

# COVID 19: REVIEW ON STRATEGIES FOR CLINICAL DENTAL CARE

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## Abstract

CORONA VIRUS disease 2019 also known as Covid-19 has become a worldwide emergency. The World Health Organization (WHO) has recently declared the global pandemic and the responsible pathogen for such infection is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As saliva plays a pivotal role in the human to human transmission hence the dentists and other healthcare professionals that perform aerosol-generating procedures may be unknowingly providing care to infected COVID-19 patients.

While performing dental procedures on patients with COVID-19 dentist are at high risk. Therefore, it is crucial for dentists to strictly follow preventive strategies to avoid the COVID-19 infection by focusing on hand hygiene and all personal protective equipment (PPE).

Thus the aim of this article is to provide a brief overview of epidemiology ,symptoms, route of transmission and recommendations for patient screening, patient management and strategies to prevent infection.

**Key words-** COVID-19, symptoms, route, screening patient, infection control

## INTRODUCTION

The name coronavirus is derived from the Latin *corona*, meaning "crown" or "halo", which refers to the characteristic appearance of a crown or a solar corona around the virions ,when viewed under two-dimensional transmission electron microscopy, due to the surface covering in club-shaped protein spikes. Coronaviruses constitute the subfamily orthocoronavirinae in the family coronaviridae<sup>1,2</sup>. They are enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry. The genome size of coronaviruses ranges from approximately 27 to 34 kilo base, the largest among known RNA viruses<sup>3</sup>. Coronaviruses are a group of viruses that cause diseases in mammals and birds. In humans, coronaviruses cause respiratory tract infections that can be mild to severe and in some case can be fatal.

## HISTORY

The history of human coronaviruses began in 1965 when Tyrrell and Bynoe<sup>1</sup> found that they could passage a virus named B814. It was found in human embryonic tracheal organ cultures obtained from the respiratory tract of an adult with a common cold but Tyrrell and Bynoe were unable to grow the agent in tissue culture at that time<sup>4</sup>. At the same time, Hamre and Procknow<sup>2</sup> were able to grow a virus with unusual properties in tissue culture from samples obtained from medical students with colds which they called 229E but these 2 viruses were not related to any known myxo- or paramyxoviruses<sup>5</sup>

In the late 1960s, Tyrrell while working on human strains and a number of animal viruses found infectious bronchitis virus, mouse hepatitis virus and transmissible gastroenteritis virus of swine, all of which were found to be morphologically the same through electron microscopy<sup>6,7</sup>. This new group of viruses was named coronavirus (corona denoting the crown-like appearance of the surface projections) and was later accepted as a new genus of viruses<sup>8</sup>

During ongoing research it was found that respiratory coronavirus infections occur more often in the winter and spring than in the summer and fall and coronavirus infections contribute as much as 35% of the total respiratory viral activity during epidemics<sup>9</sup>. Studies found that respiratory coronaviruses were associated with a variety of respiratory illnesses like upper respiratory infection with occasional cases of pneumonia in infants and young adults<sup>10,11</sup>. While research was proceeding to explore the pathogenicity and epidemiology of the human coronaviruses, the number of cases of animal coronaviruses were growing rapidly in rats, mice, chickens, turkeys, calves, dogs, cats, rabbits and pigs<sup>12</sup>.

**GENOME AND SRTUCTURE**

Coronaviruses are medium-sized RNA viruses with a very characteristic appearance in electron micrographs of negatively stained preparations. The nucleic acid is about 30 kb long, positive in sense, single stranded and polyadenylated. The RNA is the largest known viral RNA and codes for a large polyprotein. This polyprotein is cleaved by viral-encoded proteases to form: RNAdependent RNA polymerase and an ATPase helicase. The strategy of replication of coronaviruses involves a nested set of messenger RNAs with common polyadenylated 3-ends. Only the unique portion of the 5-end is translated. Coronaviruses are capable of genetic recombination if 2 viruses infect the same cell at the same time<sup>13</sup>.

Strains of human coronaviruses are known:

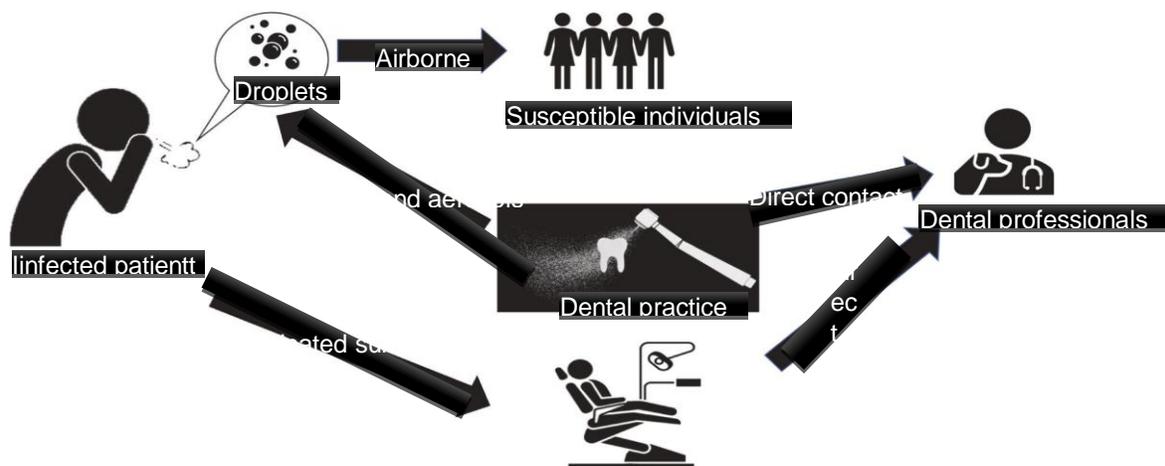
1. Human coronavirus 229E(HCoV-229E)
2. Human coronavirus OC43(HCoV-OC43)
3. Severe acute respiratory syndrome coronavirus(SARS-CoV)
4. Human coronavirus NL63(HCoV-NL63,New haven corona virus)
5. Human coronavirus HKU1
6. Middle east respiratory syndrome syndrome-related coronavirus(MERS-CoV)
7. Severe acute respiratory respiratory syndrome coronavirus 2(SARS-CoV-2)

