

Outbreak of Corona Virus (COVID-19): Risk Factors, Prevention, Diagnosis and Management in Dental Practice

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ABSTRACT

Background: COVID-19 has emerged as a pandemic threat in the world coming from a family of enveloped, single-stranded, positive-strand RNA viruses classified under Nidovirales order. After knowing its intensity to spread, it has compromised the world including medical as well as dental services in different ways. As dentist are more prone of getting exposed to this virus and are in direct contact with the oral cavity of the patients; hence, they have tremendous possibilities of getting infected by a coronavirus. Thereby, this article will give a brief knowledge about the spread of the virus, the risk factors, mode of transmission, prevention and management guidelines to be followed by the dental practitioners.

Keywords: Covid-19, SARS-CoV-2, Roniviridae families, Respiratory droplet, aerosols.

INTRODUCTION

SARS-CoV-2 was believed to be originated from the Huanan Seafood Wholesale Market, in Wuhan City China, where people buy animals like bats and other etc. that has given on to the origin of the serious pandemic disease in the year 2019.

The infection of COVID-19 is spreading fast with increasing numbers of infected patients nationwide and worldwide hence, World Health Organization declared a public health emergency of international concern over this global pneumonia outbreak on 30th January 2020.^{1,2}

For dental practices and hospitals around the globe that are affected with COVID-19, strict and effective infection control protocols are needed. This article, will give brief idea about what are the risk factors, relevant guidelines with

introduction of essential knowledge about, COVID-19 in dental settings and provides with recommended management protocols for dental practitioners.

WHAT IS CORONA VIRUS?

It belongs to the family of Coronaviridae, of the order Nidovirales, comprising large, single, plus-stranded RNA as their genome structure.³ Most of the coronavirus can cause the infectious diseases in humans. The α -CoV and β -CoV mainly infect the respiratory, gastrointestinal, and central nervous system of humans, while γ -CoV and δ -CoV mainly infect the birds.⁴ The structure of virus consists of "spike protein" in the membrane envelope and also expressed other polyproteins, nucleoproteins, and membrane proteins, such as RNA polymerase, 3-chymotrypsin-like protease, papain-like

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protease, helicase, glycoprotein, and accessory proteins.⁵

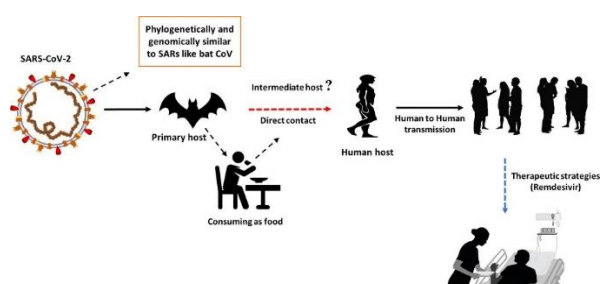
The S protein from the virus can bind to the receptors of the host to facilitate entry into target cells. A recombinant antibody with a SARS CoV-specific human monoclonal antibody and the serum from a convalescent SARS-CoV-infected patient, which can neutralize 2019-nCoV, confirmed ACE2 as the host receptor for 2019-nCoV.

The high affinity between ACE2 and 2019-nCoV S protein also suggested that the population with higher expression of ACE2 might be more susceptible to 2019-nCoV. The cellular serine protease TMPRSS2 also contributed to the S-protein priming of 2019-nCoV, indicating that the TMPRSS2 inhibitor might constitute a treatment option.⁴

EPIDEMIOLOGY:

Mode of Transmission-

Based upon the findings, it appears that the COVID-19 outbreak started with a single animal-to-human transmission, followed by sustained human-to-human spread. It is now believed that its interpersonal transmission occurs mainly via respiratory droplets and contact transmission (The Chinese Preventive Medicine Association 2020).

