Analysis of the Use of Personal Protective Equipment as a Prevention of the Spread of Covid-19 in Dentist Practice

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Abstract. Background: Coronaviruses are a big family that causes illness in both people and animals. The infection control PPE that dentists and dental nurses can employ during the corona virus. It often causes respiratory infections in humans, ranging from the common cold to severe diseases such as MERS and SARS. Purpose: To find out the analysis of the adaption of PPE as a way to avoid the spread of covid 19 in dentistry practice. Methodology: The author uses literature review as the method used to make this research. Topic researchs through Google Scholar, Pubmed and Science Direct. Based on the research title analysis of the usage of Personal Protective Equipment as a means of preventing the spread of coronavirus disease in dentist practice, the researchers conducted a literature review source search using keywords similiar the title, Personal Protective Equipment, PPE, prevention, covid-19, dentist practice. This literature review uses journals published from 2020 to 2022 and is fully accessible in PDF format. Results: Health workers such as dentists and dental nurses are at greater chance of transmitting covid-19 disease. Dentists must make adequate self-protection efforts using PPE so that the transmission of covid-19 transmission and cross-infection at the dentist's practice can be prevented properly.

Keywords: Personal Protective Equiment · Prevention · Covid-19 · Dentist Practice

1 Introduction

SARS-COV 2 is a new form of corona virus found in December 2019 in Wuhan, China. Covid 19 instances were begin announced in Indonesia on March 2, 2020, with two cases. This figure has steadily increased until today. According to data, there were 74,672,924 corona cases worldwide on December 17, 2020, with 1,658,268 deaths [1].

According to WHO, there have been 225 countries that have been infected with this virus in October 2021, a total of 4,961,489 deaths have been recorded in the world due to this virus. In Indonesia alone, there have been 143,333 deaths due to the virus (WHO, 2020). The virus is found in air, blood and saliva which can be spread through direct

B. Ichsan et al. (Eds.): ICHWB 2022, AHSR 61, pp. 67–77, 2023.
https://doi.org/10.2991/978-94-6463-184-5_8

or indirect contact. Dentists or dental nurses who treat COVID-19 patients or patients suspected of being infected with COVID-19 can initiate the spreading of this virus in dental practices [2].

Covid 19 can cause flu-like prodrome acting as a tickle in the throat, fever, pharyngitis, headache, fatigue, also diarrhea, as well as breathing difficulties, persistent discomfort or pressure in the chest, and blue lips or face, which indicate an emergency and require prompt treatment [3].

Previos to the Covid 19 epidemic, infection control was mandatory for medical personnel. This is done to protect dentists from inflammation in dentist practice. Infection control standards include hand hygiene, PPE (such as glove, mask, and goggle), cough etiquette, handling of sharp objects, environmental disinfection, and instrument processing [4].

PPE function like a border among dangerous items (for examples, bacteria and virus) and health professionals and patients skin, nose, mouth or eye (mucous membrane). PPE helps ensure that a person is safe from physical hazards that may be encountered in the work environment. The application of PPE is needed to help provide health services safely. The application of PPE serves to decrease cross-contamination between patients and patients or patients and doctors and/or nurses. The PPE used for infection control that can be beneficial by dentist and dental nurse during the COVID-19 pandemic, namely surgical masks, particulate respirators, protective glasses and face shields, gloves, surgical scrubs, coveralls, aprons and shoe covers [5].

1.1 Epidemiology of Covid-19

Corona desease is a disaster that causes illness in both people and animals. The infection control PPE that dentists and dental nurses can employ during the COVID-19 pandemic. It often causes respiratory inflammation in people, starting from the common cold to severe diseases such as MERS and SARS. The narrative corona virus discovered in humans following an unexpected incidence at China country at the beginning [6].

Coronavirus desease illness is zoonotic, however Severe acute respiratory may be transferred from person to person. The spread of this virus occurs in a very fast time. Transmission happen through droplets, namely from splashes from the mouth and nose, contact with droplets and fecaloral. The sparks will stick to objects and it is common for people to get infected if they touch these objects. The Covid-19 virus may survive for up to 72 h on stainless steel and plastic, 24 h on cardboard, and 4 h on copper.[7].