The coronaviruses HCoV-229E, -NL63, -OC43, and -HKU1 continually circulate in the human population and cause respiratory infections in adults and children world-wide<sup>14</sup>

**COVID-19**

On January 8, 2020, a novel coronavirus was officially announced as the causative pathogen of COVID-19 by the Chinese Center for Disease Control and Prevention. The epidemics of coronavirus disease 2019 (COVID19) started from Wuhan, China, last December and have become a major challenging public health problem for not only China but also countries around the world<sup>15</sup>. The novel coronavirus was initially named 2019-nCoV and officially as severe acute respiratory syndrome coronavirus 2 (SARSCoV-2).

**SOURCE OF TRANSMISSION AND ROUTE**



**Figure 1** Transmission routes of 2019-nCoV in dental practice peng et al.

Symptomatic COVID-19 (figure 1) patients have been the main source of transmission, recent observations suggest that asymptomatic patients and patients in their incubation period are also carriers of SARS-CoV-2<sup>16</sup>. Controlling COVID-19 is extremely challenging, as it is difficult to identify and quarantine the patients in time, which can further spread SARS-CoV-2 in communities. The dental surgeons should evaluate patients for who:

- Give history of traveling from countries in or near the Arabian Peninsula develop severe acute lower respiratory illness within 14 days
- Were in close contacts of a symptomatic recent traveler from the area who has fever and acute respiratory illness; or
- Are close contacts of a confirmed case.

In dental practices the droplets and aerosols from infected patients contaminate the whole surface in dental offices and remains infectious from 2 h up to 9 days, and persists better at 50% compared with 30% relative humidity. So, testing for MERS-CoV and other respiratory pathogens should be done in a near by health care centre immediately.

Thus, keeping a clean and dry environment in the dental office would help decrease the persistence of 2019- nCoV.

**.INCUBATION PERIOD**

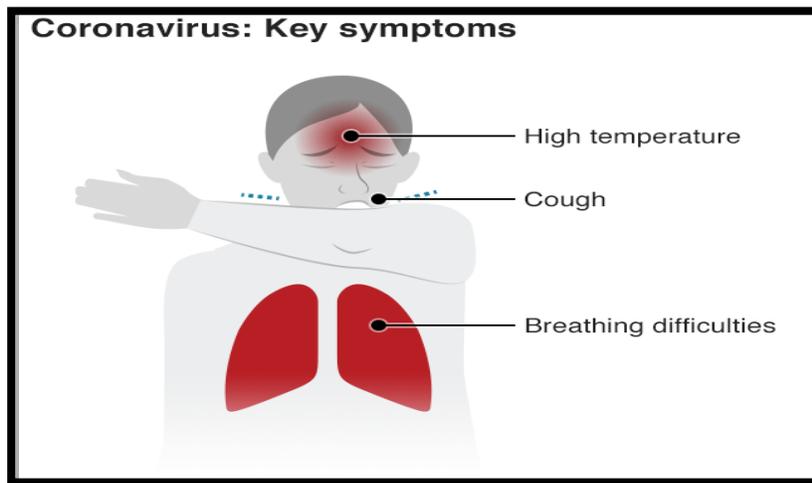
It has been estimated to be 5 to 6 days on average, but there are evidences that states it could be as long as 14 days, which is now the commonly followed duration for medical observation and quarantine of exposed persons<sup>17</sup>.

**CLINICAL SYMPTOMS**

Most of the patients experienced fever and dry cough, while some had shortness of breath, fatigue, and other symptoms, such as headache, confusion, vomiting, muscle pain, sore throat, diarrhea (figure 2)<sup>18</sup>.

Among patients who underwent chest computed tomography (CT), most showed bilateral pneumonia, with ground-glass opacity and bilateral patchy shadows being the most common patterns<sup>19</sup>.

Among hospitalized patients in Wuhan, around one-fourth to one-third developed serious complications, such as acute respiratory distress syndrome, arrhythmia, and shock, and were therefore transferred to the intensive care unit<sup>20</sup> In general, older age and the existence of underlying comorbidities (e.g., diabetes, hypertension, and cardiovascular disease) were associated with poorer prognosis<sup>21</sup>.



**Figure 2** Initial symptoms associated with corona

(virushttps://ichef.bbci.co.uk/news/410/cpsprodpb/55B6/production/\_111224912\_coronavirus\_key\_symptoms\_uk\_640-nc.png)

**COVID-19 FROM DENTAL ASPECT**

Health care professionals which include Doctors, Dental Surgeons and specialists are at a higher risk of transmission from patients. It is not always possible to early identify patients with MERS-CoV or without testing because signs ,symptoms and other clinical features may be nonspecific, thus it becomes important for health-care workers to work with proper standard protocol consistently with all patients<sup>22</sup>.