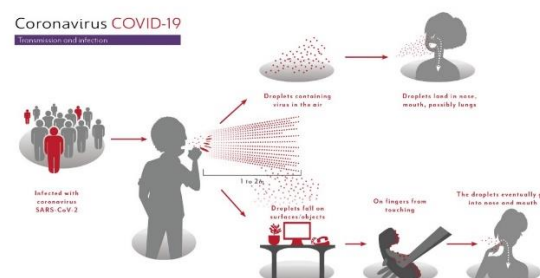


a- Airborne spread: Several publications show that almost every dental procedure produces aerosols and droplets that are contaminated with virus and many other bacteria of the oral cavity. Thus, droplet and aerosol transmission of 2019-nCoV are the most important concerns in dental clinics and hospitals, because it is hard to avoid the

generation of large amounts of aerosol and droplet mixed with patient's saliva and even blood during dental practice.⁴ As, particles of droplets and aerosols generated from air driven hand pieces are small enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract. Thus, the 2019-nCoV has the potential to spread through droplets and aerosols from infected individuals in dental clinics and hospitals.

b- Contaminated surfaces spread:

Coronavirus can persist on surfaces like metal, glass, or plastic for up to a couple of days. As, these droplets can survive for long duration depending on the type of material they come in contact, any non-infected person coming in contact with such surfaces without any proper hand sanitization or surface disinfection he/she are more prone to acquire the infection.



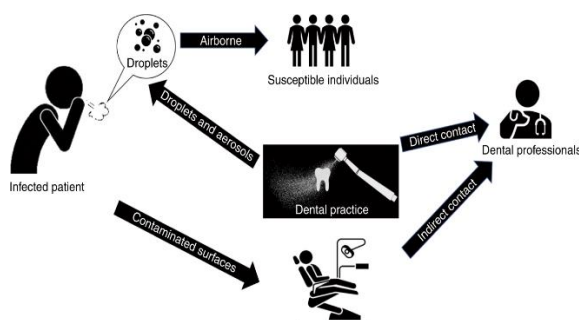
Incubation period- The incubation period of the virus is to be estimated as 5 to 6 day on average, but there is evidence that it could be as long as 14 days, which is now the commonly adopted duration for medical observation and quarantine of suspected exposed person.

Source of transmission- The common transmission route of novel coronavirus include direct transmission (cough, sneeze, and droplet inhalation) and contact transmission (contact with oral, nasal, and conjunctiva). The virus can be transmitted directly from person to person by respiratory droplets, upcoming evidences suggested that it may also be transmitted through contact, touching, hand shake even using the things of infected person.

Despite of such kind of transmission, it is also necessary to evaluate the spread of corona virus in dental practise.

EXPOSURE IN DENTAL PRACTISE:

The deadly virus can be transmitted in dental settings through inhalation of airborne microorganisms that can remain suspended in the air for long periods, direct contact of conjunctival, nasal, or oral mucosa with droplets and aerosols containing microorganisms generated from an infected individual and can travel a short distance by coughing and talking without a mask, and indirect contact with contaminated instruments or surrounding surfaces like dental chair.



RISK FACTORS:

If you have been exposed to saliva of infected person and without taking proper preventive measure you are at high risk if you-

- live with someone who has contracted the virus
- are providing home care for someone who has contracted the virus
- have an intimate partner who has contracted the virus

Older people with other medical co-morbidities like health conditions have a higher risk of severe complications if they contract the virus the health conditions include are-

- lung conditions, such as COPD and asthma
- certain heart conditions
- immune system conditions, such as HIV
- cancer that requires treatment
- severe obesity
- other health conditions, if not well-controlled, such as diabetes, kidney disease, or liver disease

SYMPTOMS:

The symptoms are usually mild initially where about 81% people develop gradually depending on the host and viral organism also few patients do not even develop any symptoms (remains asymptomatic).

The often symptoms reported as-

Table 1: List of symptoms.

COMMON SYMPTOMS	LESS COMMON SYMPTOMS	RARE SYMPTOMS
Fever	Myalgia/arthritis	Nausea, vomiting
Cough	Headache	Nasal congestions
Fatigue	Sore throat	Diarrhoea
Shortness of breath.	Chills	Palpitation and chest tightness

TESTING AND LABORATORY FINDINGS:

According to current diagnostic criteria founded by the China National Health Commission, laboratory examinations, including nasopharyngeal and oropharyngeal swab tests, have become a standard assessment for diagnosis of COVID-19 infection.⁶

The diagnostic tests for coronavirus include reverse-transcription polymerase chain reaction (RT-PCR), real-time RT-PCR (rRT-PCR), and reverse transcription loop-mediated isothermal amplification (RT-LAMP)⁷

Table 2: Specimens to be collected from the symptomatic patients and contacts.