1.2 Covid-19 Transmission Route

Covid-19 is a very infectious illness. The SARSCoV-2 virus can spread through the air, direct contact and indirect contact. Dentists and/or dental nurses and patients both have a high risk of being exposed to COVID-19 in practice because dentists, dental nurses and patients are always face-to-face and potentially cross-contact. This is related to the dentist's actions that are always in direct interaction with the patient's bodily fluids such as slobber and blood, medical equipment that enters the patient's oral cavity and actions that produce aerosols [8].

A huge proportion of aerosol and droplet will be produced, which will be mixed with the sufferer's saliva or blood when the dentist performs aerosol-generating procedures acting as the using a high-speed dental device in the patient's oral cavity. In addition, droplets can also be generated when talking, coughing and sneezing. Before falling to the surface, aerosols and droplets can continueto float for more than 3 h. Aerosol with diameter of less than 5 m can fly up to more than 1 m while droplets with a diameter of more than 5 m can fly up to less than 1 m. Aerosols and droplets containing in SARS-CoV-2 virus that fly into the air can enter in respiratory tract and infect humans [9].

Transmission by direct contact can occur when direct contact with bodily fluids like blood and saliva. Saliva and blood are examples of bodily fluids from the patient's oral cavity are often touched directly by the dentist and can lead to cross-infection. Direct contact can also occur if the dentist is close to a patient who does not use a mask when speaking or coughing [10].

In addition to direct contact, transmission of covid-19 could be through indirect contact through contaminated surfaces and equipment. Aerosols and airborne droplets will fall to the surface and after 72 h the SARS-CoV2 virus can still be detected on some surfaces. The dentist's office must be kept clean and dry because the SARS-CoV-2 virus will last longer in humid conditions and at room temperature the virus can prompt contagious for 2 h to 9 days. An uninfected person will have their hands contaminated if they touch a contaminated surface. This will cause self-inoculation if the person touches the face area because the virus will affect the eyes, nose, and mouth enter through the mucous membrane [11].

1.3 Personal Protection Equipment (PPE)

PPE is meant to keep dentists and dental nurses safe from infectious pathogens such as blood, saliva or materials that have the potential to transmit disease. PPE includes gloves, masks, face shields, eye protection, and protective apparel (such as reusable or disposable gowns, laboratory coats, jackets). Gloves are also used when there is the risk of coming into touch with blood, mucosa, bodily fluids, non-intact skin, or contaminated surfaces. This very same glove should not be used to treat more than one patient. Gloves should not be washed because gloves cannot be reused. Wash hands immediately after removing gloves. Protective clothing is worn during procedures that have the potential for contact with blood or saliva. Masks and eye protection are worn during procedures where splashes of blood or other body fluids are likely to occur. While using PPE, make sure not to touch your face, limit the surfaces you touch, remove PPE when you have finished treating patients and wash your hands [12].

Some PPE that functions to prevent cross-contamination between patients and patients or patients and doctors and/or dental nurses, namely masks, is one of them. The mask used must protect the mouth and nose and make sure that edges of mask are not loose. The outside of the mask should not be touched under any circumstances. When treating patient with proven or suspect covid-19, A surgical mask and particulate respirator are required. Surgical masks are put on first then particulate respirators. Apart from masks, protective glasses and face shields are also necessary to protect the eye area from droplets. It is better to use protective goggles rather than a face shield because

goggles are an air tight apparatus while face shields are not. If you use both together, it will be more optimal in protecting the eye area. Gloves are also required and it is advisable to use two layers of gloves i.e. surgical gloves first then nitrile gloves. Surgical gloves are useful to be free from contamination when removing other PPE and protect hands if nitrile gloves are damaged. Surgical scrubs, coveralls and aprons are important for protecting body parts. On the inside use a surgical scrub. After that, the coverall is also used on the inside to prevent contact with body fluids [13].

Surgical scrubs and coveralls are designed to be moisture-resistant so they don't cause discomfort if you sweat. Apron is used to prevent liquid splashing contact. Head cover is needed to protect hair from droplet contamination. We recommend using two layers of cover to protect the head in case of damage to one of the layers. Shoe covers to protect shoes from contaminated floors and must be replaced every time they enter and leave the contaminated area [14].