It is also possible that the dental surgeons may encounter patients who have recent history of travelling from areas affected by MERS-CoV. Even Individuals who have visited an affected area but have had no direct contact with the disease are considered at risk and precautions have to be taken while performing medical or dental care. However, individuals who may have had contact with MERS-CoV their treatment should be deferred<sup>23</sup>. MERS-CoV should be suspected in patients who have a fever  $\geq 38.6^{\circ}\text{C}$  or a history of fever in the past 24 hours and have recently visited an MERS-CoV -affected area.

**INFECTION CONTROL IN DENTISTRY**

Dental professionals are very frequently exposed to aerosol generated during certain dental treatment. These aerosols are composed of relatively small sized particles and may accommodate micro-organisms ,infections that can lead to increased risk of infection among dental professionals.Hence, it is virtually impossible to completely eliminate the risk of dental aerosol but can be minimized by adopting protective measures.

**1)MINIMIZE CHANCES OF EXPOSURE**

Multiple factors are considered while selecting suitable antiseptic agent for hand hygiene. The goal of hand hygiene is to reduce ad remove transient flora from the hands of dental healthcare personnel. Few methods of maintaining hand hygiene are (Table-1)-

<b>METHOD</b>	<b>AGENT</b>	<b>PURPOSE</b>	<b>DURATION</b>	<b>INDICATION</b>
<b>Routine handwash</b>	Water and non antimicrobial soap (e.g., plain soap <sup>†</sup> )	Remove soil and transient microorganisms	15 seconds	Before and after treating each patient (e.g., before glove placement and after glove removal). After barehanded touching of inanimate objects likely to be contaminated by blood or saliva. Before leaving the dental operatory or the dental laboratory. When visibly soiled. Before regloving after removing gloves that are torn, cut, or punctured.
<b>Antiseptic Handwash</b>	Water and anti microbial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident flora	15 seconds	
<b>Antiseptic hand rub</b>	Alcohol-based hand rub  Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident flora	Rub hands until the agent is dry	
<b>Surgical antisepsis</b>	Water and non-antimicrobial soap (e.g., plain soap <sup>†</sup> ) followed by an alcohol-based surgical hand-scrub product with persistent activity.	Remove or destroy transient microorganisms and reduce resident flora (persistent effect)	2–6 minutes	Before donning sterile surgeon’s gloves for surgical procedures

Figure 3

## **2)HAND SANITIZERS**

Hand sanitizers were introduced in 1966 for hospital and health care facilities. Hand sanitizer that contains at least 60% alcohol should be used. These alcohols kill different kinds of bacteria, including viruses like enveloped viruses such as the flu virus, the common cold virus, coronaviruses, and HIV.

There are two types of hand sanitizers:

### **A)Alcohol-free**

### **B)Alcohol-based.**

Alcohol-based hand sanitizers contain varying amounts of alcohol, often between 60% and 95% and mostly isopropyl alcohol, ethanol (ethyl alcohol) or n-propanol. Isopropyl alcohol will kill 99.99% or more of all non-spore forming bacteria in less than 30 seconds.

Alcohol free hand sanitizers have agents other than alcohol like quaternary ammonium compounds and povidone iodine. These can reduce microbes but are less effective than alcohol.

Alcohol attacks and destroys the envelope protein that surrounds some viruses, including coronaviruses. This protein is vital for a virus's survival and multiplication. But a hand sanitizer needs to be at least 60% alcohol in order to kill most viruses. Hand sanitizers with less than 60% alcohol were also found to be less effective at killing bacteria and fungi and may only reduce the growth rather than killing them.

Alcohol-free hand sanitizers may be effective but it can get contaminated because alcohol also acts as a preservative and without it, the alcohol-free solution can get contaminated. There are certain situations where hand washing with soap is preferred over hand sanitizer like hand contaminated with fluids, visible contaminants and chemicals like pesticides<sup>24</sup>

## **3)LOTIONS**

Even after using proper hand wash and hand washing technique pathogens can travel through unhealthy broken skin. Frequent handwashing with soaps and antiseptic agents can cause chronic irritant contact dermatitis. Damage to the skin changes skin flora, leading to more frequent colonization by staphylococci and gram-negative bacteria<sup>25</sup>. Lotions are recommended to reduce the dryness resulting from frequent handwashing and to prevent dermatitis from glove use. Certain lotions like Dermaglove (Hydrates hand), Rand R lotion (Vit A,D,E), Saje wellness lotion, Thursday plantation cream, Waltz lotion are the antibacterial lotions which are alcohol free and also help in healing of cracks in hands. However, petroleum-based lotion formulations can weaken latex gloves and increase permeability because of which they should be used at the end of the day<sup>26</sup>.

## **4)PERSONAL PROTECTIVE EQUIPMENT (PPE)**

PPE are designed to protect the skin and the mucous membranes of the eyes, nose, and mouth of dental health care professional from exposure to any kind of infection. PPE is an important weapon that helps in minimizing cross infection and maximizes the patient care, protects the patient and the clinical staff.

Components of PPE (figure 3) include gloves, gown, shoe covers, mask, respirators, eye protection, face shield and goggles.

