Guidance). N95 is recommended as safety protective agent in providing protection against procedures which generates aerosol in [28]. It is deemed one strategy to decrease the susceptibility to COVID-19 in medical staff [30]. Radonovich *et al*. investigated 137 outpatient healthcare sites at seven US medical centers. They reported that between outpatient healthcare workers, N95 respirators versus medical masks as used by the subjects, there were no significant differences in the incidence of influenza [31].

Face shield

Face shield is one of the protective devices that could protect the eye, nose, and mouth from fluid and spray. This PPE could not protect adequately without other protective equipment [32]. The major aim of the change in face shield is to develop the design to make it more sufficient and appropriate for use in the current pandemic [33]. Physical barriers could decrease the amount of exposure to the COVID-19 virus, such as glass or plastic windows. There is not enough investigation on face shields, thus requiring more effort.

Gloves and gown

In dental offices, during aerosol-generating procedures, long-sleeved water-resistant gowns and gloves can be used for contact precaution; additional application of aprons can be recommended when gowns are not resistant to fluids [23]. Using gloves and long-sleeved gowns resistant to water while carrying for COVID-19 patients is suggested by CDC, WHO, and ECDC [34]. The WHO specified situations in which gowns are needed. Based on the WHO, all gowns or equivalents are acceptable during dental procedures [35]. The designs of isolation and surgical gowns are according to the location used (critical zones) and the amount of liquid contact [34]. Regarding isolation gowns, the whole apparel has direct contact with blood, fluids, or pathogens, and the whole gown with its seams should obtain barrier performance. The surgical gown's lower sleeves and front panels should reach barrier performance [36].

Mouth wash

Mouth wash is considered an agent which helps reduce microorganisms in the oral cavity. Dental procedures lead to the dissemination of microorganisms in the aerosol in the dental office. Some research showed mouth wash rinse such as chlorhexidine, essential oils, cetylpyridinium chloride, and herbal products to reduce the microorganisms in dental office aerosol [37], [38], [39], [40], [41], [42], [43], [44], [45], [46], [47], [48]. Commercially available mouthwashes, such as 0.05% cetylpyridinium chloride CPC utilized as a pre-procedural mouth rinse, were equally beneficial, as CHX, to lower the incidence of bacteria produced during the ultrasonic scaling [39], [40], [44], [49], [50], [51], [52]. The decline in viable bacteria was observed in oral aerosol after dental prophylaxis with ultrasonic when CPC + Zn + F was used as a mouth wash [46], [47], [48], [47], [50], [51], [53]. Introducing the mouthwashes is an effective way to deal with SARS-CoV-2 before clinical practice is open to dispute [54]. Feres *et al*. randomly enrolled 60 subjects using oral prophylaxis with an ultrasonic scaler. They concluded that CPC and CHX had the same effectiveness in decreasing the amount of spatter bacteria and were better compared to no rinsing and water ($p < .05$, Kruskal–Wallis test). The spatter composition related to the control groups illustrated higher figures ($p < 0.05$, Kruskal–Wallis test) of Fusobacterium species and lower ratios of Capnocytophaga species compared to that related to the CHX and CPC groups [49]. Retamal-Valdes *et al*. scrutinized sixty systemically healthy volunteers receiving dental prophylaxis: (a) Rinsing with 0.28% Zn, 0.075% CPC, and 0.05% F (CPC + Zn + F), (b) water, and (c) 0.12% chlorhexidine digluconate (CHX), or (d) no rinsing. They collected active bacteria from various locations in the dental office on enriched TSA plates, followed by incubation anaerobically for 72 h. They concluded that the total number of colony-forming units (CFUs) of the aerosols related to those rinsed with CHX or CPC + Zn + F was markedly ($p < 0.05$) lower compared to cases not rinsed or used water [53].

Methods to Reduce the Risk of COVID-19 Transmission

Patient triage

As the risk of contributing to the spread of the virus is high during the outbreak, dental care should be provided just for emergencies [55]. Under ADA, an

emergency treatment consists of treating the causes of the urgency while alleviating the patient's discomfort, such as uncontrolled bleeding, cellulitis with swelling and airway involvement, and facial trauma with possible airway involvement. Severe dental pain and conditions, including pericoronitis of third molars/surgical extractive osteitis, should be considered urgent [56]. Most dental prosthetic, restorative, and periodontal procedures are regarded as elective because of scheduling in advance [57]; thus, the initial triage and screening are needed to begin through telephone for making an appointment. Those with urgent conditions such as swelling, pain, trauma, or infection are needed to be asked about [58]:

- Experience of respiratory symptoms, including fever, cough, heavily breathing, and anosmia;
- Travel to regions where the incidence of COVID-19 was high in the past 30 days;
- Contact with cases diagnosed or suspected with COVID-19 infection.

In case of confirming any of the above mentioned, they should not take dental procedures due to the risks of contaminating staff and other patients. Pharmacological therapy using antibiotics and analgesics should be considered for them, and they should refer to their physician for the assessment of general health [59]. When the dental procedure cannot be postponed, and immediate treatment (e.g., dentoalveolar trauma or progressive infection) is required, several measures should be taken to prevent the infection spread [60], [61]:

- The dentist is needed to ensure the infected or suspected COVID-19 patient arrives in a waiting room with no patient.
- When the patient arrives, his/her body temperature should be measured by a non-contact forehead thermometer.
- The patients should sit in a well-ventilated room in a dental chair isolated from others. It is better not to treat infected patients in routine dental offices but in Airborne Infection Isolation Rooms (AIIRs) designated for isolating airborne pathogens to a safe containment area through causing negative differential pressure.
- Dental staff should do safe work practices and use disposable personal protective equipment.

