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Covid-19 Safety & Precautions: From a dentist & Patient's Perspective

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Abstract

Objective: To establish the safety measures and precautions to be taken against COVID-19.

Reason: It is important to rely only on established information during the time of such pandemic. There is a lot of misinformation being communicated among the general public and even the health care professionals or the ones working in front-line. This article aims to provide the most relevant information established from the most trusted sources and internationally renowned articles.

Keywords: COVID-19, SARS-CoV-2, precaution, safety, protocols, dental clinic, India

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) ^[1, 2] also known as the coronavirus and previously known provisionally as 2019 novel coronavirus (2019-nCoV), ^[3-5] is a positive single stranded RNA virus ^[6]. It causes the respiratory illness known as the Corona Virus disease (COVID-19) ^[7]. First detected in Wuhan, China, many of the patients in the outbreak reportedly had some link to a large seafood and animal market, suggesting animal-to-person spread. The virus has now spread to 24 other countries (till date) and has been declared as a public health emergency of international concern by the World Health Organization (WHO) ^[8, 9].

About the Virus

Coronaviruses belong to the Corona viridae family in the Nidovirales order. Corona is the representation of crown-like spikes on the outer surface of the virus; hence, the name coronavirus. Coronaviruses are minute in size (65–125 nm in diameter) and contain a single-stranded RNA as a nucleic material, size ranging from 26 to 32kbs in length (Fig 1). The subgroups of coronaviruses family are alpha (α), beta (β), gamma (γ) and delta (δ) coronavirus. The severe acute respiratory syndrome coronavirus (SARS-CoV), H5N1 influenza A, H1N1 2009 and Middle East respiratory syndrome coronavirus (MERS-CoV) cause acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) which leads to pulmonary failure and result in fatality. These viruses were thought to infect only animals until the world witnessed a severe acute respiratory syndrome (SARS) outbreak caused by SARS-CoV, 2002 in Guangdong, China.

Transmission & Origin

Many scientists have been trying to understand the origin of COVID-19 and the virus that causes it (SARS-CoV-2). The source of origination and transmission are important to be determined in order to develop preventive strategies to contain the infection. While the numbers of scientific articles on this virus are increasing, there are still many grey areas as to its origins.

Comparative genomic analyses have shown that SARS-CoV-2 belongs to the group of Beta-coronaviruses and that it is very close to SARS-CoV, responsible for an epidemic of acute pneumonia, which appeared in November 2002 in the Chinese province of Guangdong and then spread to 29 countries in 2003 ^[10].

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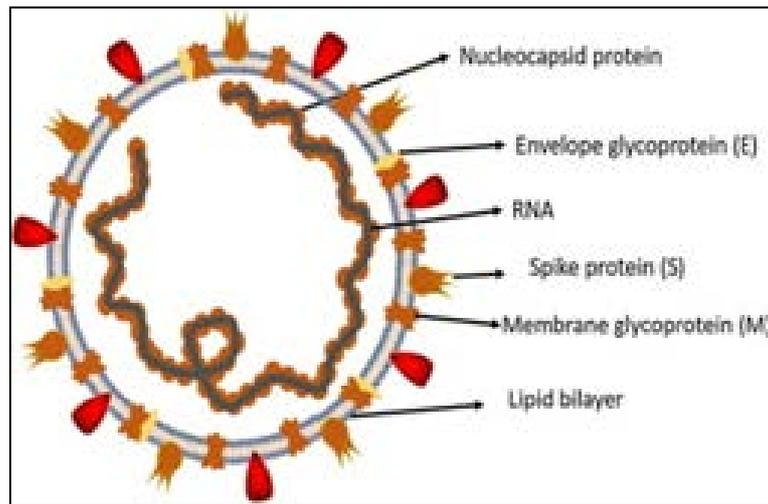


