

Review Article

Review of Available Studies and Guidelines in the Field of Prevention of COVID-19 Infection in Dental Centers

Naira Figueiredo Deana^{1,2}, Andrea Seiffert³, Yanela Aravena-Rivas², Pablo Alonso-Coello^{4,5}, Patricia Muñoz-Millán^{1,2}, Gerardo Espinoza-Espinoza^{2,6}, Patricia Pineda^{1,2}, Carlos Zaror^{1,2*}

¹Department of Pediatric Dentistry and Orthodontics, Faculty of Dentistry, Universidad de La Frontera, Temuco 4781176, Chile.

²Center for Research in Epidemiology, Economics and Oral Public Health (CIEESPO), Faculty of Dentistry, Universidad de La Frontera, Temuco 4811230, Chile.

³Dental School, Faculty of Dentistry, Universidad de La Frontera, Temuco 4781176, Chile.

⁴Iberoamerican Cochrane Centre, Biomedical Research Institute Sant Pau (IIB Sant Pau), 08025 Barcelona, Spain.

⁵CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain.

⁶Department of Public Health, Faculty of Medicine, Universidad de La Frontera, Temuco 4781135, Chile.

*E-mail ✉ carlos.zaror@ufrontera.cl

Received: 21 January 2022; Revised: 26 May 2022; Accepted: 28 May 2022

ABSTRACT

Dental services can be a suitable environment for the spread of the COVID-19 virus due to the type of treatment and the closeness of the personnel to the patients. For this reason, several guidelines have been prepared and presented by international organizations regarding the need to comply with health standards in these environments. The purpose of this study was to review and analyze the guidelines and studies conducted regarding the prevention and control of coronavirus in dental settings. In this study, Google Scholar, Scopus, and PubMed databases as well as the guidelines of the American Occupational Safety and Health Organization (OSHA), Center for Disease Control (CDC), American Dental Association (ADA), and the National Health Organization of England (NHS) were reviewed with thematic search method and used in writing this article. Investigations showed that the employees of dental centers, like other employees of health care centers, are at high risk of contracting this disease. What is most emphasized in the published guidelines is the elimination of non-emergency procedures and the provision of remote counseling services to patients. In other situations where there is a need for emergency visits to patients, it is necessary to observe preventive measures, especially hand hygiene, and to observe the protective principles related to the spread of the virus in the form of aerosols. According to the results of the present study, all dental staff must be provided with the necessary information and training regarding the prevention and control strategies of this disease based on scientific guidelines and standards. This issue can play an effective role in reducing the number of infected people and preventing the spread of the virus at the community level.

Keywords: Dental centers, Patients, Covid-19 infection, Guidelines

How to Cite This Article: Deana NF, Seiffert A, Aravena-Rivas Y, Alonso-Coello P, Muñoz-Millán P, Espinoza-Espinoza G, et al. Review of Available Studies and Guidelines in the Field of Prevention of COVID-19 Infection in Dental Centers. Ann J Dent Med Assist. 2022;1:1-7.

Introduction

Coronavirus, which started in December 2019 in Wuhan, China, quickly turned into a global pandemic and involved more than 200 countries in the world [1-

3]. Coronavirus belongs to a family of viruses with single-stranded RNA called coronaviruses. Diseases related to members of this family include severe acute respiratory syndrome (SARS-CoV), which was first

identified in 2002, and Middle East respiratory syndrome (MERS-CoV), which was first identified in 2012 [4-6].

The symptoms of this disease, like other viruses of the coronavirus family, include fever, cough, shortness of breath, weakness, and sore throat. These symptoms vary from person to person and begin one to fourteen days after exposure. Diagnosis of the disease is mainly based on clinical symptoms, laboratory and radiological evaluations, and finally specific PCR (Polymerase Chain Reaction) test. The symptoms are more severe and dangerous in elderly people, diabetics, heart patients, lung patients, BMI (Body Mass Index) above 40, and liver and kidney patients. According to the latest reports, the ways of transmission of this virus as a respiratory virus are mainly through respiratory droplets or coughing or sneezing of patients and touching contaminated objects and surfaces [7-10]. This virus can survive on surfaces in the form of secretions for two to three days and in the air in the form of aerosols for up to three hours, and the probability of transmission of this virus is higher at a distance of less than two meters from an infected person [11, 12].