Dentists are encouraged to conduct only emergency measures during the pandemic [57], [59], [61], [62], [63], [64]. Teleconsultation through a video call is useful to share health information, including photographs and radiographs, to assess the patient's condition or offer virtual health services [65]. According to Wang *et al*., in cases of periapical periodontitis, acute pulpitis, orofacial/dental trauma and infection, or other dental emergencies, guardians, and patients should use proper personal protection to visit dental clinics [66]. In Turkey, among many multi-unit centers, only well-equipped clinics were kept open to prevent contamination and the development of nosocomial infections [63]. The patient unit processing times should be shortened, and the risk of infection transmission should be minimized by keeping the appointment intervals longer [63]. They also recommended that patient care protocols to date should be revised. In Munich, all dental measures were provided for patients with the dental emergency [61]. Meng *et al*. reported treatment of over 700 patients during quarantine due to COVID-19 and the lockdown of the school and hospital of stomatology at Wuhan University, Wuhan, the primary transmission center. Emergency dental treatments, such as dental extraction and pulpectomy, were described; however, no data were reported regarding the type of performed dental emergencies. Furthermore, 1600 online consultations were done. No information was reported about the treatment of COVID-19 patients [67]. In Italy, elective procedures were suspended and limited to only emergencies. Thus, the need to be able to follow the children's oral health status merely by proper remote interaction with their parents [68].

Meng *et al*. suggested suspending dental treatments for up to 14 days following the exposure in patients with no symptoms and a history of contact with infected cases and/or travel to an at-risk area, hence recommending self-quarantine [67]. Ahmadi *et al*. reported that 70% of dentists refrained from performing non-emergency tasks, and strict triage should be performed [69]. Kılıçarslan *et al*. remarked that emergency measures should be implemented during the COVID-19 pandemic [63]. Almulhim *et al*. announced that according to a cross-sectional questionnaire-based study, majority of the dental undergraduates were willing to handle only emergency cases [70]. Two studies provided some recommendations to manage dental emergencies. They concluded the effectiveness of using ibuprofen (600 mg) with paracetamol (500) for symptomatic apical periodontitis and irreversible pulpitis, as well as acute apical abscess [71], [72]. Araújo *et al*. declared that physical distancing and telephone triage are the two measures extensively followed by professionals, leading to low COVID-19 transmission in dental settings [73]. Therefore, performing triage for investigating present health status and/or the existence of risk factors for the development of COVID-19 is highly recommended in visiting patients [55], [67], [74].

Reduction in aerosols

Aerosols can be regarded as a major route to transmit pathogens, such as SARS-CoV-2; hence, strict infection management measures are imperative [55], [75], [76]. A true droplet nucleus or aerosol can remain for 30 min in the surgical environment air following the procedure [77]. Hence, if the operator removes a face mask, there is a potential for being exposed to air-contaminated material. Furthermore, an airborne contaminant can enter the ventilation system

and spread to regions with no barrier protection [75]. The most ubiquitous measures for eliminating airborne contaminants related to the treatment room are using high-efficiency particulate air filters and ultraviolet chambers in the ventilation system [16], [75]. The installation of high-performance air filters, as well as following stringent protocols of periodic cleaning of the air conditioning system, is recommended [78].

The New Zealand Dental Association, together with other associations, recommended the use of such equipment as much as possible, as well as hand instrumentation and low-speed handpieces with no water spray, to remove dental aerosols [79]. There is a high biologic risk of COVID-19 inhalation transmission while performing dental procedures because of using handpieces under irrigation, leading to diffusion of aerosol particles of blood, secretions, and saliva. Furthermore, the generation of aerosol can alleviate the contamination of the instruments, environmental surfaces, and dental apparatuses [55], [67]. Rubber dam application is used for aerosol-producing procedures since airborne particles are declined by 70% [80]. Thus, a rubber dam is recommended for endodontics and almost all aerosol-producing dental procedures [56], [59], [49], [81]. Using rubber dam isolation and high volume of saliva ejectors while performing aerosol-generating procedures are recommended [80], [81]. Souza *et al*. recommended reducing airborne contamination: (a) Using a rubber dam when the procedure allows, in case of no possible isolation, giving preference to hand instruments and extractors (such as hoes, curettes, sickles, chisels, and periodontal files), instead of ultrasonic apparatus, to minimize the production of aerosols, (b) using high-powered dental suckers, four-handed work encouraged for the control of dissemination, (c) not using a triple syringe in spray form, activated by pressing the two buttons at the same time, adjusting the cooling water outlet, and (d) pre-cleaning and washing patients' mouths by mechanical means and antiseptic [24]. Peng *et al*. declared the risk of the dental procedures, particularly when ultrasonic and handpieces devices are used [55]. Kılıçarslan *et al*. remarked that in Turkey, the utmost attention should be paid to open clinics' ventilation and surface disinfection [63]. According to Xu *et al*., in some cases with asymptomatic COVID-19, the virus can reside in the salivary gland; thus, all patients must be considered carriers, and aerosol generation must be decreased for all patients [82]. Peditto *et al*. suggested closing the work environment during the treatment, while we proposed implementing ventilation and air filtration systems in operating rooms appropriate for the health activity [57]. Teichert-Filho *et al*. described a novel protective device to decrease aerosol dispersion in dental settings during the pandemic of COVID-19. The device provides a low-cost complementary resource for conjunction with standard PPE to prevent the transmission of SARS-CoV-2 in dental clinics. More clinical trials are needed to test the effectiveness of this device in reducing aerosol dispersion, the consequent vector of contamination, and also the ergonomic effects associated [13].