When selecting PPE, factors such as fitting, function, decontamination ability, disposal, and cost should be considered. Sometimes, when PPE will have to be used repeatedly for a long period of time, a more expensive and durable type of PPE may be less expensive overall than

disposable PPE. Clinicians with high exposure risk should wear combination of gloves, a gown, a face mask, and/or a face shield or goggles and respirator<sup>27</sup>.

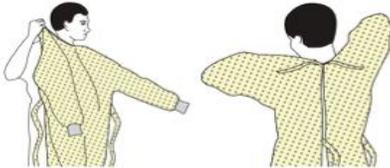
**Figure4** -Centers for Disease Control and Prevention recommendations for putting on and removing personal protectiveequipment for treatingCOVID-19 patients (www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf)

**SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)**

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

**1. GOWN**

- Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
- Fasten in back of neck and waist



**2. MASK OR RESPIRATOR**

- Secure ties or elastic bands at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator



**3. GOGGLES OR FACE SHIELD**

- Place over face and eyes and adjust to fit



**4. GLOVES**

- Extend to cover wrist of isolation gown



**USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION**

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene



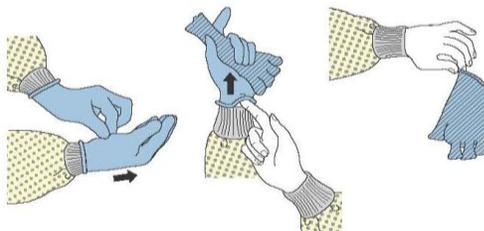
Two different ways to safely remove PPE without contaminating skin or mucous membranes are-

## HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 1

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. Here is one example. **Remove all PPE before exiting the patient room** except a respirator, if worn. Remove the respirator **after** leaving the patient room and closing the door. Remove PPE in the following sequence:

### 1. GLOVES

- Outside of gloves are contaminated!
- If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Using a gloved hand, grasp the palm area of the other gloved hand and peel off first glove
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove
- Discard gloves in a waste container



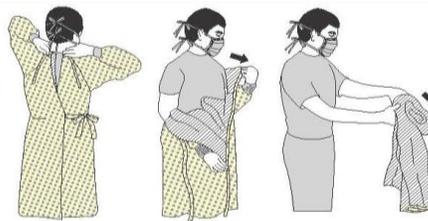
### 2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band or ear pieces
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container



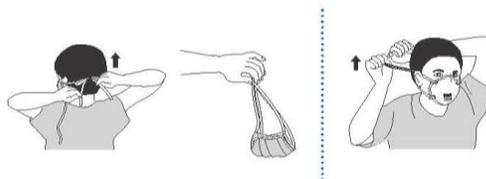
### 3. GOWN

- Gown front and sleeves are contaminated!
- If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Unfasten gown ties, taking care that sleeves don't contact your body when reaching for ties
- Pull gown away from neck and shoulders, touching inside of gown only
- Turn gown inside out
- Fold or roll into a bundle and discard in a waste container

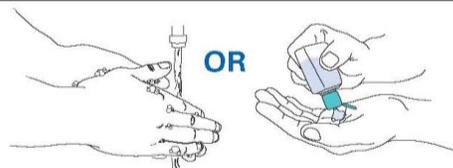


### 4. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated — DO NOT TOUCH!
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container



### 5. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



**PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE**



Figure 4.1 ([www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf](http://www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf))

## HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 2

Here is another way to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. **Remove all PPE before exiting the patient room** except a respirator, if worn. Remove the respirator **after** leaving the patient room and closing the door. Remove PPE in the following sequence:

### 1. GOWN AND GLOVES

- Gown front and sleeves and the outside of gloves are contaminated!
- If your hands get contaminated during gown or glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp the gown in the front and pull away from your body so that the ties break, touching outside of gown only with gloved hands
- While removing the gown, fold or roll the gown inside-out into a bundle
- As you are removing the gown, peel off your gloves at the same time, only touching the inside of the gloves and gown with your bare hands. Place the gown and gloves into an infectious\* waste container



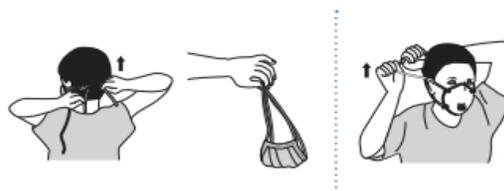
### 2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band and without touching the front of the goggles or face shield
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in an infectious\* waste container

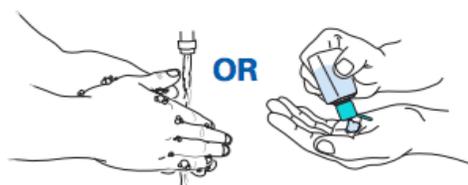


### 3. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated — DO NOT TOUCH!
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in an infectious\* waste container



### 4. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



\* An infectious waste container is used to dispose of PPE that is potentially contaminated with Ebola virus.

**PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE**



Figure 4.2 ([www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf](http://www.cdc.gov/hai/pdfs/ppe/ppe-sequence.pdf))

#### PATIENT EVALUATION

-Initial screening of patient can be done on telephonic conversation whether they have Covid-19 symptoms or not.

