

## DENTAL CONSIDERATIONS AMIDST COVID-19 SCARE

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### Abstract

A Novel coronavirus (2019-nCoV) identified in Wuhan city of china capable of causing life threatening respiratory illness declared as a pandemic by WHO and has become a global fear among the community and healthcare professionals in 2020. 2019-nCoV is a positive stranded RNA virus having an origin from bats targets the host cells via the enzyme Angiotensin Converting enzyme 2(ACE2), which is most abundant in the type II alveolar cells of the lungs. This virus has usual incubation period of approximate 5 days and typically spread from one person to another via respiratory droplets produced during coughing and sneezing. Spread of this virus in the community has been reported through direct transmission route such as cough, droplet transmission, aerosols, salivary route, ocular and through the contact spread. As the dental practice compels dentists to come in face to face contact with the patients and aerosols during certain dental procedures leading to the heightened risk of 2019-nCoV transmission from infected patients. We hereby make an attempt to discuss 2019-nCoV infection spread in the community and among dentist, including precautions and considerations pertaining to the practice of dentistry amidst 2019-nCoV scare.

### Introduction

Coronaviruses are a group of related viruses that have been known to cause diseases in mammals and humans. In the past, it usually manifested as a respiratory disease in humans ranged from a mild common cold to a fatal infection such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS).<sup>1,2</sup>

An outbreak of viral pneumonia cases of unknown cause was reported by health authorities in Wuhan, the capital of Hubei province, China on 31 December 2019.<sup>3</sup> Many of the reported cases mostly had links to the Huanan Seafood Wholesale Market, which also sold live animals; therefore, the virus is believed to have a zoonotic origin.<sup>4</sup>

Examination of bronchoalveolar lavage fluid of the admitted patients followed by whole genome sequencing, direct polymerase chain reaction (PCR) and culture has led to the identification of a novel coronavirus which was named 2019 novel coronavirus(2019-nCov).<sup>5</sup>

Since then, this viral pneumonia has rapidly spread to other provinces in china and 34 other countries.<sup>6,7</sup>

On 11th February 2020, World health organization (WHO) named the novel viral pneumonia as "Corona Virus Disease (COVID19)", while the international Committee on Taxonomy of Viruses (ICTV) suggested this novel coronavirus name as "SARS-CoV-2" due to the phylogenetic and taxonomic analysis of this novel coronavirus.<sup>8</sup>

The infection is typically spread from one person to another via respiratory droplets produced during coughing and sneezing.<sup>9</sup>

Distinctive work setting makes dentist to come in close contact with the patients and aerosols during certain dental procedures leading to the heightened risk of SARS-CoV 2 transmission from infected patients. To formulate and implement effective prevention and control strategies of SARS-CoV-2 within the dental field, comprehensive knowledge of the SARS-CoV-2 dynamics is needed. Therefore, an electronic search was conducted on PubMed and the China National Knowledge Infrastructure database for articles, using the keywords "novel coronavirus", "2019 novel coronavirus", "SARS-CoV- 2", "COVID-19" or "2019-nCoV".

This review is an attempt to discuss SARS-CoV-2 infection spread in the community and those providing dental treatment to them, including precautions and considerations pertaining to the practice of dentistry.

### General features of COVID-19 and SARS CoV2

The usual incubation period of covid-19 ranges from one to fourteen days; with a median incubation period of approximate 5 days.<sup>10</sup> The infection is typically spread from one person to another via respiratory droplets produced during coughing and sneezing.<sup>11</sup>

Early epidemiological Data indicate that the patients' median age was 59 years, with a range of 15 to 89 years. There were no significant gender differences (56% male).<sup>12</sup>

Symptoms of COVID-19 are varied and patient could be asymptomatic or show flu like symptoms such as fever, cough, fatigue, shortness of breath, or muscle pain. Further development can lead to severe pneumonia, acute respiratory distress syndrome, sepsis, septic shock and death.<sup>13</sup>

Although a good contact history, systemic symptoms, and radiographic changes of pneumonia make the diagnosis likely, the laboratory diagnosis is more reliable. Reverse transcription polymerase chain reaction (RT-PCR) from a nasopharyngeal swab is routinely used to detect causative viruses from respiratory secretions.<sup>14,15</sup>

Coronaviruses are positive-stranded RNA viruses with a crown-like appearance under an electron microscope (*coronam* is the Latin term for crown) due to the presence of spike glycoproteins on the envelope and hence got its name. The subfamily *Orthocoronavirinae* of the *Coronaviridae* family (order *Nidovirales*) classifies into four genera: Alphacoronavirus (alphaCoV), Betacoronavirus (betaCoV), Deltacoronavirus (deltaCoV), and Gammacoronavirus (gammaCoV). Furthermore, the betaCoV genus divides into five sub-genera or lineages.<sup>16</sup> SARS-CoV-2 explored in Wuhan belongs to the  $\beta$ -CoV according to the phylogenetic analysis based on the viral genome.<sup>17</sup>