Extraoral radiograph

Extraoral radiography, like panoramic radiography or cone-beam computed tomography (CT), is more effective than intraoral techniques in decreasing the saliva generation and gag reflex [55], [67], [83], [84], [85]. Nonetheless, in the case of obligatory intraoral radiograph, more precautions are suggested, such as using double barriers for preventing cross-contamination through perforated attire [86]. Meng *et al*. recommend that intraoral X-ray should be limited owing to the stimulation of saliva generation while proposing extraoral dental tests, including cone-beam CT or panoramic radiography [67]. Table 1 summarizes measures to prevent COVID-19, published by various organizations.

Table 1: Summary of preventive measures published by various organizations

Dental Intervention	Preventive Measures
Management of dental care	Postponing elective treatment[a,b,c,d]
	Providing urgent, emergency treatment merely[a,b,c,d]
Primary dental care triage	Screening patients through telecommunication technology[a,b,c,d]
PPE	Consultations in triage room[a,b,c,d]
	N95 or equivalent (particularly in aerosol producing procedures)[a, c, d]
	Surgical masks[b]
	Gowns[a,b,c,d]
	Protective eyewear[a,b,c,d]
	Appropriate gloves[a,b,c,d]
	Disposable working cap[a,b,c,d]
	Impermeable shoe covers[a,b,c,d]
Radiographs	Double barrier for intra-oral sensor or films if intra-oral radiograph is needed[e]
	Not taking intra-oral radiograph[a,b,c,d]
	Preoperative mouth rinse
	1% Hydrogen peroxide[a,b,c,d]
	0.2% Chlorhexidine[c]
	2% Listerine[c]
	0.2% Povidone-iodine[a,b,c,d]
Rubber dam	Used as appropriate, particularly in aerosol-generating procedures[a,b,c,d]
	Type of instruments and material
	Not using ultrasonic and using hand instruments[a,b,c,d]
	Not using three-way syringes if possible[a,b,c,d]
	High volume suction[a,b,c,d]
	Not using high-speed handpiece if possible[a,b,c,d]

[a]As per the guidelines published by American Dental Association [56], [b]Scottish Dental Clinical Effectiveness Programme [91], [c]New Zealand Dental Association [93], [d]International Federation of Endodontic Association-Indian Endodontic Society joint statement [81], [e]American Association of Endodontics [56]. PPE: Personal protective equipment.

Discussion

COVID-19 was initiated as a zoonotic infection, and transferred from human to human. SARS-CoV-2 can use angiotensin-converting enzyme- 2 (ACE-2) available in the lower respiratory tract and acts as SARS-CoV-2 entry receptor. COVID-19 can be transmitted by Flugge microdroplets because of direct proximity (being exposed for over 15 min and a distance < 2 m) as well as core droplets remaining suspended in aerosol

through sneezing or coughing by patient and probable transmission by fomites [84], [87]. Doctors and patients are at significant risks. Similar to SARS-CoV-1, the SARS CoV-2 is transmitted mostly through droplets and aerosol. It persists in aerosol for a maximum of 3 h with a long half-life of about 1.1 to 1.2 h [77]. In dentistry, the intense generation and persistence of aerosols while doing dental procedures can make dentists exposed to the risk of inhalation of small droplets and particles, which carry microorganisms, like viruses and bacteria [88]. Therefore, the patients' health should be protected by the establishment of a protocol for contagion risk reduction. It is important to work in a safer place and protect dentists form the virus. As a dental practitioner, we should assess each patient regarding their current health status and/or possible contact with suspected cases to prevent cross-infection. Three studies have introduced a triage in the clinical and preclinical setting, where the patient was assessed for fever and received a questionnaire [55], [67], [74]. Because SARS-CoV-2 can survive on various surfaces for a long time, special alterations to the setup and design of waiting area should limit cross-contamination [77]. As discussed, virus transmission is done by inhalation and infectious droplets that contaminate the eyes' conjunctival epithelium [89]. Thus, PPE must be worn, for providing an efficient and effective barrier to deal with the hazards of aerosols from the operative site.

Pre-operative setting should also be considered. Hand washing and proper clothing by clinicians and washing mouth by the patient can decrease the risk. Hand hygiene is very important to decrease the transmission of SARS-CoV-2. Lotfinejad *et al*. reported the effectiveness of solutions made by alcohol on inactivated enveloped viruses, such as coronaviruses, and suggested using solutions made by at least 60% ethanol for washing hands [90]. Using antimicrobial mouth rinse before surgery decreases the microbial count in mouth and aerosols produced in dental procedures [59]. Therefore, the New Zealand Dental Association (NZDA) suggests, 0.2% chlorhexidine (CHX), 1% hydrogen peroxide2% Listerine, or 2% povidone-iodine for 30 s before procedures [79]. On the contrary, National Health Commission of the People's Republic of China and the Indian Endodontic Society (IES) reported the poor effectiveness of 0.2% CHX to combat SARS-COV-2, leading to the recommendation of 1% hydrogen peroxide or 0.2% povidone-iodine [81], [91]. American Association of Endodontics suggests the use of a pre-procedural mouth rinse with 0.2% povidone-iodine [59]. The iodine and hydrogen peroxide have been the commonest mouth rinses.