Fig 1: SARS-CoV

In the case of SARS-CoV, the researchers initially focused on raccoon dogs and palm civets as a key reservoir of infection. However, only the samples isolated from the civets at the food market showed positive results for viral RNA detection, suggesting that the civet palm might be secondary hosts^[11]. In 2001 the samples were isolated from the healthy persons of Hong Kong and the molecular assessment showed 2.5% frequency rate of anti-bodies against SARS-coronavirus. These indications suggested that SARS-coronavirus may be circulating in humans before causing the outbreak in 2003^[12]. Later on, Rhinolophus bats were also found to have anti-SARS-CoV antibodies suggesting the bats as a source of viral replication^[13]. The Middle East respiratory syndrome (MERS) coronavirus first emerged in 2012 in Saudi Arabia^[14]. MERS-coronavirus also pertains to beta-coronavirus and having camels as a zoonotic source or primary host^[15]. In a recent study, MERS-coronavirus was also detected in Pipistrellus and Perimyotis bats^[16], proffering that bats are the key host and transmitting medium of the virus^[17, 18]. Initially, a group of researchers suggested snakes be the possible host, however, after genomic similarity findings of novel coronavirus with SARS-like bat viruses supported the statement that not snakes but only bats could be the key reservoirs^[19, 20]. Further analysis of homologous recombination revealed that receptor binding spike glycoprotein of novel coronavirus is developed from a SARS-CoV (CoVZXC21 or CoVZC45) and a yet unknown Beta-CoV^[21].

It was later established that bats of the genus Rhinolophus (potentially several cave species) were the reservoir of this virus and that a small carnivore, the palm civet (*Paguma larvata*), may have served as an intermediate host between bats and the first human cases. On February 7, 2020, we learned that a virus even closer to SARS-CoV-2 had been discovered in pangolin. With 99% of genomic concordance reported, this suggested a more likely reservoir than bats. The coronavirus isolated from pangolin is similar at 99% in a specific region of the S protein, which corresponds to the 74 amino acids involved in the ACE (Angiotensin Converting Enzyme 2) receptor binding domain, the one that allows the virus to enter human cells to infect them. By contrast, the virus RaTG13 isolated from bat *R. affinis* is highly divergent in this specific region (only 77 % of similarity). This means that the coronavirus isolated from pangolin is capable of entering human cells whereas the one isolated from bat *R. affinis* is not.

These genomic comparisons suggest that the SARS-Cov-2 virus is the result of a recombination between two different viruses, one close to RaTG13 and the other closer to the pangolin virus. In other words, it is a mix between two preexisting viruses^[22].

Moreover, recent studies showed preliminary evidence that pangolins are the likely missing link of 2019-nCoV-like coronaviruses,^[23-25] invalidating Ji *et al.*'s conclusion^[26]. The scientific community has commonly questioned the conclusion of snakes being intermediate hosts, it is still important to carefully examine the base and reliability of the RSCU approach, which should help prevent such biased analyses from misleading the community and the general public

Airborne spread

The airborne spread of SARS-Cov 2 is well-reported in many researches. The literature shows that many dental procedures produce aerosols and droplets that are contaminated with virus^[26]. Thus the transmission of this virus is the most important concern in all the medical facilities especially in dental clinics as it is very difficult to avoid the treatments involving aerosol in a dental clinic. In addition to patient's saliva, there are also droplets of the high-speed turbine of a hand piece mixed with patient's blood that again, is very contagious.^[27] ENCE we have established a few protocols through this article to reduce down the potential spread of the virus through aerosol in dental clinics or any other medical facilities.

Contact spread

The conjunctival, nasal or oral mucosa of an infected individual can be transmissible through routine contacts. In addition, coughing and talking without a mask can propel the microorganism to a short distance. A dental professional's frequent direct or indirect contact with human fluids, patient materials, and contaminated dental instruments or environmental surfaces makes a possible route to the spread of the virus^[28]. This article aims to find the most effective infection control strategies that are needed to prevent the spread of 2019-nCoV.