Many workers have a low risk of infection. However, healthcare workers such as doctors, nurses, dentists, waste collection workers, and burial officials have a higher risk than other professions. In the report of the National Health Committee of China, it was confirmed that healthcare personnel were infected with COVID-19, which led to the death of a large number of these people [13, 14].

Dental professionals are highly exposed to this disease due to face-to-face contact with clients and frequent exposure to saliva secretions, blood, and exhaled air of patients, as well as the high use of rotating and winching tools. Therefore, it is very important to implement control measures in this job to control infection and prevent personal transmission [10]. Considering the spread of this disease and the high risk of contracting it in dental activities, the purpose of this study was to review the existing studies and guidelines regarding the prevention and control of corona disease in dental settings.

Materials and Methods

The purpose of this study was to review and analyze the guidelines and studies conducted regarding the prevention and control of coronavirus in dental settings. In this study, Google Scholar, Scopus, and PubMed databases as well as the guidelines of the American Occupational Safety and Health Organization (OSHA), Center for Disease Control

(CDC), American Dental Association (ADA), and the National Health Organization of England (NHS) were reviewed with thematic search method and used in writing this article.

Results and Discussion

The first step in determining a disease prevention strategy is to assess the risk of exposure. The Occupational Safety and Health Administration (OSHA) has divided different jobs into 4 categories of very high risk, high risk, medium risk and low risk based on the risk of occupational exposure to Covid-19. This risk is determined based on the type of work and the possibility of contact with people infected or suspected of having Covid-19 at a distance of 2 meters. Based on this classification, all medical personnel, including doctors, dentists, nurses, paramedical groups, and emergency medical technicians who are exposed to performing actions that produce aerosols (intubation, bronchoscopy, some dental examinations and procedures, etc.) are in the high risk group [15]. The dental work process involves the use of instruments, rotary burs, surgical instruments, and syringes. These tools create visible particles that contain large droplets of water, saliva, blood, microorganisms, and other debris. These secretions quickly travel a short distance on the floor, adjacent surfaces, service personnel or the patient, and can also contain aerosols that are not visible to the eye. It is worth noting that there is a possibility that dental procedures It should also be done for some patients with asymptomatic Covid-19 infection, because the incubation period of this disease can be from 1 to 14 days, and most patients show only mild symptoms [16-19]. Therefore, every patient should be considered as potentially infected with this virus, and all the dental protection measures that are carried out in the normal state, should be considered more obsessively and carefully. Due to special procedures in dentistry that generate aerosols and spray a large amount of saliva droplets, the standard protective measures that are performed in the routine of dentistry are not effective enough to prevent the spread of the Covid-19 infection. Especially in situations where people are in the incubation period, or are unaware of their infection or hide their infection, this issue will face a great challenge. Therefore, the strict recommendation against this disease is to strictly observe personal protection measures and eliminate or minimize actions that may produce aerosols and a large volume of droplets. Using a saliva sucker can be effective in reducing the production of aerosols and droplets. Also,

the use of the four-hand technique is known to be beneficial in this regard [20, 21].

Another important issue is the fact that infection prevention precautions are not possible in many dental settings because many of these places are not designed or equipped to provide standard care. For example, in many dental offices, there are no isolation rooms for airborne infections, which must be completely ventilated 6 to 12 times per hour. Many of these places lack written respiratory protection programs and routinely do not have suitable masks [22].

According to the announcement of the American Dental Association (ADA) on March 16, 2020, dentists across the United States have been advised to limit dental treatments to emergency or emergency cases for

the next three weeks. To reduce exposure to the disease, this association has emphasized that dental center employees should attend their workplace with the least number and in shifts [10].

According to the guidelines published by other reputable organizations, during the coronavirus epidemic, all routine dental procedures should be postponed and treatment should be limited to cases requiring emergency or urgent procedures (**Table 1**). Emergencies are conditions that are potentially life-threatening and require immediate treatment. Emergencies are those that require immediate attention to reduce severe pain or risk of infection. In these cases, it is better to use less invasive treatments as much as possible [23].

Table 1. Safety recommendations are provided by international organizations to prevent the spread of COVID-19 in dental environments.