Due to the relatively high load of virus in human saliva, using only a pre-procedural mouth rinse is not able to limit this hazard. Therefore, using other measures, like a dental rubber dam, is important [92]. For example, rubber dam isolation reduced airborne particles by 70%, in an operational field of three foots in diameter [55], [80]. The practice of dentistry involves using rotary surgical/dental instruments, creating a high volume of aerosols containing blood, water, microorganism's saliva, and other debris. The NZDA and other associations have recommended reducing the use of such equipment if possible, and highlighted using hand instrumentation, and also low-speed handpiece with water spray for obviating dental aerosols. In case the use of aerosol generating equipment is inevitable, using high volume saliva ejectors is suggested along with the other precautions described [59], [79]. Furthermore, a hand piece with an anti-retraction valve or other anti-reflux design can be used during the pandemic and post-pandemic era [55]. Using disposable instruments if possible has also been recommended.

Conclusion

According to the present study, although providing an ideal safe environment may be difficult, various methods and protocols developed have been proven effective. Many studies have revealed that using face shields combined with other equipment such as N95 masks could protect the eye, nose, and mouth of the practitioner. Using long-sleeved gowns resistant to water and gloves are suggested for more effective protection. High-performance air filters and ultraviolet chambers in the ventilation system have been found highly productive for eliminating aerosols. It is also suggested that bringing mouthwash into play before clinical practice can lessen the oral cavity microorganisms, reducing contaminated airborne. Ultimately, the information about precautions and protocols to prevent COVID-19 cross contamination is not definite, thus requiring more investigation.

References

1. Banakar M, Lankarani KB, Jafarpour D, Moayedi S, Banakar MH, MohammadSadeghi A. COVID-19 transmission risk and protective protocols in dentistry: A systematic review. BMC Oral Health. 2020;20(1):275. https://doi.org/10.1186/s12903-020-01270-9
2. Melo P, Barbosa JM, Jardim L, Carrilho E, Portugal J. COVID-19 management in clinical dental care. Part I: Epidemiology, public health implications, and risk assessment. Int Dent J. 2021;71(3):251-62. https://doi.org/10.1016/j.identj.2021.01.015 PMid:33879353
3. Sa Y, Lin WS, Morton D, Huang C. Coronavirus disease 2019 (COVID-19): Experiences and protocols from the Department of Prosthodontics at the Wuhan University. J Prosthet Dent. 2021;126(1):41-50. https://doi.org/10.1016/j.prosdent.2020.06.004

