



Personal protective equipment against coronavirus in the field of dentistry: A rapid review

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Abstract

Background: The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) disease can be transmitted through direct or indirect contact with droplets from the infected person's respiratory system. The aim of this study was a rapid review of the use of personal protective equipment against coronavirus in the field of dentistry.

Methods: This study was a rapid cross-sectional review and research. A search was performed in Scopus and PubMed. The key words were PPE) personal protective equipment) with "Corona virus" OR "Coronavirus" OR "Covid 19" as well as the combination of "oral health" and "dent" with "Corona virus" OR "Covid 19" OR "coronavirus." Finally, we selected nine articles and excluded 545 irrelevant articles. We reviewed these nine studies in full text and excluded two of them as they were unrelated to the review of personal protective equipment.

Results: One study showed that patients with COVID-19 who do not yet have symptoms might seek emergency dental treatment. Two researchers concluded that dentists had good information about how the virus was transmitted but did not know its symptoms well. One study concluded that the use of filtering facepiece respirators (FFRs) during the COVID-19 pandemic is essential to preventing exposure to aerosols and droplets, as it is more fluid-resistant and functions better than surgical masks, which cause flooding around the mouth and nose.

Conclusion: This study shows that many dentists do not have enough information about the disease and proper personal protective equipment. This may be due to a lack of precise operating instructions.

Keywords: Personal protective equipment, PPE, Coronavirus, COVID-19, Dentist

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Introduction

COVID-19, caused by the novel betacoronavirus, was first reported in December 2019 in Wuhan, China. It causes acute respiratory syndrome in humans.¹ The disease has a two-week incubation period, and its symptoms include fever, cough, acute respiratory distress, difficulty breathing, decrease (or in some cases, no change) in white blood cell count, and decreased lymphocytes. Most patients show mild symptoms, and some have progressive and severe symptoms. The disease also has radiographic symptoms. It does not respond to 3- to 5-day courses of antibiotic treatment, and there is no recommended antiviral drug for it.²⁻⁴ However, corona vaccination is currently in progress worldwide.

The virus can be transmitted indirectly or directly through droplets.⁵ The virus is also abundant in saliva.⁶ Also, aerosols, a suspension of fine solid particles or liquid droplets in air or other gases, can carry the virus nucleus over longer distances and also help it stay in the air for

a relatively long time.⁷ Many researchers have shown that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in aerosols persists for up to 3 hours after contamination, exceeding 72 hours when the contaminated surface is made of plastic or stainless steel.⁸

The dental profession is one of the medical professions associated with the production of aerosols. Because the dentist is usually seated a short distance from the patient, the dental community is a high-risk population for transmitting the disease.⁹ Therefore, elective dental work was banned during the outbreak of COVID-19, but dental emergencies are one of the things that cannot be avoidable. Thus, in this situation, the role of personal protective equipment is of key importance.

Dentists have always taken precautions to prevent cross-infection, but in these cases, dentists should be aware of special personal protective equipment and use it to protect the patients and themselves. With this knowledge, the virus transmission chain can be broken by dentists.



COVID-19 is currently a pandemic, and it is not clear how long it will last as there is still no definitive cure for it. Also, it is impossible to postpone or avoid emergency dental treatment, so the purpose of our study is to review the articles published on the use of personal protective equipment against coronavirus in the field of dentistry.

The purpose of this article was to summarize the current evidence on the use of personal protective equipment against coronavirus in dentistry. In particular, we sought to examine personal protective equipment and the need to use it.

Methods

This study was a rapid cross-sectional review. We searched PubMed and Scopus through the combination of PPE with “Covid 19” OR “Corona virus” OR “Coronavirus” as well as the combination of “dent” and “oral health” with “Covid 19” OR “Corona virus” OR “coronavirus.” The search was limited to articles published before January 1, 2021. We obtained 811 records, all of which were entered into Mendeley, and 257 duplicate items were removed. We selected those that studied PPE use in dentistry. Finally, nine articles were selected, and 545 irrelevant articles were omitted (Figure 1).