The following are the three levels of PPE protection, namely:

Level 1 protection for triage and outpatient clinics in the form of disposable surgical caps, disposable surgical masks, disposable latex gloves, work uniforms and, if necessary, disposable isolation clothing.

Level 2 protection for poly fever, isolation rooms (including ICU rooms), examination of non-respiratory specimens from suspected or confirmed patients, radiographic examination of suspected or confirmed patients, cleaning of surgical instruments used by suspected or confirmed patients in the form of disposable cap, medical protection mask (N95), work uniform, disposable medical protection uniform, disposable glove and protection goggle.

Level 3 protection for personnel performing procedures like tracheotomy, tracheal intubation, bronchofibroscope, gastroenterology endoscopy and others as long as suspected or confirmed patients may splash respiratory secretions or body fluids or blood, when officers perform surgery and autopsies for confirmed patients or suspected, when officers perform PCR (Polymerase Chain Reaction) for covid-19 in the form of disposable cap, medical protection mask (N95), work uniform, disposable medical protection uniform, disposable glove and full-face respirator mask or airpurifying respirator [15].

Three levels of protection are recommended for use by dentists and dental hygienists in practice, namely:

The main protection or standard protection is using disposable cap, disposable surgical mask, work uniform, protection goggle or face shield and disposable glove.

Secondary protection in handling patient, namely wearing disposable surgical cap, disposable surgical mask, protective eyewear, face shield and work uniform with disposable isolation clothing or surgical gown on the outside and disposable glove.

Tertiary protection (extra protection in handling patients with confirmed or suspected covid-19). Patients with confirmed or suspected COVID-19 should be hospitalized. When treated in a dentist's office, special protective clothing is required because dentists and dental hygienists cannot avoid close contact. If special protective clothing is not available then a work uniform can be used with extra disposable protective clothing on the outside then a disposable surgical cap, goggles, face shield, disposable surgical mask and FFP2 or FFP3 mask, disposable latex glove and shoe cover on waterproof rubber boot [4].

2 Methods

The author uses a literature review as the way or method used to make this research. The strategy for finding sources for research topics was bring off through Google Scholar, PubMed, and Science Direct. Based on the research title analysis of the usage of PPE as a method of reducing the transmission of coronavirus disease in dentist practice, the researchers conducted a literature review source search using keywords similiar the title, PPE, prevention, covid-19, dentist practice. This literature review uses journals published from 2020 to 2022 and is fully accessible in PDF format. The search was conducted based on keywords and found 855 articles. Then the research was conducted depending on the year of publication from 2020–2022 and found 223 articles that met the criteria. Then the articles were filtered by title and abstract found 50 articles that match the criteria. The articles were filtered again based on the contents of the articles found 6 articles used in this study (Fig. 1).