PMid:32778470

4. Ashtiani RE, Tehrani S, Revilla-Leon M, Zandinejad A. Reducing the risk of COVID-19 transmission in dental offices: A review. J Prosthodont. 2020;29(9):739-45. https://doi.org/10.1111/jopr.13261
PMid:32935425
5. Li F. Structure, function, and evolution of coronavirus spike proteins. Annu Rev Virol. 2016;3(1):237-61. https://doi.org/10.1146/annurev-virology-110615-042301
PMid:27578435
6. Weiss SR, Navas-Martin S. Coronavirus pathogenesis and the emerging pathogen severe acute respiratory syndrome coronavirus. Microbiol Mol Biol Rev. 2005;69(4):635-64. https://doi.org/10.1128/MMBR.69.4.635-664.2005
PMid:16339739
7. Hasoksuz M, Kilic S, Sarac F. Coronaviruses and SARS-COV-2. Turk J Med Sci. 2020;50(SI-1):549-56. https://doi.org/10.3906/sag-2004-127
PMid:32293832
8. Induri SN, Chun YC, Chun JC, Fleisher KE, Glickman RS, Xu F, *et al*. Protective measures against COVID-19: Dental practice and infection control. Healthcare (Basel). 2021;9(6):679. https://doi.org/10.3390/healthcare9060679
PMid:34200036
9. Jamal M, Shah M, Almarzooqi SH, Aber H, Khawaja S, El Abed R, *et al*. Overview of transnational recommendations for COVID-19 transmission control in dental care settings. Oral Dis. 2021;27(Suppl 3):655-64. https://doi.org/10.1111/odi.13431
PMid:32428372
10. Mascarenhas RE, Pralhad S, Manaktala N. Pan-dent-emic: Safety considerations for dental surgery in the era of COVID-19. Patient Saf Surg. 2021;15(1):16. https://doi.org/10.1186/s13037-021-00289-3
PMid:33845838
11. Deana NF, Seiffert A, Aravena-Rivas Y, Alonso-Coello P, Munoz-Millan P, Espinoza-Espinoza G, *et al*. Recommendations for safe dental care: A systematic review of clinical practice guidelines in the first year of the COVID-19 pandemic. Int J Environ Res Public Health. 2021;18(19):10059. https://doi.org/10.3390/ijerph181910059
PMid:34639363
12. Li L, Zeng M, Chen X, Cai S, Xu C, Xia W, *et al*. Optimizing safe dental practice during the COVID-19 pandemic: Recommendations based on a guide developed for dental practices in China. Front Med (Lausanne). 2021;8:619357. https://doi.org/10.3389/fmed.2021.619357
PMid:34124084
13. Teichert-Filho R, Baldasso CN, Campos MM, Gomes MS. Protective device to reduce aerosol dispersion in dental clinics during the COVID-19 pandemic. Int Endod J. 2020;53(11):1588-97. https://doi.org/10.1111/iej.13373
PMid:32735690
14. Santana MA, Velazquez FA, Valencia C, Zumaran A, Alonso NV, Rider R, *et al*. Saliva: What dental practitioners should know about the role of this biofluid in the transmission and diagnostic of SARS-CoV-2. Medicina (Kaunas). 2021;57(4):349. https://doi.org/10.3390/medicina57040349
PMid:33917276
15. Harte JA. Standard and transmission-based precautions: An update for dentistry. J Am Dent Assoc. 2010;141(5):572-81. https://doi.org/10.14219/jada.archive.2010.0232
PMid:20436107
16. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect. 2020;104(3):246-51. https://doi.org/10.1016/j.jhin.2020.01.022
PMid:32035997
17. Rabenau HF, Kampf G, Cinatl J, Doerr HW. Efficacy of various disinfectants against SARS coronavirus. J Hosp Infect. 2005;61(2):107-11. https://doi.org/10.1016/j.jhin.2004.12.023
PMid:15923059
18. Careddu R, Ciaschetti M, Creavin G, Molina F, Plotino G. COVID-19 and dental practice: Overview and protocols during pandemic. G Ital Endod. 2020;34(1):13-9. https://doi.org/10.32067/GIE.2020.34.01.08
19. Tseng CC, Li CS. Inactivation of viruses on surfaces by ultraviolet germicidal irradiation. J Occup Environ Hyg. 2007;4(6):400-5. https://doi.org/10.1080/15459620701329012
PMid:17474029
20. Ijaz MK, Brunner AH, Sattar SA, Nair RC, Johnson-Lussenburg CM. Survival characteristics of airborne human coronavirus 229E. J Gen Virol. 1985;66(Pt 12):2743-8. https://doi.org/10.1099/0022-1317-66-12-2743
PMid:2999318
21. Subpiramaniyam S. Outdoor disinfectant sprays for the prevention of COVID-19: Are they safe for the environment? Sci Total Environ. 2021;759:144289. https://doi.org/10.1016/j.scitotenv.2020.144289
PMid:33321443
22. Cimolai N. Environmental and decontamination issues for human coronaviruses and their potential surrogates. J Med Virol. 2020;92(11):2498-510. https://doi.org/10.1002/jmv.26170
PMid:32530505
23. World Health Organization. Rational Use of Personal Protective Equipment for COVID-19 and Considerations during Severe Shortages: Interim Guidance. Geneva: World Health Organization; 2020.
24. Souza AF, de Arruda JA, Costa FP, Bemquerer LM, Castro WH, Campos FE, *et al*. Safety protocols for dental care during the COVID-19 pandemic: The experience of a Brazilian hospital service. Braz Oral Res. 2021;35:e070. https://doi.org/10.1590/1807-3107bor-2021.vol35.0070
PMid:34076066
25. Estrich CG, Mikkelsen M, Morrissey R, Geisinger ML, Ioannidou E, Vujicic M, *et al*. Estimating COVID-19 prevalence and infection control practices among US dentists. J Am Dent Assoc. 2020;151(11):815-24. https://doi.org/10.1016/j.adaj.2020.09.005
PMid:33071007
26. Food and Drug Administration. N95 Respirators and Surgical Masks (Face Masks). United States: US Food and Drug Administration (FDA); 2020. Available from: https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/n95-respirators-surgical-masks-face-masks-and-barrier-face-coverings
27. Bien EA, Gillespie GL, Betcher CA, Thrasher TL, Mingerink DR. Respiratory protection toolkit: Providing guidance without changing requirements-can we make an impact? Workplace Health Saf. 2016;64(12):596-602. https//:doi.org/10.1177/2165079916657831
PMid:27439880
28. Bartoszko JJ, Farooqi MA, Alhazzani W, Loeb M. Medical masks vs N95 respirators for preventing COVID-19 in healthcare workers: A systematic review and meta-analysis of randomized trials. Influenza Other Respir Viruses. 2020;14(4):365-73. https://doi.org/10.1111/irv.12745
PMid:32246890
29. Long Y, Hu T, Liu L, Chen R, Guo Q, Yang L, *et al*. Effectiveness of N95 respirators versus surgical masks against influenza:

A systematic review and meta-analysis. J Evid Based Med. 2020;13(2):93-101. https://doi.org/10.1111/jebm.12381
PMid:32167245