Of the seven included articles that remained after two more were omitted due to irrelevance, one article addressed the need to use personal protective equipment.¹⁰ Two studies examined dentists’ knowledge of COVID-19 and the use of personal protective equipment.^{11,12} One study examined the personal protective equipment used by dentists before and after the disease outbreak.¹³

Two studies assessed available personal protective equipment,^{14,15} and one identified disadvantages that may be associated with using personal protective equipment⁵ (Table 1).

Results and Discussion

The need for knowledge about and use of personal protective equipment for dentists

According to the protocols outlined in *Interim Infection Prevention and Control Guidance for Dental Settings during the COVID-19 Response* published by the Center for Disease Control and Prevention (CDC), dentists, dental nurses, laboratories, and their staff are required to adhere to the principles of infection control to prevent COVID-19 infection^{14,16,17} (Table 2).

In a study by Odeh et al,¹⁰ patients with COVID-19 who do not yet have symptoms may seek emergency treatment. Their saliva is expected to be infected with the virus and they are a confirmed source of infection. We should divide dental procedures into two groups in terms of aerosol production. Procedures that produce aerosols include cavity preparation for tooth filling, use of rotary instruments for endodontic treatment, scaling and polishing of teeth, placement of dental implants, and surgical extraction of teeth, to name a few. The nasolacrimal duct connects the conjunctival mucosa and upper respiratory tract. Both share a common receptor for SARS-CoV-2 entry into their cell membranes called angiotensin converting enzyme 2 (ACE2).¹⁸ This puts dental health professionals at risk of infection by exposing the conjunctiva (eye) directly to droplets while they are

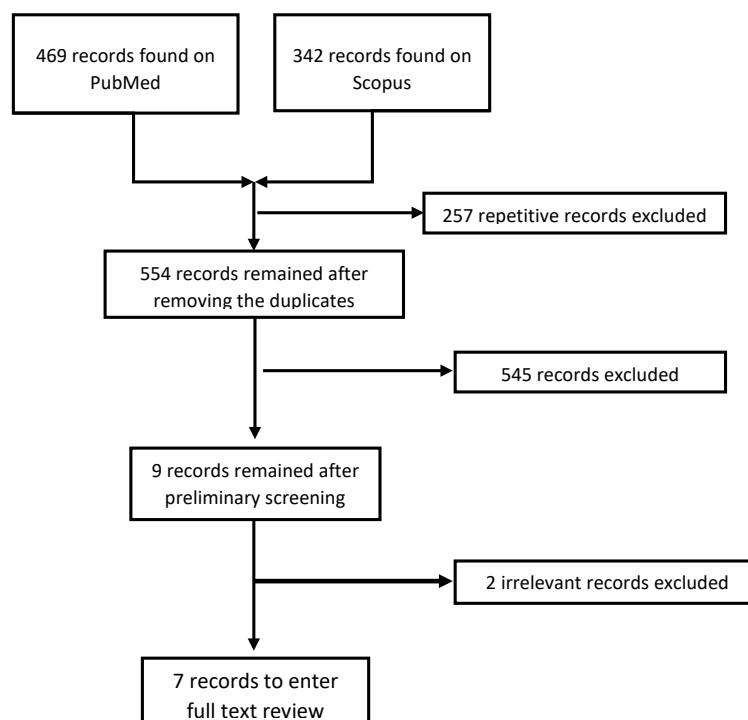


Figure 1. Flow diagram for study selection.