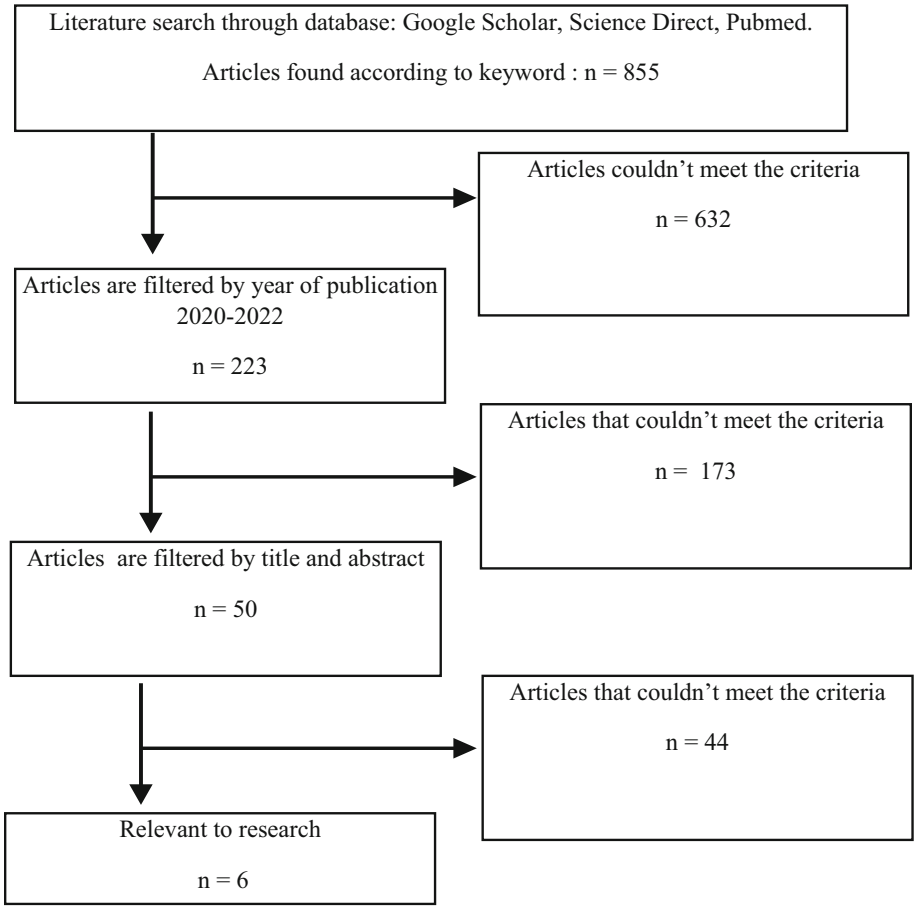

Fig. 1. PRISMA flow diagram

3 Results

See Table 1.

Table 1. Article characteristics

Writer, Year	Journal	Source	Purpose	Methods	Results
Chasib et al., 2021	Dentists' practices and attitudes toward using personal protection equipment and associated drawbacks and cost implications during the covid-19 pandemic	Google scholar	The purpose of these learning was for investigating dentists' behaviors also attitudes toward the usage of PPE as well as the associated costs also costs throughout the pandemic.	A cross sectional research	The median scores for attitudes toward using PPE were 2.26 and 0.90, respectively, while the median scores for practices involving the application of ppe were 5.41 and 1.71 (median 6). The median scores for downsides and cost were identical at 5.22 and 1.24 (median 5) and 1.68 and 0.74 (median 2), severally. In comparison to their peers, dentists who had recently graduated, had postgraduate degrees, also worked in the private section displayed more high degrees of practices. Regression study showed that while attitudes toward PPE are considerably influenced by only one qualification, exercises of PPE may be anticipated based on credentials and work environment

(*continued*)

Table 1. (*continued*)

Writer, Year	Journal	Source	Purpose	Methods	Results
Akbari et al., 2021	Comparison of the use of personal protective equipment and infection control in dentists and their assistants before and after the corona crisis	Google scholar	This study compared how dentists and their assistants used PPE, SPE, and adhered to PIC before and after the corona crisis	A cross sectional study	Before and after the corona crisis, dentists used PPE more frequently for oral and dental examinations as well as dental operations ($p < 0.001$). With the exception of different forms of adsorption ($p = 0.22$), dental handpieces ($p = 0.66$), and dental part ($p = 1$), there are indicatory changes in terms of often of utilize of speadditionally, observance of pic prior to and following the corona criticalness. Prior to also following the corona crisis, dental assistants used PPE much less frequently ($p < 0.001$)
Ionescu et al., 2021	Efficacy of personal protective equipment against coronavirus transmission via dental handpieces	Google scholar	To determine how well PPE and HVE work to prevent the transmission of the hcov-229e during a routine dental operation	Eksperimental study	Low contamination was induced by the inoculum's extensive distribution across the superficies. When using a face shieldwas not employed, virus loads on masks and respirators' external surfacesvaried from 1.2 to 1.4 log10 average number of gene copies per cm2. For all PPE, virus loads fell under the threshold limit (< 0.317 log10 gene copies/cm2) when the shield was on display. When employing any PPE, with or without the shield, the virus loads inside the mouth were below the detection threshold. Hve had no significant effect on viral loads