30. Wang X, Pan Z, Cheng Z. Association between 2019-nCoV transmission and N95 respirator use. J Hosp Infect. 2020;105(1):104-5. https://doi.org/10.1016/j.jhin.2020.02.021
PMid:32142885
31. Radonovich LJ, Jr., Simberkoff MS, Bessesen MT, Brown AC, Cummings DA, Gaydos CA, *et al*. N95 respirators vs medical masks for preventing influenza among health care personnel: A randomized clinical trial. JAMA. 2019;322(9):824-33. https://doi.org/10.1001/jama.2019.11645
PMid:31479137
32. Roberge RJ. Face shields for infection control: A review. J Occup Environ Hyg. 2016;13(4):235-42. https://doi.org/10.1080/15459624.2015.1095302
PMid:26558413
33. Celik HK, Kose O, Ulmeanu ME, Rennie AE, Abram TN, Akinci I. Design and additive manufacturing of medical face shield for healthcare workers battling coronavirus (COVID-19). Int J Bioprint. 2020;6(4):286. https://doi.org/10.18063/ijb.v6i4.286
PMid:33088997
34. Park SH. Personal protective equipment for healthcare workers during the COVID-19 pandemic. Infect Chemother. 2020;52(2):165-82. https://doi.org/10.3947/ic.2020.52.2.165
PMid:32618146
35. World Health Organization. COVID-19 v4: Operational Support and Logistics: Disease Commodity Packages. Geneva: World Health Organization; 2020.
36. Association for the Advancement of Medical Instrumentation. Liquid Barrier Performance and Classification of Protective Apparel and Drapes Intended for Use in Health Care Facilities. Virginia, United States: Association for the Advancement of Medical Instrumentation; 2003.
37. Marui VC, Souto ML, Rovai ES, Romito GA, Chambrone L, Pannuti CM. Efficacy of preprocedural mouthrinses in the reduction of microorganisms in aerosol: A systematic review. J Am Dent Assoc. 2019;150(12):1015-26.e1. https://doi.org/10.1016/j.adaj.2019.06.024
PMid:31761015
38. Moghaddam A, Ranjbar R, Yazdanian M, Tahmasebi E, Alam M, Abbasi K, *et al*. The current antimicrobial and antibiofilm activities of synthetic/herbal/biomaterials in dental application. Biomed Res Int. 2022;2022:8856025. https://doi.org/10.1155/2022/8856025
PMid:35958811
39. Motallaei MN, Yazdanian M, Tebyanian H, Tahmasebi E, Alam M, Abbasi K, *et al*. The Current Strategies in Controlling Oral Diseases by Herbal and Chemical Materials. Evid Based Complement Altern Med. 2021;2021:3423001. https://doi.org/10.1155/2021/3423001
40. Mosaddad SA, Beigi K, Doroodizadeh T, Haghnegahdar M, Golfeshan F, Ranjbar R, *et al*. Therapeutic applications of herbal/synthetic/bio-drug in oral cancer: An update. Eur J Pharmacol. 2021;890:173657. https://doi.org/10.1016/j.ejphar.2020.173657
PMid:33096111
41. Moghadam ET, Yazdanian M, Tahmasebi E, Tebyanian H, Ranjbar R, Yazdanian A, *et al*. Current herbal medicine as an alternative treatment in dentistry: *In vitro*, *in vivo* and clinical studies. Eur J Pharmacol. 2020;889:173665. https://doi.org/10.1016/j.ejphar.2020.173665
42. Yazdanian M, Rostamzadeh P, Rahbar M, Alam M, Abbasi K, Tahmasebi E, *et al*. The potential application of green-synthesized metal nanoparticles in dentistry: A comprehensive review. Bioinorg Chem Appl. 2022;2022:2311910. https://doi.org/10.1155/2022/2311910
PMid:35281331
43. Yazdanian M, Rostamzadeh P, Alam M, Abbasi K, Tahmasebi E, Tebyaniyan H, *et al*. Evaluation of antimicrobial and cytotoxic effects of *Echinacea* and *Arctium* extracts and *Zataria* essential oil. AMB Express. 2022;12(1):75. https://doi.org/10.1186/s13568-022-01417-7
PMid:35705727
44. Yazdanian M, Motallaei MN, Tahmasebi E, Tebyaniyan H, Alam M, Abbasi K, *et al*. Chemical characterization and cytotoxic/antibacterial effects of nine Iranian propolis extracts on human fibroblast cells and oral bacteria. BioMed Res Int. 2022;2022:6574997. https://doi.org/10.1155/2022/6574997
PMid:35434137
45. Hussain A, Tebyaniyan H, Khayatan D. The role of epigenetic in dental and oral regenerative medicine by different types of dental stem cells: A comprehensive overview. Stem Cells Int. 2022;2022:5304860. https://doi.org/10.1155/2022/5304860
46. Barzegar PE, Ranjbar R, Yazdanian M, Tahmasebi E, Alam M, Abbasi K, *et al*. The current natural/chemical materials and innovative technologies in periodontal diseases therapy and regeneration: A narrative review. Mater Today Commun. 2022;32(2):104099. https://doi.org/10.1016/j.mtcomm.2022.104099
47. Yazdanian M, Rahmani A, Tahmasebi E, Tebyanian H, Yazdanian A, Mosaddad SA. Current and advanced nanomaterials in dentistry as regeneration agents: An update. Mini Rev Med Chem. 2021;21(7):899-918. https://doi.org/10.2174/1389557520666201124143449
PMid:33234102
48. Moghadam ET, Yazdanian M, Alam M, Tebyanian H, Tafazoli A, Tahmasebi E, *et al*. Current natural bioactive materials in bone and tooth regeneration in dentistry: A comprehensive overview. Mater Res Technol. 2021;13:2078-114. https://doi.org/10.1016/j.jmrt.2021.05.089
49. Feres M, Figueiredo LC, Faveri M, Stewart B, de Vizio W. The effectiveness of a preprocedural mouthrinse containing cetylpyridinium chloride in reducing bacteria in the dental office. J Am Dent Assoc. 2010;141(4):415-22. https://doi.org/10.14219/jada.archive.2010.0193
PMid:20354090
50. Hakim LK, Yazdanian M, Alam M, Abbasi K, Tebyaniyan H, Tahmasebi E, *et al*. Biocompatible and biomaterials application in drug delivery system in oral cavity. Evid Based Complement Altern Med. 2021;2021:9011226. https://doi.org/10.1155/2021/9011226
PMid:34812267
51. Tahmasebi E, Alam M, Yazdanian M, Tebyanian H, Yazdanian A, Seifalian A, *et al*. Current biocompatible materials in oral regeneration: A comprehensive overview of composite materials. J Mater Res Technol. 2020;9(5):11731-55. https://doi.org/10.1016/j.jmrt.2020.08.042
52. Mosaddad SA, Tahmasebi E, Yazdanian A, Rezvani MB, Seifalian A, Yazdanian M, *et al*. Oral microbial biofilms: An update. Eur J Clin Microbiol. 2019;38:2005-19. https://doi.org/10.1007/s10096-019-03641-9
PMid:31372904
53. Retamal-Valdes B, Soares GM, Stewart B, Figueiredo LC, Faveri M, Miller S, *et al*. Effectiveness of a pre-procedural mouthwash in reducing bacteria in dental aerosols: Randomized clinical trial. Braz Oral Res. 2017;31:e21. https://doi.org/10.1590/1807-3107BOR-2017.vol31.0021
PMid:28380086
54. Kelly N, Iomhair AN, McKenna G. Can oral rinses play a role in preventing transmission of Covid 19 infection? Evid Based Dent.