Recommending organization	Recommendations
CDC (Centers for Disease Control) [22]	<ul style="list-style-type: none"> • During the pandemic, services should be limited to emergency visits. • Employees of dental centers should stay at home if they are sick. • Call all patients who need emergency treatment (Urgent)* or emergency (Emergency)** before the appointed time and ask them about the symptoms of respiratory disease. If the person reports these symptoms, the dental and medical team must determine the appropriate place to perform emergency dental treatment. • Infected patients can receive emergency dental services if they complete home quarantine under the following conditions: <ol style="list-style-type: none"> 1) At least three days have passed since the person's recovery (absence of fever without the use of antipyretic drugs and improvement of respiratory symptoms such as cough and shortness of breath) and 7 days have passed since the onset of his first symptom, or: 2) If the person is asymptomatic and he was infected with Covid-19 only by taking a test, at least 7 days must have passed since the date of his positive test and he did not develop symptoms during this period.
NHS (National Health Service) [24]	<ul style="list-style-type: none"> • All routine and non-emergency dental procedures, including orthodontics, routine dental check-ups, and dental health improvement measures, are postponed until further notice. • All measures should be performed remotely and with the help of telephone triage for patients who need emergency measures during normal working hours and if possible in the form of providing advice, prescribing painkillers or appropriate antibiotics. • If it is impossible to manage the patient with the above method, he should be referred to a center that provides emergency dental services.
ADA (American Dental Association) [25]	<ul style="list-style-type: none"> • Patients should be screened for dental emergencies using remote methods • Use available personal protective equipment completely. Surgical masks are unsuitable for protection against airborne transmission of the virus • If possible, radiography has been done with extraoral methods because intraoral techniques can trigger coughing • Aerosol production should be minimized as much as possible with the help of hand instrumentation and high-speed suction • While treating the patient at a close distance, use an N95 mask and a full face shield (as per the protocol for the treatment team performing intubation). If the N95 mask is not available, use a surgical mask (with FDA approval) along with goggles, gloves and gown • The dental team that needs to work within 2 meters of the aerosol generator treatment should be limited to the operator and his assistant

* Severe tooth pain caused by pulp inflammation, abscess or localized bacterial infection, pericoronitis or wisdom tooth pain, tooth fracture leading to tooth pain or soft tissue damage, the need to perform dental procedures before medical procedures vital, denture adjustments in patients undergoing cancer treatment, tooth trauma with avulsion/luxation, extensive tooth decay, biopsy of abnormal tissue, suture removal, dry cavity dressing, denture adjustments when chewing function is difficult, orthodontic wire adjustments

** Uncontrolled bleeding, trauma to the facial bones with the possibility of blocking the patient's airway, cellulitis or diffuse soft tissue swelling inside or outside the mouth with bacterial origin and potentially blocking the airway

To prevent occupational diseases, it is necessary to take preventive measures in the workplace. These measures, in the order of priority, include removing or replacing the harmful agent, engineering, management measures, and the use of personal protective equipment. **Table 2** shows the most important protective measures to prevent COVID-19 infection in dental centers. The use of personal protective equipment is always the last way to control harmful factors in the work environment, but regarding the coronavirus, due to the possibility of rapid transmission of the disease and high prevalence, it is recommended to use integrated control methods in

the work environment, i.e. engineering, management and Use personal protective equipment at the same time. The use of N95, FFP2, and FFP3 respirators is recommended for dental workers and people who are exposed to high levels of viral particles due to the high filtration power of fine suspended particles. Before going to high-risk places, the person using the mask must make sure that it is properly installed and fully adhered to the face by performing the Fit test and Seal check. The presence of any tear or contamination of the mask, facial deformities, or the presence of a beard reduces the protective function of the mask [26].

Table 2. Different levels of protective measures in dental centers.

Substitution	Engineering Controls	Administrative Controls	Personal Protective Equipment (PPE)
<ul style="list-style-type: none"> • Removal of all non-emergency dental procedures • Preventing infected or suspected people from entering dental centers 	<ul style="list-style-type: none"> • Establishing proper ventilation in work environments • Use of glass or plastic barriers between staff and patients • Use of disposable tools and equipment 	<ul style="list-style-type: none"> • Continuous training of employees regarding compliance with hygiene rules, hand washing, and how to use personal protective equipment • Reducing the number of office visitors and proper spacing between patients • Providing non-attendance services to patients • Continuous washing and disinfection of surfaces and equipment 	<ul style="list-style-type: none"> • Using a suitable mask and respirator (N95/FFP2) • Use eye protection, gloves, and gloves

The spread of the corona disease caused the decline of many economic and social activities around the world. To reduce the economic losses of this disease and to support the affected and small businesses, many countries have considered support measures such as allocating free loans or reducing taxes. In America, the ADA was consulting with the Small Business Administration to get their approval for a \$10,000 loan for dental centers [25].