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Writer, Year	Journal	Source	Purpose	Methods	Results
Chen et al., 2022	Assessment of dental personal protective equipment (ppe) and the relationship between manual dexterity and dissemination of aerosol and splatter during the covid-19 pandemic	Science direct	We examined the effectiveness and potential inadequacies of PPE when brushing teeth and looked at the relationship between doctors' skill and the size of the droplets they could spray	Eksperimental study	Pigment splash marks were discovered on both the dentist's and the assistant's PPE. Except for shoe covers, hair caps, and surgical masks. A statistically significant difference exists between interns, residents, and attending physicians ($p < 0.05$), the interns cleaned for noticeably longer than the residents and doctors. The difference between the interns' and residents' splatter distances was statistically significant ($p < 0.05$)
Melo et al., 2021	Covid-19 management in clinical dental care part ii: personal protective equipment for the dental care professional	Pubmed	This article's goal is to explain how dental care professionals (dcp) choose also use PPE while taking into account the risk level associated with the proposed procedures	Eksperimental study	In addition to other operational precautions, the right use of PPE can offer excellent defense against germs that are spread through bodily fluids or the air
Diakonoff et al., 2022	Application of recommended preventive measures against covid-19 could help mitigate the risk of sars-cov-2 infection during dental practice: results from a follow-up survey of french dentists	Pubmed	The purpose of this study was to resurvey French dentists following the first lockdown in france in order to (1) inform about the prevalence of covid-19, (2) evaluate the effectiveness of precautionary measures put in place after the isolation ended, also (3) determinedangerbarometerlinked to covid-19	A cross sectional research	According to the findings, 3.6% of the 3497 respondents had covid-19. Covid-19 risk factors included using surgical masks during non-aerosol producing procedures, while protective factors included limiting the number of patients

4 Discussion

Coronavirus disease is a very infectious illness. The SARSCoV-2 virus can spread through the air, direct contact and indirect contact. Dentists and/or dental nurses and patients both have a high risk of being exposed to covid-19 in practice because dentists, dental nurses and patients are always face-to-face and potentially cross-contact. This is associated with the actions of dentists who are always in direct interaction with the patient's body fluids such as the patient's saliva and blood, medical equipment that enters the patient's oral cavity and actions that produce aerosols [21].

Aerosols and airborne droplets will fall to the surface and after 72 h the SARS-CoV2 virus can still be detected on some surfaces. The dentist's office must be kept clean and

dry because the SARS-CoV-2 virus will last longer in humid conditions and at room temperature the virus could contagious for 2 h to 9 days. An uninfected person will have their hands contaminated if they touch a contaminated surface. This will cause self-inoculation if the person touches areas of the face like the eyes, mouth, and nose because the virus will enter through the mucous membranes [22].

Prevention that can be done in dentistry against the corona virus is by using PPE. PPE that can be used can be in the form of latex gloves, hazmat, protective goggles, N95 or KN95 masks, face shields, shoe covers, head covers. Before using basic self-protection equipment, you can wash your hands with soap. Do not forget, the use of PPE or personal protection in accordance with procedures could decrease the danger of increasing the corona virus. Personal protection or PPE consists of 3 levels that can be used in dentistry. Level 1, using standard protection for clinic staff using disposable head coverings, disposable surgical masks, white coats, face shields, and disposable latex gloves. Level 2, which is to protect dentists using PPE such as level 1 plus disposable surgical gowns Meanwhile, level 3 is used for treatment the sufferers with suspicion coronavirus disease. Level 3 PPE is used inside the form of protective clothing or hazmat. If hazmat is not available, you can use a white coat covered with a disposable gown or robe, plus goggles or face shield, latex gloves and shoe covers [23].

5 Conclusion

Health workers such as dentists and dental nurses can be the hazardous of transmitting coronavirus disease. This is because the dentist works on the patient's oropharyngeal area which produces a lot of aerosols. The existence of these risks requires dentists to carry out adequate self-protection efforts using level 3 PPE so that the dissemination of covid-19 transmission and cross-inflammation in the dentist's practice can be prevented properly.

Acknowledgements. All authors were gladly to everyone who helped and encouraged the author in this study. The authors are grateful to all staff at Muhammadiyah University of Surakarta's Faculty of Dentistry.

Authors' Contributions. All essential elements of the content, as well as a comprehensive evaluation of the entire work, are the authors' responsibility.

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