2020;21(2):42-3. https://doi.org/10.1038/s41432-020-0099-1
PMid:32591651

55. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci. 2020;12(1):9. https://doi.org/10.1038/s41368-020-0075-9
PMid:32127517

56. American Dental Association. What Constitutes a Dental Emergency. United States: American Dental Association; 2020. p. 1.

57. Peditto M, Scapellato S, Marciano A, Costa P, Oteri G. Dentistry during the COVID-19 epidemic: An Italian workflow for the management of dental practice. Int J Environ Res Public Health. 2020;17(9):3325. https://doi.org/10.3390/ijerph17093325
PMid:32403248

58. World Health Organization. Decontamination and Reprocessing of Medical Devices for Health-Care Facilities. Geneva: World Health Organization; 2016.

59. Ather A, Patel B, Ruparel NB, Diogenes A, Hargreaves KM. Coronavirus disease 19 (COVID-19): Implications for clinical dental care. J Endod. 2020;46(5):584-95. https://doi.org/10.1016/j.joen.2020.03.008
PMid:32273156

60. Centers for Disease Control Prevention. Interim Infection Prevention and Control Recommendations for Healthcare Personnel during the Coronavirus Disease 2019 (COVID-19) Pandemic. Geneva: World Health Organization; 2020.

61. Diegritz C, Manhart J, Bucher K, Grabein B, Schuierer G, Kuhnisch J, *et al*. A detailed report on the measures taken in the Department of Conservative Dentistry and Periodontology in Munich at the beginning of the COVID-19 outbreak. Clin Oral Investig. 2020;24(8):2931-41. https://doi.org/10.1007/s00784-020-03440-z
PMid:32607830

62. Maret D, Peters OA, Vaysse F, Vigarios E. Integration of telemedicine into the public health response to COVID-19 must include dentists. Int Endod J. 2020;53(6):880-1. https://doi.org/10.1111/iej.13312
PMid:32320488

63. Kılıçarslan MA, Şenel FÇ, Özcan M. Assessment of dental care during the covid-19 pandemic in Turkey and future projections. Braz Dent Sci. 2020;23(2):1-7.

64. Alharbi A, Alharbi S, Alqaidi S. Guidelines for dental care provision during the COVID-19 pandemic. Saudi Dent J. 2020;32(4):181-6. https://doi.org/10.1016/j.sdentj.2020.04.001
PMid:32292260

65. Kochhar AS, Bhasin R, Kochhar GK, Dadlani H. COVID-19 pandemic and dental practice. Int J Dent. 2020;2020:8894794. https://doi.org/10.1155/2020/8894794
PMid:32695170

66. Wang Y, Zhou CC, Shu R, Zou J. Oral health management of children during the epidemic period of coronavirus disease 2019. Sichuan Da Xue Xue Bao Yi Xue Ban. 2020;51(2):151-4. https://doi.org/10.12182/20200360101
PMid:32220180

67. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): Emerging and future challenges for dental and oral medicine. J Dent Res. 2020;99(5):481-7. https://doi.org/10.1177/0022034520914246
PMid:32162995

68. Luzzi V, Ierardo G, Bossu M, Polimeni A. Paediatric oral health during and after the COVID-19 pandemic. Int J Paediatr Dent. 2021;31(1):20-6. https://doi.org/10.1111/ipd.12737
PMid:33012056

69. Ahmadi H, Ebrahimi A, Ghorbani F. The impact of COVID-19 pandemic on dental practice in Iran: A questionnaire-based report. BMC Oral Health. 2020;20(1):354. https://doi.org/10.1186/s12903-020-01341-x

70. Almulhim B, Alassaf A, Alghamdi S, Alroomy R, Aldhuwayhi S, Aljabr A, *et al*. Dentistry amidst the COVID-19 pandemic: Knowledge, attitude, and practices among the Saudi Arabian dental students. Front Med (Lausanne). 2021;8:654524. https://doi.org/10.3389/fmed.2021.654524
PMid:33898488

71. Watts K, Balzer S, Drum M, Nusstein J, Reader A, Fowler S, *et al*. Ibuprofen and acetaminophen versus intranasal ketorolac (Sprix) in an untreated endodontic pain model: A randomized, double-blind investigation. J Endod. 2019;45(2):94-8. https://doi.org/10.1016/j.joen.2018.11.005
PMid:30711184

72. Taggar T, Wu D, Khan AA. A randomized clinical trial comparing 2 ibuprofen formulations in patients with acute odontogenic pain. J Endod. 2017;43(5):674-8. https://doi.org/10.1016/j.joen.2016.12.017
PMid:28320537