The genome nucleotide sequence identity between a coronavirus (BatCoV RaTG13) detected in the bat *Rhinolophus affinis* from Yunnan Province, China, and SARS-CoV-2, was 96.2%, indicating that the natural host of SARS-CoV-2 may also be the *Rhinolophus affinis* bat.<sup>18</sup> However, the differences may also suggest that there is an or more intermediate hosts between the bat and human. Though the SARS-CoV-2 originated from bats, the intermediary animal through which it crossed over to humans is uncertain. Pangolins and snakes are the current suspects.<sup>19</sup>

The lungs are the organs most affected by COVID-19 because the virus accesses host cells via the enzyme Angiotensin Converting enzyme 2 (ACE2), which is most abundant in the type II alveolar cells of the lungs. The virus uses a special surface glycoprotein, called "spike", to connect to ACE2 and enter the host cell.<sup>20</sup>

### Spread of virus in a dental set-up

Direct spread through droplets and contact are the two major routes of transmission of SARS-CoV2 in a dental setting.<sup>21</sup> Presence of live virus has also been found in the saliva of infected individuals.<sup>22</sup> Limited research have shown the airborne transmission through aerosols.<sup>23</sup> Eye exposure has also shown the transmission in some of the studies.<sup>24</sup>

Dental professionals are very frequently exposed to the bioaerosols generated during certain dental treatments. The dental devices such as high-speed dental handpiece and ultrasonic scalers when work in the patient's oral cavity, generates a large number of aerosols mixed with saliva or blood which remains airborne in the dental setting which afterwards settles down on the surfaces and contaminates it. These bioaerosols composed of relatively small particle size that can lead to increased risk of infection among dental professionals.<sup>23</sup>

As the experimental study revealed, SARS-CoV2 remained viable in aerosols for approximate 3 hours. The scientists found that SARS-CoV2 was detectable on copper for 4 hours, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel.<sup>25</sup>

Therefore, droplet and aerosols spread from infective individuals and frequent contact of contaminated surfaces in dental settings are a potential source of SARS CoV2 transmission among dentists and hence strict preventive measures are to be implemented.

### Review of precautionary measures

Here we recommend the infection control measures that should be followed by dentist. Our recommendations are based on *Centers for disease control and prevention (CDC): Healthcare infection control guidance, the Guideline for the Prevention and Control of Novel Coronavirus Pneumonia in Medical Institutes* (the 1st edition), and *the Guideline for the Use of Medical Protective Equipment in the Prevention and Control of Novel Coronavirus Pneumonia* released by the National Health Commission of the People's Republic of China.

### Patient assessment

As always, dentists should take a thorough medical history from each patient and update it at each recall appointment. The questionnaire should be presented to the patients before the onset of procedure consisting of

targeted screening questions regarding COVID-19. These questions may include the following:

- Do you have fever?
- Have you experienced a recent onset of a respiratory problem, such as a cough or difficulty breathing?
- Have you, within the last 14 days travelled internationally or visited an area where documented or suspected COVID-19 transmission is occurring?
- Have you come into contact with a patient with COVID-19 in the past 14 days?

If a patient replies “yes” to the first two screening questions, the dentist should get into personal protective equipment before the procedure<sup>26</sup>

In the event that the patient recently has returned from a geographic region with documented or suspected transmission of COVID-19, the clinician can defer elective treatment until the incubation period is over. Dentists can provide emergency treatment, provided they use routine barrier precautions and avoid spatter or aerosol-generating procedures. This emergency treatment should be limited to the control of pain and infection. Dentists should not treat patients in the dental office who are suspected of having COVID-19.

Clinicians should delay treating convalescing patients for at least one month after they are released from the hospital.<sup>27</sup>

#### Personal protective equipment (PPE)

CDC outlines the specific personal protective equipment and the order in which healthcare providers should put it on ,1) Gown2) Surgical Mask/respirator3) protective eyewear/face shield 4) gloves.<sup>28,29,30</sup>

#### Respiratory Hygiene

As surgical masks are not designed to provide adequate protection against exposure to a droplet nucleus smaller than 5 micrometers. For such purposes, particulate respirators (for example, N-95 masks) must be used especially during the aerosol generating procedure.<sup>30</sup>

In times of shortages, alternatives to N95s should be considered, including other classes of Filtering facepiece respirator (FFRs), elastomeric half-mask and full facepiece air purifying respirators, and powered air purifying respirators (PAPRs) where feasible.<sup>31</sup>

#### Hand Hygiene

According to the CDC hand hygiene guidelines, dentists should perform hand hygiene before and after all patient contact, contact with potentially infectious material, and before putting on and after removing PPE, including gloves. It should be performed by using alcohol-based

hand rub (ABHR) with 60-95% alcohol or washing hands with soap and water for at least 20 seconds.<sup>31</sup>