	Test	Type of sample	Timing
Patient	NAAT	Lower respiratory tract - Sputum - Spirate - Lavage Upper respiratory tract - Nasopharyngeal and - Oropharyngeal swabs - Nasopharyngeal wash/ Oropharyngeal aspirate	Collet on presentation. Possibly repeated sampling to monitor clearance. Further research needed to determine effectiveness and reliability of repeated sampling.
Patient	SEROLOGY	Consider stool, whole blood urine and if diseased, material from autopsy. Serum for serological testing once validated and available.	Paired sample are necessary for conformation with the initial sample collected in the first week of illness and the second ideally collected 2-4 weeks later. (optimal timing for last convalescent sample need to be established)
Contact- In healthcare centre associated outbreak or other settings where contact have symptoms, or where symptomatic contacts have had high-intensity contact with a COVID-19 case.	NAAT	Nasopharyngeal and Oropharyngeal swabs	Within incubation period of last documented contact.
	SEROLOGY	Serum for serological testing once validated and available.	Baseline serum taken as early as possible within incubation period of contact and convalescent serum taken after 2-4 weeks of last contact (optimal timing for last convalescent sample need to be established)

PREVENTION:

Wash your hands frequently for at least 20 seconds at a time with warm water and soap. How long are 20 seconds? About as long as it takes to sing your "ABCs."

- Don't touch your face, eyes, nose, or mouth when your hands are dirty.
- Don't go out if you're feeling sick or have any cold or flu symptoms.
- Stay at least 3 feet (1 meter) away from anyone who is coughing or sneezing.

- Cover your mouth with the inside of your elbow whenever you sneeze or cough. Throw away any tissues you use right away.
- Clean any objects you touch a lot. Use disinfectants on objects like phones, computers, utensils, dishware, and doorknobs.

MANAGEMENT IN DENTAL PRACTISE:

Dental professionals should be familiar with the spread of the virus, how to identify patients with 2019-nCoV infection, and what extra-protective measures should be adopted during the practice, in order to prevent the transmission of the deadly virus. Therefore, we recommend the infection control measures that should be followed by dental professionals-

• Patient evaluation

The body temperature of the patient should be measured in the first place.

A contact-free forehead thermometer is strongly recommended for the screening.

A questionnaire should be used to screen patients with potential infection of 2019-nCoV before they could be led to the dental chair-side.

These questions should include the following:

- (1) Have you experienced fever within the last 14 days?
- (2) Have you experienced a recent onset of respiratory problems, such as a cough or difficulty in breathing within the last 14 days?
- (3) Have you travelled to any city or country?
- (4) Have you come into contact with a patient with confirmed 2019- nCoV infection within the past 14 days?
- (5) Have you recently participated in any gathering, meetings, or had close contact with many unacquainted people?

• Hand hygiene

Specifically, the oral professionals should wash their hands before patient examination, before dental procedures, after touching the patient,

after touching the surroundings and equipment without disinfection, and after touching the oral mucosa, damaged skin or wound, blood, body fluid, secretion, and excreta. More caution should be taken for the dental professionals to avoid touching their own eyes, mouth, and nose.

• Personal protective measures for the dental professionals

Based on the possibility of the spread of 2019-nCoV infection, three-level protective measures of the dental professionals are recommended for specific situations.

(1) Primary protection (standard protection for staff in clinical settings). Wearing disposable working cap, disposable surgical mask, and working clothes (white coat), using protective goggles or face shield, and disposable latex gloves or nitrile gloves should be necessary.

(2) Secondary protection (advanced protection for dental professionals). Wearing disposable doctor cap, disposable surgical mask, protective goggles, face shield, and working clothes (white coat) with disposable isolation clothing or surgical clothes outside, and disposable latex gloves.

(3) Tertiary protection (strengthened protection when contact patient with suspected or confirmed 2019-nCoV infection). Although a patient with 2019-nCoV infection is not expected to be treated in the dental clinic, in the unlikely event that this does occur, and the dental professional cannot avoid close contact, special protective outwear is needed. In addition, disposable doctor cap, protective goggles, face shield, disposable surgical mask, disposable latex gloves, and impermeable shoe cover should be worn.⁴

• Anti-retraction hand piece

The high-speed dental hand piece without anti-retraction valves may aspirate and expel the debris and fluids during the dental procedures. More importantly, the microbes, including bacteria and virus, may further contaminate the air and water tubes within the dental unit, and thus can potentially cause cross-infection.