73. Araujo MW, Estrich CG, Mikkelsen M, Morrissey R, Harrison B, Geisinger ML, *et al*. COVID-2019 among dentists in the United States: A 6-month longitudinal report of accumulative prevalence and incidence. J Am Dent Assoc. 2021;152(6):425-33. https://doi.org/10.1016/j.adaj.2021.03.021
PMid:34044974

74. Li ZY, Meng LY. Prevention and control of novel coronavirus infection in department of stomatology. Zhonghua Kou Qiang Yi Xue Za Zhi. 2020;55(4):217-22. https://doi.org/10.3760/cma.j.issn.1002-0098.2020.0001
PMid:32057210

75. Harrel SK, Molinari J. Aerosols and splatter in dentistry: A brief review of the literature and infection control implications. J Am Dent Assoc. 2004;135(4):429-37. https://doi.org/10.14219/jada.archive.2004.0207
PMid:15127864

76. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. J Dent Sci. 2020;15(4):564-7. https://doi.org/10.1016/j.jds.2020.02.002
PMid:32296495

77. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, *et al*. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. N Engl J Med. 2020;382(16):1564-7. https://doi.org/10.1056/NEJMc2004973
PMid:32182409

78. Amorim LM, Maske TT, Ferreira SH, Santos RB, Feldens CA, Kramer PF. New post-COVID-19 biosafety protocols in pediatric dentistry. Pesqui Bras Odontopediatria Clín Integr. 2020;20(Suppl 1):e0117. https://doi.org/10.1590/pboci.2020.117

79. Association NZD. COVID-19 Safety Standards 2020. Available from: https://www.nzda.org.nz/assets/files/Standards__Guidelines/Supplementary_Standard_to_the_Infection_Prevention_and_Control_Practice_Standard.pdf

80. Samaranayake LP, Reid J, Evans D. The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination. ASDC J Dent Child. 1989;56(6):442-4.
PMid:2681303

81. Krithikadatta J, Nawal R, Amalavathy K, McLean W, Gopikrishna V. Endodontic and dental practice during COVID-19 pandemic: Position statement from the Indian Endodontic Society, Indian Dental Association, and International Federation of Endodontic Associations. Endodontology. 2020;32:55-66.

82. Xu J, Li Y, Gan F, Du Y, Yao Y. Salivary glands: Potential reservoirs for COVID-19 asymptomatic infection. J Dent Res. 2020;99(8):989. https://doi.org/10.1177/0022034520918518

PMid:32271653

83. Kochhar AS, Bhasin R, Kochhar GK, Dadlani H. Provision of continuous dental care for oral oncology patients during and after COVID-19 pandemic. Oral Oncol. 2020;106:104785. https://doi.org/10.1016/j.oraloncology.2020.104785

PMid:32416969

84. Suri S, Vandersluis YR, Kochhar AS, Bhasin R, Abdallah MN. Clinical orthodontic management during the COVID-19 pandemic. Angle Orthod. 2020;90(4):473-84. https://doi.org/10.2319/033120-236.1

PMid:32396601

85. González-Quintanilla D, Santos-López M. Medidas preventivas y consideraciones para la práctica de cirugía oral durante COVID-19. Int J Odontostomatol. 2020;14(3):338-41. https://doi.org/10.4067/S0718-381X2020000300338

86. Hokett SD, Honey JR, Ruiz F, Baisden MK, Hoen MM. Assessing the effectiveness of direct digital radiography barrier sheaths and finger cots. J Am Dent Assoc. 2000;131(4):463-7. https://doi.org/10.14219/jada.archive.2000.0202

PMid:10770008

87. Giudice RL. The severe acute respiratory syndrome coronavirus-2 (SARS CoV-2) in dentistry. Management of biological risk in dental practice. Int J Environ Res Public Health. 2020;17(9):3067. https://doi.org/10.3390/ijerph17093067

PMid:32354081

88. Zemouri C, de Soet H, Crielaard W, Laheij A. A scoping review on bio-aerosols in healthcare and the dental environment. PLoS One. 2017;12(5):e0178007. https://doi.org/10.1371/journal.pone.0178007

PMid:28531183

89. Lu CW, Liu XF, Jia ZF. 2019-nCoV transmission through the ocular surface must not be ignored. Lancet. 2020;395(10224):e39. https://doi.org/10.1016/S0140-6736(20)30313-5

PMid:32035510

90. Lotfinejad N, Peters A, Pittet D. Hand hygiene and the novel coronavirus pandemic: The role of healthcare workers. J Hosp Infect. 2020;105(4):776-7. https://doi.org/10.1016/j.jhin.2020.03.017

PMid:32201339

91. Scottish Dental Clinical Effectiveness Programme. Management of Acute Dental Problems during COVID-19 Pandemic; 2020. Available from: https://secibonline.com/wp-content/uploads/2020/04/SDCEP-MADP-COVID-19-guide-300320.pdf

92. Spagnuolo G, De Vito D, Rengo S, Tatullo M. COVID-19 outbreak: An overview on dentistry. Int J Environ Res Public Health. 2020;17(6):2094. https://doi.org/10.3390/ijerph17062094

PMid:32235685

93. New Zealand Dental Association. Medical Management of Acute Dental Pain. New Zealand: New Zealand Dental Association; 2020. Available from: https://www.nzda.org.nz/assets/files/Standards__Guidelines/Medical_Management_of_Acute_Dental_Pain.pdf