In the meantime, the employees providing health care services were forced to be present in their work environment and provide these services to the members of the community. Undoubtedly, the global spread of this virus increased the possibility of dentists being involved in dental procedures. During these actions, the transmission of the virus was possible in three main ways: airborne spread through produced aerosols, contact spread through exposure of eye, nose, and mouth mucosa with patient saliva droplets, and spread from surrounding contaminated surfaces and dental tools [20].

What is most emphasized in the published guidelines is the elimination of non-emergency measures and the provision of remote counseling services. For symptomatic treatment in these cases, prescribing

antibiotics or painkillers can help postpone these actions. In other situations where there is a need for emergency visits to patients, it is strongly recommended to follow preventive measures at three levels engineering, management, and personal protection [27]. However, in the study of Ather *et al.* [28], it is recommended that if an appointment is made to carry out selective measures, first a preliminary screening should be done by phone to identify suspected or infected people with Covid-19 and by asking about the symptoms related to this disease and any exposure the person with other suspected or infected people with this virus. In case of a positive answer to these questions, the person should be encouraged to self-quarantine and the elective procedure should be postponed for at least 2 weeks.

The novel coronavirus can remain on surfaces for several hours to several days, depending on the type of surface, temperature, and humidity of the environment [29]. In one study, it was found that the virus can survive on copper and paper for 4 to 24 hours. On the other hand, the infectivity of the virus on steel surfaces decreases only after 48 hours and on plastic after 72 hours. Therefore, the virus survives on metal devices or disposable materials in polluted air conditions more

than in waiting room environments. Considering these conditions and considering that the virus is destroyed by water, soap, and other cleaners, paying close attention to the principles of hand hygiene and surface cleaning are important measures that should be taken [11].

Dentists should take stricter infection prevention and control measures. In some centers, patients are given a medical mask and their temperature is taken when they enter the dental clinic. Suspects of COVID-19 should sit in a separate, well-ventilated waiting room with a distance of at least 2 meters from other healthy clients [30]. Patients should be asked to cover their mouth and nose while coughing and sneezing. In this situation, dentists are required to fully comply with standard precautions related to the transmission of contact and airborne infections. In one study, the use of treatment rooms with negative pressure or special rooms for airborne infections has been suggested to treat suspected or infected people with Covid-19 [28]. Even though the National Health Committee of China has classified COVID-19 in the group of infections such as SARS and bird flu, it has advised all healthcare personnel to take all protective measures similar to those required for pathogens such as cholera and plague [20]. The use of appropriate personal protective equipment (FFP2 or N95 masks, surgical gloves, face shields, and overalls) has been mentioned as effective measures to prevent the spread of the coronavirus [22, 31].

In some studies, it is recommended to perform a series of measures to reduce the possibility of transmission of infection. Based on the research that was done before about MERS (Middle East Respiratory Syndrome), and SARS (Severe Acute Respiratory Syndrome) infections, it is recommended to rinse the mouth with 0.2% povidone-iodine and 0.5-1% hydrogen peroxide mouthwash to reduce the number of coronavirus in saliva. The use of oral mirrors, disposable syringes, and extraoral photography also reduces the risk of contamination transmission. In cases where intraoral photography is unavoidable, sensors with a double barrier layer should be used. It is recommended that dentists minimize the use of ultrasonic instruments, three-way syringes, and high-speed hand instruments [28]. The use of saliva suckers and the four-handed technique are also known to be useful for infection control [20].

Conclusion

The purpose of this study was to review and analyze the guidelines and studies conducted regarding the prevention and control of coronavirus in dental

settings. Investigations showed that the employees of dental centers, like other employees of health care centers, are at high risk of contracting this disease. What is most emphasized in the published guidelines is the elimination of non-emergency procedures and the provision of remote counseling services to patients. In other situations where there is a need for emergency visits to patients, it is necessary to observe preventive measures, especially hand hygiene, and to observe the protective principles related to the spread of the virus in the form of aerosols. According to the results of the present study, all dental staff must be provided with the necessary information and training regarding the prevention and control strategies of this disease based on scientific guidelines and standards. This issue can play an effective role in reducing the number of infected people and preventing the spread of the virus at the community level.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

References

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727-33.
2. She J, Jiang J, Ye L, Hu L, Bai C, Song Y. 2019 novel coronavirus of pneumonia in Wuhan, China: Emerging attack and management strategies. *Clin Transl Med*. 2020;9(1):19. doi:10.1186/s40169-020-00271-z
3. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061-9. doi:10.1001/jama.2020.1585
4. Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. 2020;579(7798):270-3.
5. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. *Can J Anesth*. 2020;67(5):568-76.