Our study has shown that the anti-retraction high-speed dental hand piece can significantly reduce the backflow of oral bacteria and HBV into the tubes of the hand piece and dental unit as compared with the hand piece without anti-retraction function.⁸

Anti-retraction dental hand piece with specially designed anti-retractive valves or other anti-reflux designs are strongly recommended as an extra preventive measure for cross infection.⁹

• Disinfection of the clinic settings

Medical institutions should take effective and strict disinfection measures in clinic settings and hospital areas. The clinic settings should be cleaned and disinfected in accordance with the Protocol for the Management of Surface Cleaning and Disinfection of Medical Environment (WS/T 512-2016) released by the National Health Commission of the People's Republic of China.⁴

Table 3: A guidance table showing the categories of dental treatments and the variety of treatments that can be provided for the patient during the COVID-19 pandemic. (*Usually managed by oral and maxillofacial surgeons., **Pain assessment is carried out using the Universal Pain Assessment Tool (UPA).²⁸.

Appliances and instruments should also be frequently cleaned and disinfected, including door handles, chairs, and desks.

TREATMENT CATEGORISATION:

- Dental procedures are proposed to be divided into five categories (Table 1):

A. Emergency management of life-threatening conditions.

B. Urgent conditions that can be managed with minimally invasive procedures and without aerosol generation.

C. Urgent conditions that need to be managed with invasive and/or aerosol generating procedures.

D. Non-urgent procedures.

E. Elective procedures.

Dental Treatments Categories				
A	B	C	D	E
Emergency	Urgent conditions that can be managed with minimally invasive procedures and without aerosol generation	Urgent conditions that need to be managed with invasive and/or aerosol-generating procedures	Non-urgent	Elective
Unstable maxillofacial fractures that can compromise the patient's airway. * procedures. **	Severe dental pain (7≤) from pulpal inflammation that requires tooth extraction. **	Severe dental pain (7≤) from pulpal inflammation that need to be managed with aerosol generating	Removable dentures adjustments or repairs.	Removable Initial or periodic oral examinations and recall visits
Diffuse soft tissue bacterial infection with intraoral or extraoral swelling that can compromise the	Severe dental pain (7≤) from fractured vital tooth that can be managed without	Severe dental pain (7≤) from fractured vital tooth that need to be	Asymptomatic fractured or defective restoration.	Aesthetic dental procedures.

patient's airway.*	aerosol generation.**	managed with aerosol generating procedures.**		
Uncontrolled postoperative bleeding.*	Dental trauma with avulsion/luxation that can be minimally managed without aerosol generation.	Dental trauma with avulsion/luxation that need invasive/Aerosol Generating Procedures	Asymptomatic fractured or defective fixed prosthesis.	Restorative treatment of asymptomatic teeth.
	Surgical postoperative osteitis or dry socket that can be managed without aerosol generation.*	Deboned fixed prosthesis cleaning and temporary cementation	Asymptomatic fractured or defective orthodontic appliance.	Extraction of asymptomatic teeth.
	Pericoronitis or thirdmolar pain that can be managed without aerosol generation.	Removable dentures adjustments for radiation/oncology patients.	Chronic periodontal disease.	Orthodontic procedures other than those in category B/C.
	Stable maxillofacial fractures that requires no intervention.*	Fractured or defective fixed prosthesis causing soft tissue injury.		Routine dental cleaning and preventive therapies.
	Localised dental/periodontal abscess that can be managed without aerosol generation.	Acute periodontal disease.		Replacement of missing tooth/teeth with fixed or removable prosthesis.
	Fractured or defective fixed orthodontic appliance causing soft tissue laceration.			Dental implant surgery.

CONCLUSION

The spread of coronavirus (COVID-19) has posed significant challenges for dentistry and medicine, and dental and medical schools, in all affected countries. In my opinion, the dental team are familiar with assessing cross-infection

risk but should not be placed at unnecessary risk themselves as this would be morally unacceptable. Dental drills cause the formation of aerosol and splatter commonly contaminated with bacteria, viruses, fungi and blood.

Aerosols are liquid and solid particles (<50 µm diameter) suspended in air for protracted periods. We need to support each other in our professional family, reduce patient contact, restrict the generation of aerosols and use the best PPE. We also need to look out for our own mental health and wellbeing, and that of each other.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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