Symptoms

- Fever (44%–98%)
 - Range may be lower at earlier stages
- Dry Cough (46–82%)

- Shortness of breath at onset (31%)
- Myalgia or fatigue (11–44%)
- Loss of taste or smell
- Potential sign in early infection, but not unique to COVID-19. It may be seen with other viral infections as well.
- Less common symptoms:
 - Pharyngitis
 - Headache
 - Productive cough
 - GI symptoms
- Have been described as a presenting symptom, and potentially heralding more severe illness.
- Hemoptysis

Disease Spectrum

- ~80% of infections are not severe and some may be asymptomatic.
- Illnesses caused by the virus can be either upper or lower respiratory tract infections.
- For hospitalized patients with pneumonia, limited studies suggest the disease course (Wuhan experience and others):
 - ~50% develop hypoxemia by day 8
 - Severe illness and cytokine release syndrome appear to develop mostly within 5–10d after symptom onset in susceptible patients.
 - Markers of severe infection include regular high fevers (>39° C), RR > 30, worsening oxygen requirements (4–6L nasal canula), also elevated IL-6 levels (> 40–100), CRP (>10x normal), ferritin (> 1000), d-dimer (>1).
 - ARDS develops in 17–29%
 - Patients in the ICU require:
 - Non-invasive ventilation (42%)
 - Mechanical ventilation (47%)
 - High-flow O₂ (11%)
 - ECMO (2-5%) (30)

Covid-19 Testing

- With limited testing capacities in many locations, clinicians should use their judgment to determine if a patient has signs and symptoms compatible with COVID-19 and whether the patient should be tested.
- The most common symptoms include fever (subjective or confirmed) and/or symptoms of acute respiratory illness (e.g., cough, difficulty breathing) or initial nausea/vomiting/diarrhea.
- Other considerations that may guide testing are epidemiologic factors such as the occurrence of local community transmission of COVID-19 infections in a jurisdiction.

Safety & Precautions: General Public

- General measures recommended
 - Avoid sick individuals.
 - Wash hands with soap and water x 20 seconds before eating, after cough/sneezing or bathroom visits.
 - Social distancing maneuvers include keeping spacing >6 feet from other people.
 - Masks now universally recommended when in public.
 - Don't touch the face, eyes, etc.
 - Stay home if ill.
 - Cover your sneeze.
 - Disinfect frequently touched household objects.
 - Current CDC recommendations do not suggest using a

facemask for protection, though this is debated as a routine for all or special populations such as HCWs when interacting with all patients.

- Keep up to date on the latest COVID-19 hotspots (cities or local areas where COVID-19 is spreading widely). If possible, avoid traveling to places – especially if you are an older person or have diabetes, heart or lung disease. Why? You have a higher chance of catching COVID-19 in one of these areas.

Safety & Precautions: Dental Clinic

Dental team members will often be responsible for communicating with patients in advance of appointment attendance. For this reason, it is important that each practice has in place a protocol and training for their team on how to screen for patients at risk of COVID-19. It remains an important recommendation to defer any non-urgent dental care for people who are at moderate or high-risk of COVID-19.

Any patient at risk of COVID-19 should be brought to the attention of the dental practitioner before presenting for treatment. If the dental practitioner determines that the patient is at moderate to high risk of COVID-19, and that urgent dental treatment is necessary, additional infection control measures will be required.

The decision of whether to treat a patient at risk of COVID-19 should be made by the dental practitioner after taking into consideration the safety of the dental team and other patients, as well as the ability of the dental practice to appropriately manage the situation, particularly with respect to standard and transmission-based precautions.