6. Liew MF, Siow WT, MacLaren G, See KC. Preparing for COVID-19: Early experience from an intensive care unit in Singapore. *Crit Care*. 2020;24:83. doi:10.1186/s13054-020-2814-x
7. Tan C, Zheng X, Huang Y, Liu J. Key to successful treatment of COVID-19: Accurate identification of severe risks and early intervention of disease progression. *MedRxiv*. 2020;4(6):4890.
8. World Health Organization. Coronavirus disease 2019 (COVID-19): Situation report 72. Geneva: World Health Organization; 2020.
9. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). New York: StatPearls Publishing; 2020.
10. Coulthard P. Dentistry and coronavirus (COVID-19)-moral decision-making. *Br Dent J*. 2020;228(7):503-5.
11. 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.
12. Pochtovyi AA, Bacalin VV, Kuznetsova NA, Nikiforova MA, Shidlovskaya EV, Verdiev BI, et al. Sars-cov-2 aerosol and surface contamination in health care settings: The Moscow pilot study. *Aerosol Air Qual Res*. 2021;21(4):200604. doi:10.4209/aaqr.200604
13. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the Chinese center for disease control and prevention. *JAMA*. 2020;323(13):1239-42. doi:10.1001/jama.2020.2648
14. Zhou M, Zhang X, Qu J. Coronavirus disease 2019 (COVID-19): A clinical update. *Front Med*. 2020;14(2):126-35. doi:10.1007/s11684-020-0767-8
15. Guidance on preparing workplaces for COVID-19. Occupational safety and health administration. Available from: <https://www.osha.gov/Publications/OSHA3990.pdf>; 2020.
16. Bastola A, Sah R, Rodriguez-Morales AJ, Lal BK, Jha R, Ojha HC, et al. The first 2019 novel coronavirus case in Nepal. *Lancet Infect Dis*. 2020;20(3):279-80.
17. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, et al. First case of 2019 novel coronavirus in the United States. *N Engl J Med*. 2020;382(10):929-36. doi:10.1056/NEJMoa2001191
18. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of 2019 novel coronavirus infection in China. *MedRxiv*. 2020;2(6):974.
19. Liu L, Lei X, Xiao X, Yang J, Li J, Ji M, et al. Epidemiological and clinical characteristics of patients with coronavirus disease-2019 in Shiyan city, China. *Front Cell Infect Microbiol*. 2020;10:284. doi:10.3389/fcimb.2020.00284
20. 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.
21. Ak G, Gunay AY, Olley RC, Sen N. Managing emerging challenges of Coronavirus disease 2019 (COVID-19) in dentistry. *Eur Oral Res*. 2020;54(2):101-7. doi:10.26650/eor.20200056
22. Centers for Disease Control and Prevention (CDC). Update: Recommendations for middle east respiratory syndrome coronavirus (MERS-CoV). *MMWR Morb Mortal Wkly Rep*. 2013;62(27):557.
23. Krithikadatta J, Nawal RR, 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(2):55-66.
24. Providing urgent dental care to vulnerable patients in Kent. National Health Service. Available from: <https://www.england.nhs.uk/primary-care/dentistry/dentistry-publications/providing-urgent-dental-care-to-vulnerable-patients-in-kent/>; 2020.
25. American Dental Association. Task force for dental practice recovery after COVID-19 pandemic. New York: American Dental Association; 2020.
26. World Health Organization. Getting your workplace ready for COVID-19: How COVID-19 spreads, 19 March 2020. Geneva: World Health Organization; 2020.
27. Sun P, Lu X, Xu C, Sun W, Pan B. Understanding of COVID-19 based on current evidence. *J Med Virol* 2020;92(6):548-51.
28. 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.

29. World Health Organization. Questions and answers on coronaviruses. Geneva: World Health Organization; 2020.
30. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvitz DM, et al. Guidelines for infection control in dental health-care settings-2003. J Am Dent Assoc. 2004;135(1):33-47.
31. Ali S, Zeb U, Khan M, Muhammad A. Transmission routes and infection control of novel Coronavirus-2019 in dental clinics–A review. J Islamabad Med Dent Coll. 2020;9(1):65-72.