Table 1. Details of the information extracted from the studies included in rapid review

Title of paper	First author	Year or work experience	No. of sample	Sex	Tasks done
COVID-19: Present and future challenges for dental practice	Odeh ND	2020	-	-	This review addresses several issues related to the COVID-19 epidemic that are directly associated with dental practice in terms of prevention, treatment, and orofacial clinical manifestations.
COVID-19 outbreak perception in Italian dentists	De Stefani A	2020	1500	664 m 836 f	In the first phase, the authors aimed to assess dentists' knowledge of COVID-19. Second, dentists' understanding of the risks associated with COVID-19, their attitudes toward reopening their activities, and how they judge their formal interventions from a health and economic point of view.
COVID-19: a survey on knowledge, awareness and hygiene practices among dental health professionals in an Indian scenario.	Singh Gambhir R	2020	215	133 m 82 f	Assessing the basic requirements of knowledge, awareness and health practices among dental health professionals against COVID-19
Epidemiological aspects and psychological reactions to COVID-19 of dental practitioners in the Northern Italy districts of Modena and Reggio Emilia	Consolo U	2020	356	215 m 141 f	Investigating the behavior of dentists and analyzing their reactions to the professional restrictive measures of the COVID-19 epidemic due to the Italian National Administrative Instruction
COVID-19 pandemic: what changes for dentists and oral medicine experts? A narrative review and novel approaches to infection containment	Bizzoca ME	2020	-	-	The authors emphasize the importance of accurately identifying the risk of infection in dental practice and properly adjusting the use of PPEs in order to invest adequate financial resources and avoid putting dental teams and patients at risk.
Role of respirators in controlling the spread of Novel Coronavirus (COVID-19) among dental health care providers: a review	Umer F	2020	-	-	This review discusses respirators, their purposes and types, clinical efficacy, and appropriate techniques for their use.
COVID-19 and inequities in oral health care for older people: an opportunity for emerging paradigms	León S	2020	-	-	This article provides an overview of the oral health status imposed by COVID-19 and the minimum intervention options for providing care to older people who are at risk and have little access to treatment.

Table 2. The types of PPE commonly used for high-risk settings are shown with advantages and disadvantages for each. [Modified from Honda et al^{14,16,17}]

Type of PPE	Advantages	Disadvantages
Medical mask	Easy to wear, disposable, comfortable compared with N95, N99 respirators, or PAPR	Controversial adequacy against novel influenza or highly virulent droplet pathogens, not indicated when operator is in contact with highly virulent pathogens during aerosol-generating procedures
Particulate respirators (FFP2, FFP3, N95)	Indicated for airborne pathogens, able to protect from virulent pathogens during aerosol-generating procedures, disposable	Less comfortable, facial hair and facial deformity prevent the sealing of the mask to the face
Powered air purifying respirator (PAPR)	Desired for high-risk aerosol-generating procedures, half or full face piece provides facial protection	Unwieldy, battery-operated, not disposable
Gown	Easy to put on and take off, not causing heat, disposable, more available	Has more openings than coveralls
Coverall	Covers a large part of the surface area	Causes heat stress, unwieldy
Apron	Additional protection when using gowns or coveralls	Disinfection is needed with apron not Disposable
Goggles	Easy to wear, Protection of eyes	Affect visibility by fogging, some parts of face may not be protected
Face shield	Less fogging, Easy to wear, covers a larger part of the face	-
Gloves (double gloving)	Reduction of the risk of transmission of high virulent pathogens through glove holes, reduction of contamination risk for hands when removing gloves	Reduction of tactile sensation, unwieldy removal process
Head and neck cover	Protects head, neck skin, and hair	No evidence about protection in high-risk situations
Boots	Easy to disinfect, considered a standard equipment in high-risk procedures	Lack of information in comparison of boots vs shoes with covers
Shoes with covers	Easy to wear	Not optimal when the floor is wet

treating the patient's teeth. Therefore, to do dental work, you need to make sure that the entire dental team is well aware of how COVID-19 is transmitted and the preventive measures they should take.

Is the dentists' information sufficient in this regard?

Two studies have measured the knowledge of dentists in this field. In a study conducted in Italy,¹¹ the researchers concluded that the dentists had good information about how the virus was transmitted, but they did not know its symptoms well. Dentists were not yet sufficiently trained and did not have the necessary information to be able to work during the lazaretto.

