

# Prevention of aerosol transmission in dental preparation during the corona virus (covid-19) pandemic facing the new normal



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## Abstract

**Objective:** To prepare for the needs of facing the new normal era in dental practice, especially in aerosol transmission for dental conservation treatment.

**Methods:** Literature searches are obtained from several literature study sources related to the topics to be discussed.

**Results:** The spread of COVID-19 infection could be through aerosol transmission generated during dental conservation treatment.

**Conclusion:** Special precautions are considered to be effective during dental care procedures during the COVID-19 pandemic facing the new normal era.

**Keywords:** Dental conservation treatment, Covid-19, Aerosol transmission, Dentistry

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## Introduction

Corona viruses belong to the Coronaviridae family in the order Nidovirales. Corona viruses are small (65-125nm in diameter) and contain single-stranded RNA as the nucleic material, ranging in size from 26 to 32 kbs. Severe Acute Respiratory Syndrome Corona Virus (SARS-CoV), influenza A H5N1, H1N1 2009 and Middle East Respiratory Syndrome Corona Virus (MERS-CoV) cause Acute Lung Injury (ALI) and acute respiratory distress syndrome (ARDS) which causes lung failure and resulting in death.<sup>1</sup> Figure 1 shows the structure of the respiratory syndrome that causes the human corona virus.

Clinical symptoms of COVID-19 are mostly symptomatic including a dry cough which is usually accompanied by fever, difficulty breathing, fatigue and other less typical symptoms. Covid-19 can also be asymptomatic, or with mild symptoms, moderate symptoms, severe and critical symptoms.<sup>2</sup>

The average incubation period for COVID-19 is estimated to be up to 14 days, which is the commonly used duration for medical observation and quarantine of exposed patients. Although patients with COVID-19 symptoms have been the main source of transmission, recent observations suggest that asymptomatic patients and patients in their incubation period can also be silent carriers of SARS-CoV-2. Health workers and other patients in hospitals are also at high risk of transmitting infection with SARS-CoV-2.<sup>2</sup>

Initial screening via telephone to identify patients suspected or possibly infected with COVID-19 can be carried out remotely before making an

appointment. The most relevant questions for initial screening should include any exposure to a patient with a known or suspected presentation of COVID-19, recent travel history to an area with a high incidence of COVID-19 or the presence of symptoms of respiratory illness, fever or cough.<sup>3</sup>

## Methods

### COVID-19 Transmission in Conservative Dental Care

In the context of the corona virus, a study examined the oral cavity of SARS patients and found large amounts of SARS-CoV RNA in the patient's saliva (7.08×10<sup>3</sup> to 6.38×10<sup>8</sup> copies/mL). This indicates that the transmission of the corona virus may occur through oral droplets. Dental conservation treatments such as tooth preparation to endodontic treatment are very challenging during the COVID-19 outbreak due to the inhalation of particles and aerosols generated during treatment. Figure 2 shows the initial screening that can be done for COVID-19.

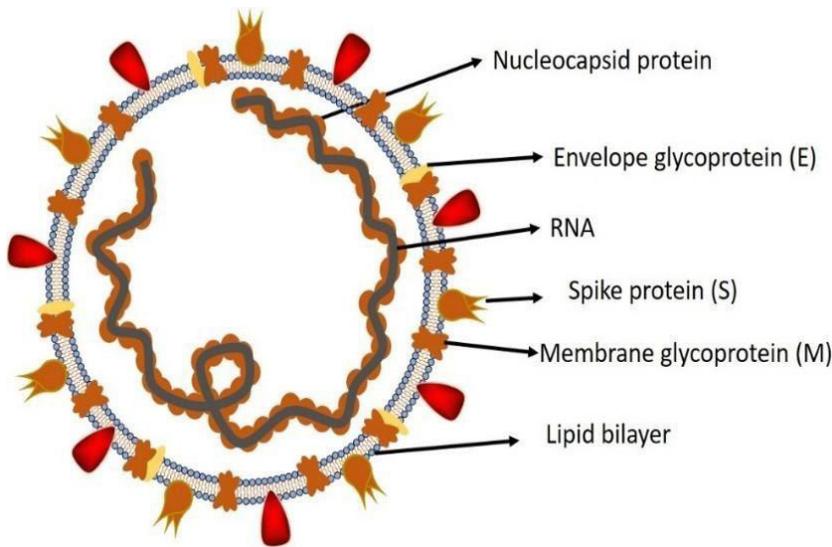
If a respondent is found (+) for one of the 3 questions, treatment must be postponed for at least 2 weeks according to the incubation period of COVID-19. Patients are advised to self-quarantine and contact the primary care physician by telephone.<sup>4,5</sup>