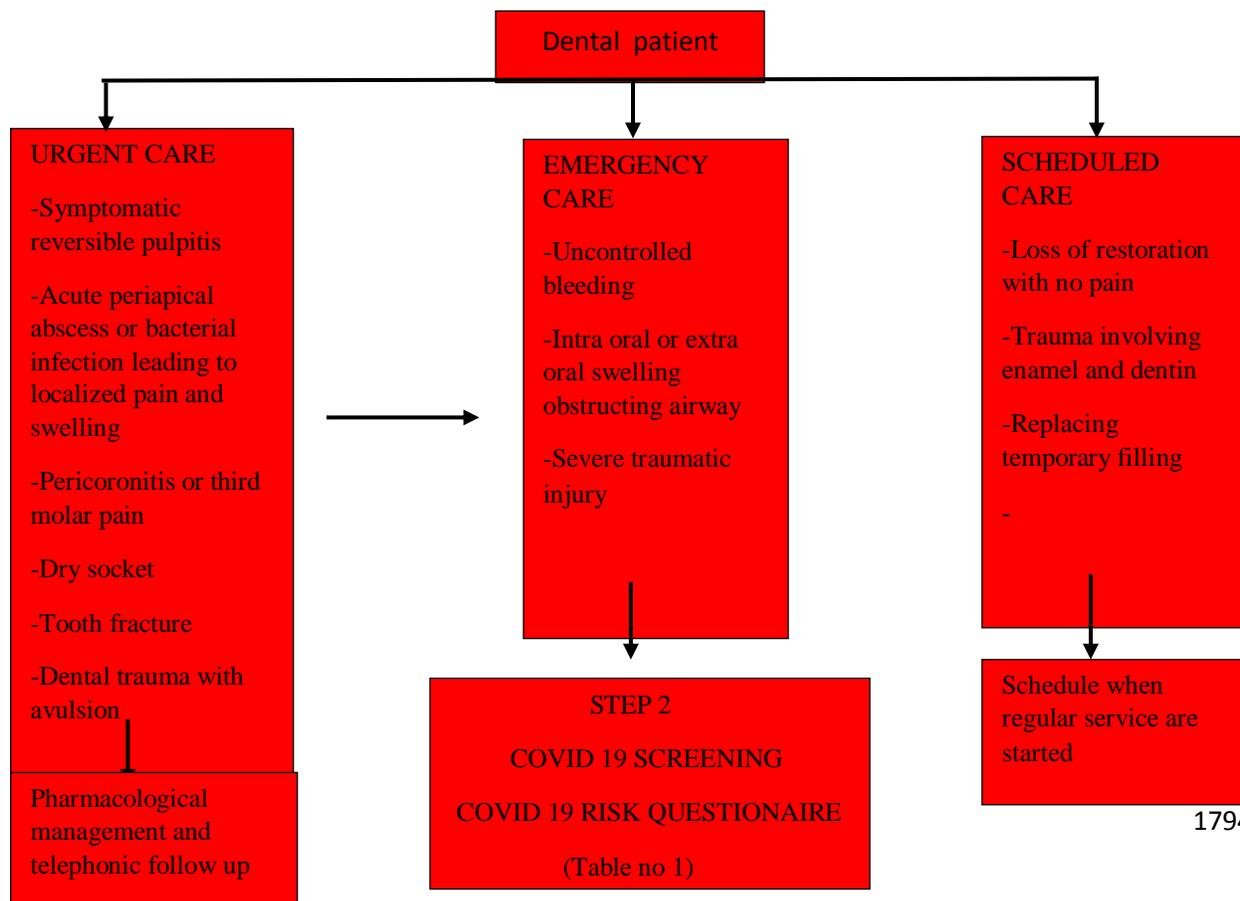
-Upon patients arrival, patient should complete a detailed medical form and Covid-19 screening questionnaire<sup>28</sup> (Fig 4).

COVID-19 SCREENING QUESTIONNAIRE	YES	NO
<ul style="list-style-type: none"> <li>• Date-</li> <li>• Name (last name, first name)-</li> <li>• D.O.B (mm/ dd /yy)-</li> <li>• Have u had any history of fever in last 14 days?</li> <li>• Have u had any respiratory illness such as cough or difficulty breathing in last 14 days?</li> <li>• Have you or any household member traveled to international area or to area of suspected community spread in the last 14 days?</li> <li>• In the past 14 days have you or any household member had any contact with a known COVID-19 patient?</li> </ul>		

**Figure 5**(<https://www.aae.org/specialty/clinical-resources/coronavirus-disease-19-covid-19-implications-for-clinical-dental-care/screeningquestionnaire>)

Proper protocol should be followed to measure and record the temperature of every staff and patient as a routine procedure. Precheck staff should ask the patients about the health status and history of contact or travel. Patient and the accompanying person should be given mask and their temperature should be checked when they enter the clinic. Patients with fever should be referred to nearby hospitals. If a patient has been to epidemic regions within the past 14 days, patient be quarantine for at least 14 days. In areas where COVID-19 has spreads, non-emergency dental practices should be postponed<sup>28</sup>