A study published in 2017 in the *Journal of Infectious Diseases* evaluated the virucidal activity of ABHS against re-emerging viral pathogens, such as Ebola virus, Zika virus (ZIKV), severe acute respiratory syndrome coronavirus (SARS-CoV), and Middle East respiratory syndrome coronavirus (MERS-CoV) and concluded that the enveloped viruses could be effectively inactivated by both WHO formulations I and II (ethanol-based and isopropanol-based respectively).<sup>32</sup> This further supports the use of ABHS by dentists in viral outbreak situations. Another advantage to using ABHS is that they are often less irritating to the hands. Excessive hand washing with soap and water can cause skin damage and increase the risk for infections. Drying hands with a towel remove pathogens first by friction during rubbing with the drying material and then by wicking away the moisture into that material. The CDC recommends the use of alcohol-based hand rubs containing various emollients and other skin conditioners as a strategy to reduce skin damage, dryness, and irritation.<sup>33,34</sup>

After using an alcohol-based hand rub, the dentist must dry his or her hands thoroughly before putting on gloves, because any residual alcohol may increase the risk of glove perforation.<sup>35</sup>

#### Oral examination during COVID-19 outbreak

Preventive measures can be implemented by controlling the gag or cough reflex during examination and dental procedures. The gag or cough reflex may be stimulated by certain procedures, such as posterior intraoral and bite-wing radiographs and taking impressions. Extraoral radiographs may be considered as an interim alternative to intraoral radiographs for examination.<sup>36</sup>

Since oral mucosa is very sensitive in posterior regions, therefore local anaesthesia should be administered to reduce sensitivity, thereby reducing the gag or cough reflex while taking impressions.<sup>37</sup> Sedation may also be considered to control gag reflex.<sup>38</sup>

#### Preprocedural mouth rinse during COVID-19 outbreak

A preprocedural antimicrobial mouth rinse (with 0.12 to 0.2 percent chlorhexidine gluconate) is believed to reduce the number of microbes that are released into the operatory environment.<sup>39</sup>

However, no concrete data show that a preprocedural mouth rinse reduces infection among dental health care workers or patients. A preprocedural rinse would be most useful in situations in which a rubber dam cannot be used, such as when a prophylaxis cup or an ultrasonic scaler is used, and in the absence of assisted, high-volume suction.

### Rubber dam isolation during COVID-19 outbreak

Rubber dams help minimize the production of saliva- and blood- contaminated aerosol or spatter. A study reports an up-to-70-percent reduction in airborne particles around a 3-foot diameter of the operational field when a rubber dam was used.<sup>40</sup> Thus a four handed dentistry is recommended.

### Emergency endodontic treatment during COVID-19 outbreak

In the event of an emergency endodontic treatment, the caries removal and pulp exposure could be done using chemo-mechanical method, under rubber dam and high-volume suction after local anaesthesia<sup>41</sup>

Clinical experience shows that placing a pulp devitalizing agent should be performed to reduce pain and then the filling material can be replaced gently without a devitalizing agent later according to the manufacturer's recommendation.<sup>42</sup>

### Scheduling the appointment during COVID-19 outbreak

To decrease the risk of nosocomial infection, the patient should be scheduled as the last appointment of the day. After treatment, environmental cleaning and disinfection procedures should be followed.<sup>43</sup> Alternatively, patients could be treated in an isolated and well-ventilated room or negatively pressured rooms if available for suspected cases with COVID-19.

### Emergency tooth extraction during COVID-19 outbreak

If the tooth needs to be extracted, absorbable suture should be preferred. It is advised to rinse the extraction wound slowly and use the saliva ejector to avoid spraying.<sup>42</sup>

### Managing maxillofacial injuries during COVID-19 outbreak

Life-threatening cases with oral and maxillofacial compound injuries should be admitted to the hospital immediately, and chest CT should be prescribed if available to exclude suspected infection because the RT-PCR test, besides time-consuming, needs a laboratory with pan-coronavirus or specific SARS-CoV-2 detection capacity.<sup>42</sup>

### Oral prophylaxis during COVID-19 outbreak

To minimize the generation of aerosols in the clinical environment, use of hand scalers are advised instead of ultrasonic scalers.<sup>42</sup>

### Managing child patients during COVID-19 outbreak

To meet the psychological needs of the children, toys are provided to them which can be a potential source of cross-infection. Soft toys are more likely to be contaminated, difficult to disinfect and may re-contaminate quickly compared to hard-surfaced toys. Moreover, restraining

devices used during the treatment, may also be contaminated and should be disinfected accordingly.<sup>43</sup>

### Disinfection of dental clinic setting

Exhaust air should be vented outside to prevent the recirculation of contaminated air.<sup>44</sup>

Contaminated air can be managed by improving dental clinic ventilation and/or by disinfecting the air. An ideal airflow pattern combined with a minimum of 3 air changes per hour has been recommended for dental settings.<sup>45,46</sup>

Moreover, although its use in dental clinics is unconfirmed, ultraviolet germicidal irradiation may be installed and is effective against fungi, viruses, and bacteria, namely, tubercle bacilli and anthrax.<sup>47</sup>

### Conclusion

Considering the unique work environment of dentists, which involves close patient contact and aerosol production, the risk of SARS-CoV 2 transmission from an infected patient is high. As the number of COVID-19 cases may increase in future, dentists should be well informed and educated about not only the signs and symptoms of the condition but also how to follow stringent infection control measures in these cases.

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