### Aerosol Transmission of Dental Patients during the 2019 Corona Virus Pandemic (COVID -19)

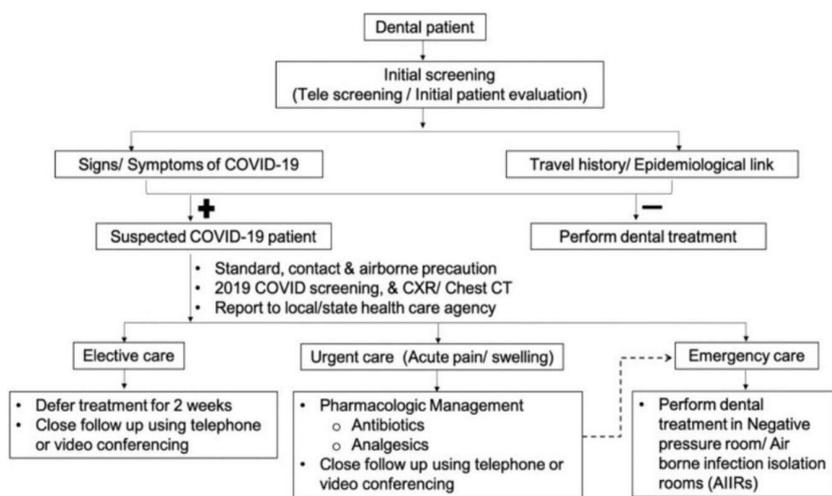
Aerosol transmission to dental patients during the COVID-19 pandemic is very likely to occur if the

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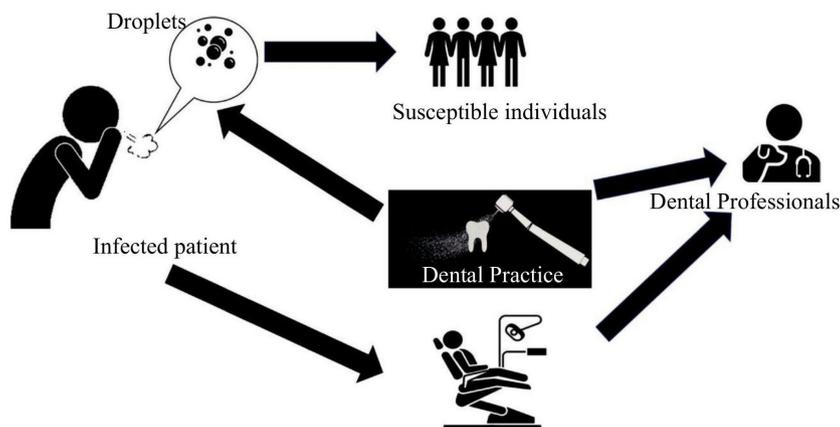
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**Figure 1** The structure of the respiratory syndrome causing the human corona virus



**Figure 2** Initial screening



**Figure 3** Illustration of the covid-19 transmission route at the dental clinic

treatment procedure uses dental equipment that can trigger aerosol transmission, such as in cavity preparation treatment using dental handpieces.

In addition, saliva in the oral cavity can also be a source of transmission of COVID-19 because it can produce droplets, not only that, blood flow during treatment is also highly avoided because it can be a source of transmission.<sup>6</sup> Figure 3 shows an illustration of the transmission route of covid-19 in dental clinic.

Dental equipment such as high-speed handpieces use high speeds to drive turbines and work with flowing water so that dental equipment working in the patient's oral cavity produces a number of aerosols and droplets that mix with the patient's saliva or even produce blood flow in the event of trauma. Droplet and aerosol particles are small enough to remain in the air for a long time before settling on environmental surfaces or entering the respiratory tract, so a dental aerosol vacuum is needed to minimize this.<sup>7,8</sup> Figure 4 shows the aerosols generated by the dental equipment.

**Cross-contamination prevention protocol**

SARS-CoV-2 can survive on surfaces for several hours or up to several days, depending on the type of surface, temperature or humidity of the environment (WHO 2020). This reinforces the need for hand hygiene and the importance of thorough disinfection of all surfaces in the dental clinic. The use of personal protective equipment, including masks, gloves, gowns, and goggles or face shields, is recommended to protect the skin and mucosa from blood or secretions that may become infected.