STEP 1-Telephonic conversation



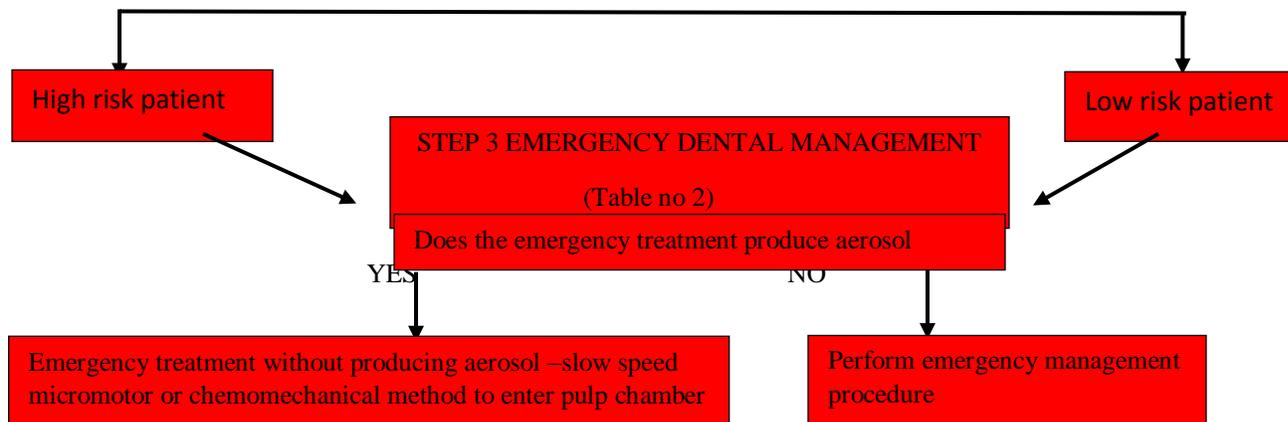


Figure 6<sup>29</sup>

Geographical location– Areas Stage 3 of outbreak (Community Transmission )	History of exposure	Temperature/Respiratory symptoms	Risk Category
+	+	+	<b>HIGH RISK</b>
+	+	-	
+	-	-	
-	+	+	
-	+	-	
-	-	+	<b>LOW RISK</b>
-	-	-	

Figure 6<sup>29</sup> continued

S.NO	SUBJECT	RECOMENDATION	REASON
1.1	PROCEDURES TO BE AVOIDED	-Avoid intra oral radiograph and ultrasonic scaling -Avoid use of three way air	-Stimulate saliva secretion and induce coughing, hence should be avoided or performed cautiously.

		water syringe	-Try going for extraoral dental radiographs, such as panoramic radiography and CBCT.
1.2	PREPROCEDURAL MOUTH RINSE	-1% hydrogen peroxide -povidone iodine 7%, diluted 1:30	-Reduces the salivary load of oral microbes, including potential SARSCoV-2 carriage. -chlorhexidine is in effectice against SARS-COV-2
1.3	<p>Emergency protocol for management of high risk patients.</p> <p>These pateints not to be treated in routine dental practice setting. They should be treated in negative pressure treatment room or air borne infection isolation room(AIIRs)</p>		
1.3.1	NON-AEROSOL GENERATING PROCEDURES	<p>Management of Carious teeth with symptomatic irreversible pulpitis</p> <ul style="list-style-type: none"> <li>•Four handed technique</li> <li>•Local anesthesia with 2% lidocaine. Allow sufficient time for anesthesia to take effect (15 mins)</li> <li>•Use supplemental buccal infiltration with 4% Articaine with 1: 100,000 epinephrine (0.9 – 1.2ml) at the apex of the tooth to be treated [32,33,34] /Intraligamentary injection 0.2ml of 2% lidocaine with 1: 100,000 epinephrine[35] Buffering (alkanising)LA solution</li> <li>•Dental dam isolation with high volume saliva ejectors. Use of 3-way syringe to be avoided</li> <li>•Chemomechanical caries excavation - Carisolv+ spoon excavator or slow speed micromotor handpiece without water spray until pulp is exposed</li> <li>•PerformPartial/complete pulpotomy.</li> <li>•Arrest bleeding with sterile cotton or soaked with 3% NaOCl applied with slight pressure. Place sterile dry cotton and provide temporary seal.</li> <li>•If bleeding is not arrested, place arsenic-free pulp devitaliser and temporary filling.</li> </ul> <p>-Prescribe NSAIDs approved</p>	<p>-Alternatives to aerosol generation in managing emergencies of Endodontic origin</p> <p>-Promote haemostasis.</p>

		by the local government health authorities for post-operative pain management -Where indicated, extraction followed by suture placement	
1.3.2	AEROSOL GENERATING PROCEDURES	-Use PPE -Pre procedural mouth rinses -Rubber dam application -Disposable instruments	
		LOW RISK PATIENTS: Dental Dam with Four-handed Dentistry + high / low volume saliva ejectors	Significantly reduce airborne particles in a 3-foot diameter of the operational field. When used with dental dam can effectively minimise aerosol production
		SUSPECTED OR CONFIRMED COVID 19 PATIENTS	1.Treated in dental setups equipped with negative pressure or AIIRs treatment rooms and allows for complete disinfection to prevent crosscontamination. 2. If not prepared, then should be directed toward the local authorities for assessment and management
1.4		DISINFECTION OF THE CLINIC SETTINGS	1. Non-aerosol related procedures: General areas - frequently clean and disinfect, including door handles, chairs, and desks. Disinfectants - Isopropyl alcohol, 0.5 % sodium hypochlorite Reusable instruments -pretreated, cleaned, sterilised, and properly stored 2. Aerosol related procedures - To post as the last case of the day followed by fumigation and ventilation, in addition to above

Figure 6<sup>29</sup> continued

**RESETTING YOUR CLINICAL PRACTICE**

It is well known that COVID-19 situation is a novel, unprecedented challenge to human well being .As a dental professional, it becomes further challenging to work not just in terms of fear of possibility of acquiring infection from clinical practice but also in terms to financial implication and commitments. Therefore it is must to ensure infection control in strict sense for each patient starting from screening till post treatment care. Dentistry is a profession which apart from affecting posture of the body also leads to exposure of infections and diseases. Dental clinicians invariable carry the risk of COVID-19 due to close communication with patient and specificity of procedures. So in such situation of pandemic disease every patient should be considered as a asymptomatic SARS-COV2 carrier.