The clinic/office must be divided into separate stages according to the different spaces inside the clinic/dental office. The protocol to be established becomes simpler if we partition the spaces in 4 different stages. We have taken the example of an average clinic space that includes the following:

- **Stage 1:** Patient before entering the clinic
- **Stage 2:** Reception
- **Stage 3:** Operating area
- **Stage 4:** Back office/ Staffs & doctors room/ Sterilization Lab

Protocols in Stage 1

- Automated calls/messages asking the patients to self-isolate in case of any symptoms/ travel history.
- Patients attend alone or only bring minimal additional accompanying persons being mindful of consent requirements and family commitments.
- If your practice has on-site parking, consider placing a sign on the practice door asking patients to wait in their car in the car park and call the practice upon arrival. Provide entry to the practice only immediately prior to their appointment or to use the bathroom. This allows patients to avoid waiting in the waiting room.
- Upon arrival at the practice reception, have the patient use an alcohol-based hand sanitizer and rub their hands for 20 seconds.
- Pre-appointment questionnaire (Fig 2) can be given to the patient in the car while waiting for their time slot or before entering the reception/waiting room.
- Entry must be strictly restricted to the people entering without a facemask.

Date: _____
 Name (last name, first name): _____
 Date of Birth (mm/dd/yy): _____

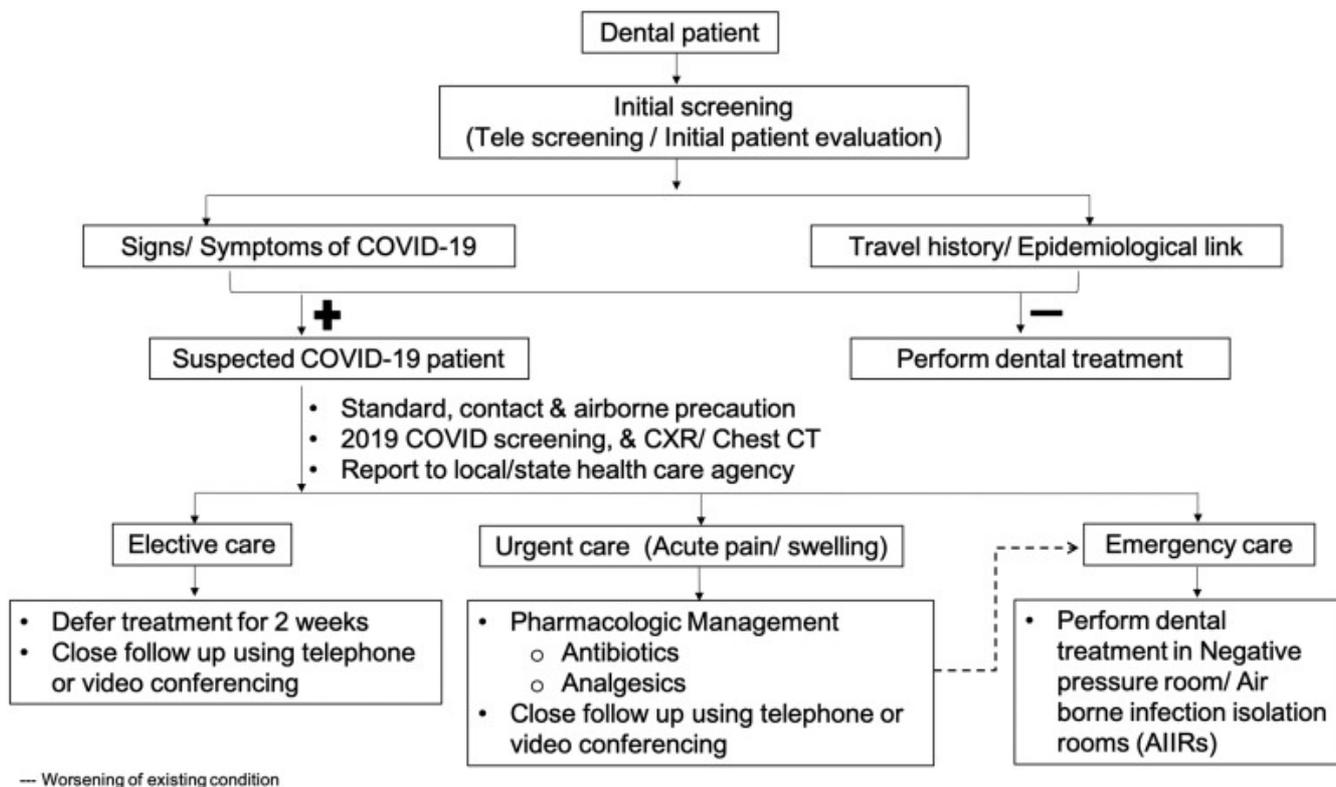
Yes	No	COVID-19 Screening Questionnaire
		In the past 14 days, have you or any household member traveled to areas with known cases of COVID-19? If so, please note location:
		In the past 14 days, have you or any household member had any contact with a known COVID-19 patient?
		Have you or any household member have a history of exposure to COVID-19 biologic material?
		Have you had any history of fever in the last 14 days?
		Have you had any symptoms such as cough, difficulty breathing, diarrhea, nausea, body ache, loss of smell or loss of taste in the last 14 days?
		Urgent Dental Need Question Do you have uncontrolled dental or oral pain, infection, swelling or bleeding or trauma to your mouth?