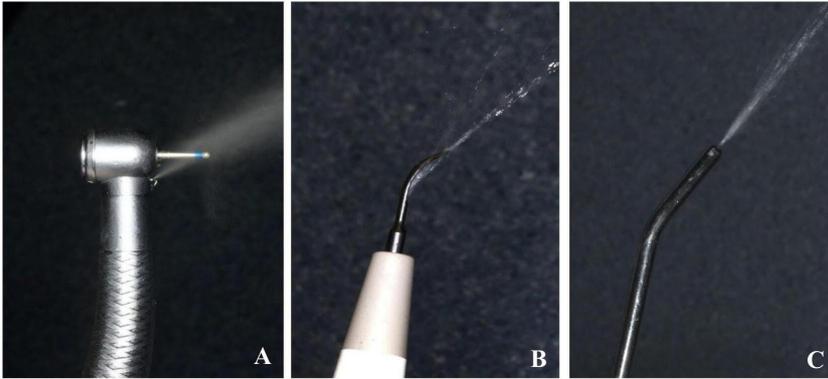
Spread through direct contact from a source of microorganisms originating from the patient's mouth can be through the skin of the dental team and for infection control it must use gloves and increase body immunity. Spread can occur through droplets, mechanisms or steps to enter the body because the corona virus is inhaled by the operator, while infection control is carried out using masks, rubber dams and mouthwash on patients.<sup>9</sup>

**Results**

**Recommendations for Dentist Practice**

Based on experience and relevant guidelines and research, dentists should take strict personal protective measures and avoid or minimize treatments that can generate droplets or aerosols. The use of low or high-volume saliva ejectors can reduce the production of droplets and aerosols. The ventilator located under the dental unit must always function during treatment, the air conditioner must be turned off, and the room sterilized using UV light.<sup>3</sup>

If providing care for a suspected or confirmed case of COVID-19 infection, the operator should observe the following recommendations: Operators must follow standard, contact, and



**Figure 4** A. Aerosols produced by dental high-speed handpieces, B. Ultrasonic scalers, C. 3-way syringes

airborne precautions, including proper use of personal protective equipment and hand hygiene; Preprocedural mouth rinse: previous studies have shown that SARS-CoV and MERS-CoV are highly susceptible to preprocedural mouth rinses with 0.2% povidone-iodine can reduce the burden of corona virus in saliva. Another alternative is to use a 0.5% - 1% hydrogen peroxide mouth rinse, because it has non-specific virucidal activity against the corona virus; Use of single-use devices such as mouthpieces, syringes, and blood pressure cuffs to prevent cross-contamination; Use of Radiographs: panoramic or tomography is used to avoid vomiting or cough reflexes that may occur intraoral; The use of a rubber dam by the operator to minimize the generation of splashes, minimize the use of ultrasonic instruments, high speed handpieces, and 3-way syringes to reduce the risk of aerosol contamination; Use of Negative-pressure treatment rooms/airborne infection isolation rooms (AIIR). Patients with suspected or contaminated COVID-19 should not be admitted to a routine dental practice. Instead, patients should only be treated in a negative pressure room or AIIR.

## Discussion

### Personal Protective Equipment

The use of personal protective equipment is now part of the dental routine to protect the operator from direction and saliva. WHO recommends the use of a particulate respirator at least as protective as the US National for Occupational Safety and Health (NIOSH)-certified N95, European Union (EU) standard FFP2, or equivalent when performing nursing procedures?. In the field of dentistry today, the use of special protective equipment is highly recommended, such as the P100 mask where the filter can be changed, the dress/gown is only worn once or a maximum of 2 uses after sterilization.<sup>9</sup> Masks, protective goggles, face shields; Wear

a surgical mask and eye protection along with a face shield to protect the eyes, nose and mouth during procedures that are likely to result in splashes of blood or other body fluids such as aerosols; Change the mask at every patient change or during patient care if the mask gets wet; Clean with soap and water and disinfect reusable protective equipment such as goggles and face shield.

Protective clothing; Wear protective clothing such as gowns that are reusable or disposable and can cover all parts of the body; Change protective clothing if it is visibly soiled or if it has been exposed to blood and other potentially infectious fluids.

Gloves; Wear medical gloves if there is a potential for contact with blood, saliva, potentially infectious materials or mucous membranes; Put on new medical gloves for each patient, remove them immediately after use, and wash hands immediately to avoid transferring microorganisms to the patient or other environment; Remove any torn, cut or punctured gloves as soon as possible and wash hands before regloving; Do not wash, sterilize or disinfect gloves that have been used for reuse; Make sure that the gloves are used according to the size of the operator's hands so that there are no difficulties during maintenance.<sup>9</sup>

## Conclusion

The anticipatory knowledge of health care centers with the provision of AIIR will help operators to provide emergency care if needed; Nurses must ensure to disinfect inanimate surfaces using chemicals recently approved for COVID-19 and maintain a dry environment to combat the spread of SARS-CoV-2.

## Acknowledgment

None.

## Conflict of Interest

The authors report no conflict of interest.

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