**1)RECOMMENDATION BEFORE TREATING PATIENT DURING COVID-19**

In order to protect the clinician, dental staff and patient few guide lines(Figure 7) should be followed-

- Place Visual Alerts for patient awareness using posters on COVID-19 pandemic awareness, cough etiquette and hand hygiene practices
- Modify existing patient waiting area seating arrangement to enforce social distancing of 1 to 2 meters
- Insist on use of Alcohol Based Hand Rub (ABHR) for ALL upon entry into your dental practice.
- Provide face mask for all patients prior to consultation.
- Tissue paper dispenser and foot operated waste bin mandatory in patient waiting room
- Mandatory provision for hand washing with soap and water
- Avoid usage of commercial split/ centralized / window air conditioners unless equipped with High Efficiency Particulate Air (HEPA) filters
- It is recommended to use natural and mechanical ventilation using fans and exhaust

Figure 7<sup>30</sup>

- A. Treatment area/patient care area**
- All critical, heat resistant semi critical instruments and handpieces should be cleaned and sterilized after each use or discarded.
  - Heat sensitive semi-critical items can be processed with high-level disinfection eg. 2% Gluteraldehyde.
  - High touch/clinical surfaces that are difficult to clean must be covered using a physical barrier for every patient or disinfected between patients. (Eg: 1 % Sodium hypochlorite or 70% alcohol)
  - Use moistened wipe / cloth to clean all surfaces with freshly prepared disinfectant solution. (Eg: 1 % Sodium hypochlorite or 3% hydrogen peroxide). Always Discard remnant diluted solution
  - Floor - Use Wet Moping- Multi Bucket Technique :
    - (i) Water followed by
    - (ii) Detergent followed by
    - (iii) Low Level Disinfectant like 3% hydrogen peroxide, 1% Sodium hypochlorite or EPA approved agents
  - Mop heads and cleaning cloths must be decontaminated regularly by Laundering (heat disinfection) with detergent and drying at 80 °c and changed frequent
  - Do not perform disinfectant fogging / fumigation
- B. Reception and patient waiting area**
- Avoid sweeping with broom
  - Use wet moping with warm water and detergent or hospital disinfectan (eg. 1 % Sodium hypochlorite).
  - High touch surfaces must be cleaned more frequently with detergent/ disinfectant.

Figure 7<sup>30</sup>

**2)INACTIVATION OF VIRAL AGENTS IN HANDPIECE SPLATTER**

Water spray with a high speed airtor is a significant vehicle for dispersion of agents in the environment, which makes the patient, clinician and dental staff at risk. Acc to a study by Robert J Ceisel, reported that 0.01% of sodium hypochloride in dental waterline could significantly reduce the chances of infection<sup>31</sup>. Acc to a study by Irfana Fatima et all reported that if the disinfectant (clean cert-hypochlorous based disinfectant) is left over night in the

dental pipe line it can help in removing biofilm and will help in maintaining a sterile environment in dental pipeline<sup>32</sup>.

**3)DISINFECTING SURROUNDINGS**

It is very well known that healthcare-associated infection (HAIs) puts patients safety at risk and several pathogens of these infections are on surfaces and equipments handled by clinicians. Micro- organisms that cause HAIs to common cleaning procedure can get transferred by not only through hands but also through the air. Now despite of new products and technologies sodium hypochlorite is still one of the most widely used and accessible product in terms of cost and benefit. In a review article Samantha Storer Pesani Pereira et al reported that sodium hypochlorite (0.5% to 1%) was equally or more effective<sup>33</sup>.

**4) EXTRA ORAL SUCTION DEVICES**

Modern dental equipments like high speed handpiece and ultrasonic scalers have led to increase in aerosol generation and these aerosols they further increase the risk of infection in the clinical environment.



**Figure8** ([https://i.ytimg.com/vi/\\_hiOtsWfuR8/hqdefault.jpg](https://i.ytimg.com/vi/_hiOtsWfuR8/hqdefault.jpg))

In a study by Nobuo Motegi et al the extra oral suction was used for 3minutes during sub-gingival scaling. The suction head was positioned 5cm from the treatment side at 45 degrees to the floor surface. Then it was concluded that combined use of intra oral and extra oral suction results in lower level of aerosol spreading in around the working area<sup>34</sup>.

**ADJUCT MEASURES**

In pandemic disease like COVID-19, clinicians needs to move beyond instrument sterilization, disinfecting surroundings and address the invisible risk in the surrounding clinical air. Air conditioning systems which is designed for a comfortable environment at the same time can collect and circulate microbes from one place to another Here are certain methods of minimizing infectious pathogen in air-

**1)ULTRA-VIOLET GERMICIDAL IRRADIATION(UVGI)**

UVGI is a disinfection method that uses short ultraviolet wavelength light to kill or inactivate bacteria, viruses and other pathogens in air. UV light is a electromagnetic radiation with shorter wavelength than visible light but longer than x rays.