This was contrary to the dentists' belief that they were up to date regarding COVID-19, as a significant percentage of them (40.9%) were unaware of the appropriate personal protective equipment; only 13.2% of them knew all the known symptoms of the disease.

In another study conducted in India,¹² the findings showed significant inadequacy in the knowledge of dental professionals about some of the various aspects of COVID-19 and that only one-third of participants were informed of personal protective equipment used during treatment. Therefore, the researchers found that there is an urgent need to raise dentists' awareness through health education and training programs.

According to the research work by De Stefani in Italy¹¹, there is still no consensus on appropriate personal protective equipment. The lack of a precise operational guidelines has created uncertainty about infection control measures and the proper use of personal protective equipment.

Have dentists changed their personal protective equipment since the outbreak?

In a study conducted by Consolo et al in Italy,¹³ a questionnaire containing 40 questions was provided to dentists online. The questionnaire asked dentists to identify the personal protective equipment they used before the outbreak. It was found that 34.6% of participants used only masks and gloves, 12.4% used masks, gloves, and isolated disposable gowns, and 42.4% used masks, gloves, isolated disposable gowns, disposable protective helmets, and goggles or pink shields. Finally, 10.7% also used other equipment. Most dentists (77%) said they should increase their personal protective equipment. Some (12.9%) were waiting for instructions to guide them through the procedure. Only 10 percent did not make the change, probably because they already used the maximum amount of personal protective equipment.

Personal protective equipment

There were two studies on personal protective equipment and the comparison of the different types. In a study

conducted by Bizzoca et al,¹⁴ they prepared a list of personal protective equipment and their advantages and disadvantages. Among the equipment, only pink shields were found to have no disadvantages.

Another study by Umer et al¹⁵ focused only on masks and respirators. It was revealed that the use of filtering facepiece respirators (FFRs) during the COVID-19 pandemic is essential to prevent the transmission of aerosols and droplets, as it is more fluid-resistant and better than surgical masks, which cause folding around the mouth and nose. The most common FFR used to prevent transmission is the N95 respirator. Of course, this respirator is less comfortable, and facial hair or facial deformities prevent it from folding properly.¹⁴

Disadvantages of personal protective equipment

We have already talked about the need to use personal protective equipment. However, they also have disadvantages. An example of these disadvantages is given in a study done by León and Giacaman.⁵ In this study, which focused specifically on the elderly, the healthcare staff's use of these devices was found to impede communication with patients with cognitive impairment, physical disorders, or dementia. For example, older people with hearing loss find it more difficult to understand a dentist who is using personal protective equipment. Elsewhere in the article, it is pointed out that the dental profession and the health care system face higher costs due to the need for additional personal protective equipment. Healthcare professionals should raise awareness of this problem among policymakers.

Conclusion

COVID-19 is currently a pandemic, and it is unclear how long it will last. This demonstrates the need for awareness and use of personal protective equipment, especially among dentists. Dentists are a high-risk population because some of their treatment processes involve the production of aerosols. Therefore, to do dental work, we need to ensure that the entire dental team is well aware of how COVID-19 is transmitted and the preventive measures they should take. Finally, it seems that the studies conducted in this field are insufficient, and there is still a need for further studies to answer the many remaining questions in this field. This may be due to a lack of precise operating instructions.

Each type of personal protective equipment currently available has its advantages and disadvantages. These devices can also cause problems, especially for patients with mental or physical disorders, making it more difficult for them to communicate with the dentist. In addition, this equipment leads to increased costs for healthcare professionals, which is more difficult for them when they have been away from work for some time. Finally, there

is still need for more studies to answer the remaining questions in this regard.

Limitations

- Lack of access to the full text of some articles
- A limited number of studies

Conflict of Interests

Authors have no conflict of interest.

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