Fig 2: Questionnaire

Protocols in Stage 2

- Remove unnecessary items in the waiting room including toys and magazines.
- Adjust seating in waiting room to ensure social distancing of at least 1.5 m between seats if possible.

- Regularly wipe down surfaces with >60% alcohol-based wipes or 0.1% sodium hypochlorite solution, including door handles, reception desks, phones.



Treatment Selection Protocol

Protocols in Stage 3:

This stage is the most crucial as all the operatory work will be happening in this space and people will be highly prone to infection via aerosol.

- Physical disinfection must be done regularly by the use of fumigators and alcohol/water based disinfectant solutions.
- The dental chair along with the desks/trolleys must be wiped with disinfectant wipes after every patient.
- It is recommend that prior to commencing treatment all

patients should be asked to undertake a 20-30 second pre-procedural mouth rinse with either:

- 1% hydrogen peroxide
- 0.2% Povidone iodine
- 0.2% Chlorhexidine rinse (alcohol free)
- Beta dine mouth rinse

-Ensure that you use high-speed evacuation for all aerosol generating procedures and the use of rubber dam for

restorative procedures to reduce the amount of aerosol ejection. Consider practicing 6-handed dentistry to maintain the sterilization of all instruments and of the operating area.

-A waste bag must be present next to all chairs to dispose off the non-sterilizable items after the procedure. This bag must be sealed off before leaving the operatory.

-Air conditioners must be fit with PM 2.5 micro filters to prevent the re-entry of virus through the vents.

-Consider the use of betadine/chlorhexidine solution in the water tanks for air rotors and 3 way syringes. This has a possibility of disinfecting the aerosol by almost 90%. The handpieces must be oiled thoroughly after such use.

Protocols in Stage 4:

-Autoclaving and packaging of all instrument sets after every patient is a must.

-2 separate trolleys to be made for sterilized and non-sterilized instruments which will be carried only by the materials/instruments in charge in and out of the operatory.

-PPE for Dental Team Members:

- Dental team members should change from personal clothing to scrubs before entering the clinic and vice versa before returning home and must take shower before coming in contact with any family member
- Water impervious gowns with head caps
- N-95/3 ply masks
- Protective eye wear
- Face shield
- Shoe covers at all times

-Provide task-specific education and training on preventing transmission of infectious agents, including refresher training.

Summary

The rapidly increasing number of COVID-19 suggests that this virus is more contagious than SARS-CoV and MERS-CoV. By mid-February 2020, a large number of infections of all the medical staffs have been reported. According to number of researches, dentists remain the most prone to the virus due to the close proximity and aerosol of the patient. We have summarized a large number of possible routes of transmission and how to prevent it in a dental clinic/office. We have also reviewed a number of strategies to block the transmission to provide a reference for other medical professionals as well. There are a large number of people who need emergency dental care that shouldn't be ignored by the dental team members.

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