**Figure 9** (<https://www.todaysrdh.com/ultraviolet-germicidal-irradiation-dental-medical-settings-method-steriization>)

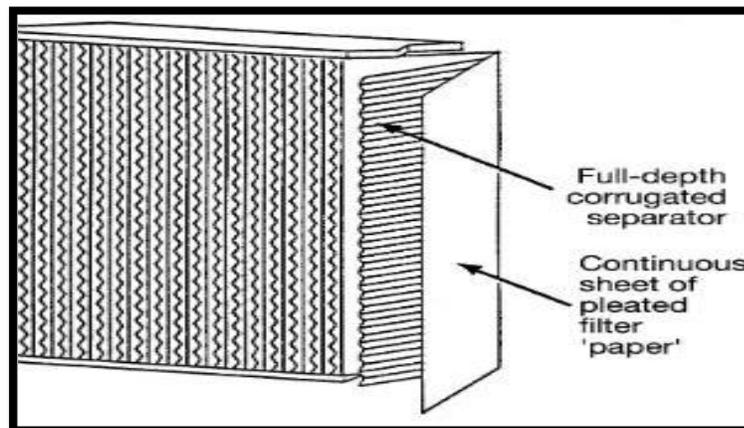
UV can be separated in to various ranges but the shorter wavelength s considered to be germicidal. Wavelengths between 200-300nm are strongly absorbed by nucleic acids which prevents replication of pathogen and ultimately leads to death<sup>35</sup>.

## 2) AIR FILTRATION

Air quality and ventilation in dental clinic plays a major role in infection rate. It has been reported that to maintain the air cleanliness in operating room , air exchange rate should be more than 15 minutes in 1 hour. Air purifiers use different types of filtration such as carbon, HEPA or mixture of both.

### A) HEPA FILTER

According to the institute of environmental sciences and technology a certified HEPA filter must capture minimum of 99.7% of contaminants with a diameter greater than or equal to 0.3 microns.



**Figure 10** (<https://www.neimagazine.com/Uploads/NewsArticle/4316295/main.jpg>)

HEPA filters are being used now to enhance the air quality in clinics, hospitals, isolating rooms and pharmaceutical industries around the world.

HEPA filters are made from paper such as glass fiber or polymer sheet which are pleated many times into a “V” pattern to increase the surface area within a small volume to enhance their effectiveness in removing air particle<sup>36</sup>. Types of HEPA filters-

- HEPA H14- pass up 0.005% of 0.1 micron particles per liter of air.
- HEPA H13- pass up 0.05% of 0.1 micron particles per liter of air.
- HEPA H12- pass more than 0.5% of 0.1 micron particles per liter of air.
- HEPA H11- pass a maximum of 5% of 0.1 micron particles per liter of air.
- HEPA H10- pass more than 15% of 0.1 micron particles per liter of air.

HEPA type or HEPA like filter – Minimum filtration

So, among all these filters HEPA H14 is more efficient in removing dust, allergens, bacteria, viruses, aerosol from air<sup>37</sup>.

### **BOOSTING IMMUNITY TO FIGHT CORONA**

One of the reason that the coronavirus is spreading so rapidly and having such a significant impact on people around the world is that we lack immunity to it. Our immune systems have never seen it before. Good hand hygiene and social distancing can help keeping the virus away but taking a healthy diet can further help in keeping the infection away, if one gets exposed.

Antiviral and immunity boosting foods include-

#### 1)Garlic-

Apart from lowering blood pressure garlic also helps in increasing immunity as it contains sulfur containing compound known as allicin.

#### 2)Ginger-

Ginger not only helps in increasing immunity but also decreases inflammation and reduces sore throat

#### 3)Spinach-

It is rich in vitamin C , antioxidants and beta carotene. When it is cooked as little as possible it increases the infection fighting ability of the body.

#### 4)Papaya-

It is loaded with vitamin C and has digestive enzyme called papain which has anti-inflammatory effect .It also has good amount of potassium, folate and vit B which further helps in enhancing the immune system of the body.

#### 5)Anti-viral herbal receipe-

1 - Sweet potato <sup>1/2</sup>- GarlicSome - Spring onionsFew – ParsleyFew - Rosemary

Mix all the ingredients together and make it into a soup.The soup helps boost the immune system against cold, flu and virals

#### 6)Pre-biotic or pro-biotic to keep your gut healthy. The healthier your gut, the stronger is your immune system

Apart from these fruits and vegetables good exercise and proper sleep can helpus in fighting against COVID-19<sup>38</sup>.

### **DISCUSSION**

Universal precautions are necessary to minimize the spread of this virus. As presented in this review, further precautions are required that includes prescreening of the patient confirmed with COVID-19.Also Indian Council Of Medical Research has suggested the use of hydroxychloroquine sulfate tablets if working with symptomatic or asymptomatic patients but it is still controverstial<sup>39</sup>. The latest update (March 16, 2020) by the American Dental Association recommends the clinicians nationwide to delay elective dental treatment for the next three weeks and focus on emergency cases<sup>40</sup>Thus, at this stage every patient in clinical practice should be considered potentially infected by this virus and health care professionals must keep themselves upto date about the virus and infection control policies.

### **CONCLUSION**

COVID-19 is an dangerous disease with a high mortality rate, it is unlikely that the dental team will encounter an case but possess a significant transmission risk if any undetected case visit the clinic.One of the best ways to prevent

the spread of viral illness is to minimize the circumstances in which individuals may interact and transmit disease. It is the duty of health care professionals to protect the public and maintain high standard of care and infection control.

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