

Covid 19 – Facts And Its Infection Control Measures For Dentists

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Abstract: The present outbreak of the Coronavirus diseases (COVID-19) caused due to the virus SARS-CoV-2 constitutes a public health emergency of global concern. Symptoms of COVID-19 infection include fever, cough, and acute respiratory disease, with severe cases leading to pneumonia, kidney failure and even death.

This disease shows human to-human transmission and display signs and symptoms of fever, and acute respiratory disease, which further can lead to pneumonia, kidney failure, and even death.

Since dentists work in close proximity to the patients and their oral cavities, it is quite crucial for the dentists to undertake appropriate prevention and infection control measures to avoid the spread of the virus.

This review tries to give an overview to the dentists about this pandemic and provide a criteria for proper history taking in the form of a questionnaire along with recommendations about the infection control and preventive measures that can be employed by them to prevent further spread and subsequent worsening of the current disease scenario based on the current research evidence and the knowledge from these researches across the globe about this disease .

Key words: COVID-19, Coronavirus, Dentists, SARS-CoV-2, Infection control.

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I. Introduction:

On December, 2019, there was an outburst of pneumonia of unknown cause in Wuhan, China, which received intense attention not only within China but also internationally. A novel coronavirus was subsequently identified as the causative pathogen by the Chinese scientists and was named as 2019 novel coronavirus (2019-nCoV).¹ WHO named this disease as COVID-19 short for 'coronavirus disease-2019'.²

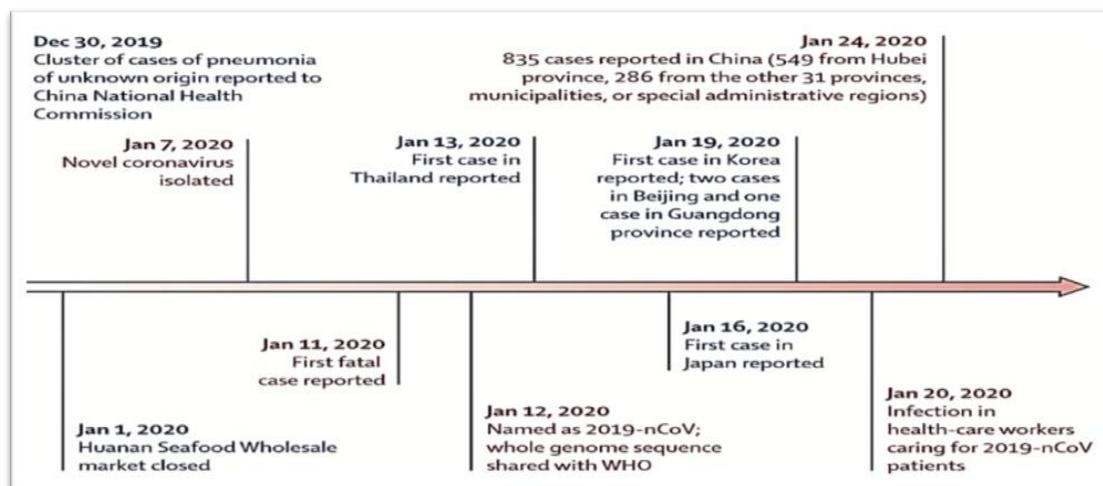


Figure: Timeline of early stages of 2019-nCoV outbreak. Source- www.thelancet.com

COVID-19 is not the first severe respiratory disease outbreak caused by the coronavirus. Coronaviruses have caused three epidemic diseases, namely, COVID-19, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) in the past two decades³. On 30th January, 2020, WHO declared the outbreak a Public Health Emergency of International concern (PHEIC). On 11 March, WHO Director General characterized COVID-19 as a pandemic. The increasing number of cases and widening geographical spread of the disease raise grave concerns about the future trajectory of this outbreak.

On the basis of current data, it seems that the 2019 novel coronavirus might have been initially hosted by bats, and might have been transmitted to humans via wild animal(s) sold at the Huanan seafood market, China since several patients with COVID-19 were found to be epidemiologically associated with the Huanan seafood market.¹

Dental treatments can lead to the spread of infection since maximum number of dental procedures cause aerosols generation, frequent exposure to saliva, blood and body fluids and the handling of sharp instruments. Hence, to prevent the spread of the disease, dentist should give utmost importance to proper history taking, patient education and infection prevention measures.

What is coronavirus?

Coronaviridae is family of zoonotic virus which primarily targets the human respiratory system. Coronaviruses are large enveloped, positive single stranded RNA viruses that can be divided into four genera, namely alpha, beta, delta and gamma. Since

they are positive-sense single-stranded RNA viruses, they do not need to carry enzymes to initiate infection.⁴ The virus genome was found to be 75-80% identical to the SARS-CoV-1 which had caused the SARS epidemic.⁵ This virus binds to their target cells through angiotensin-converting enzyme 2 (ACE 2) which is expressed by epithelial cells of lung, intestine and blood vessels. World Health Organisation (WHO) has classified COVID-19 as a Beta-CoV of group 2B.

Signs and symptoms of COVID-19 infection-

The symptoms of COVID-19 infection appear after an incubation period of approximately 5.2 days. The period from the onset of COVID-19 symptoms to death ranged between 6 to 41 days with a median of 14 days.²

As of 20 February, 2020 and based on 55924 laboratory confirmed cases, typical signs and symptoms include: fever (87.9%), dry cough (67.7%), fatigue (38.1%), sputum production (33.4%), shortness of breath (18.6%), myalgia or arthralgia (14.8%) sore throat (13.9%), headache (13.6%), , chills (11.4%), nausea or vomiting (5.0%), nasal congestion (4.8%), diarrhoea (3.7%), and haemoptysis (0.9%), and conjunctival congestion (0.8%) Further development of symptoms can lead to severe pneumonia, acute respiratory distress syndrome, sepsis, septic shock and death.⁶

As of April 1,2020; 5:19AM IST, 857,487 confirmed cases have been diagnosed globally out which 178,034 people have recovered from the illness whereas, 42,107 patients have died. This information comes from the Coronavirus COVID-19 Global Cases map developed by the Johns Hopkins Center for Systems Science and Engineering. (<https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>)

The Indian Ministry of Family and Health welfare has reported the following data as on 1-04-2020 19:30 GMT+5:30-⁷

Total number of Active COVID 2019 cases across India :1649

Total number of Discharged/Cured COVID 2019 cases across India: 143

Total number of Deaths due to COVID 2019 across India: 41

Transmission-

The virus is thought to spread mainly from person to person.⁸

1. Amongst people who are in close contact with one another.
2. Through respiratory droplets produced when an infected person coughs or sneezes.
3. Faecal-oral route might also be a mode of transmission.

Individuals at highest risk for severe disease and death include people aged over 60 years and those suffering from hypertension, diabetes, cancer and chronic respiratory disease. COVID-19 in children is relatively rare with approximately 2.4% of the total reported cases reported amongst individuals aged under 19 years. A very small proportion of those aged under 19 years have developed severe (2.5%) or critical disease (0.2%).

A news article from The New York Times dated on March 15, 2020 by Lazaro Gamio stated that dentist pose the greatest coronavirus risk.



Source – New York times.

The vertical position of each bubble in the above picture is a measure of how often workers in a given profession are exposed to disease and infection. The horizontal position is a measure of how close people are to others during their workdays.

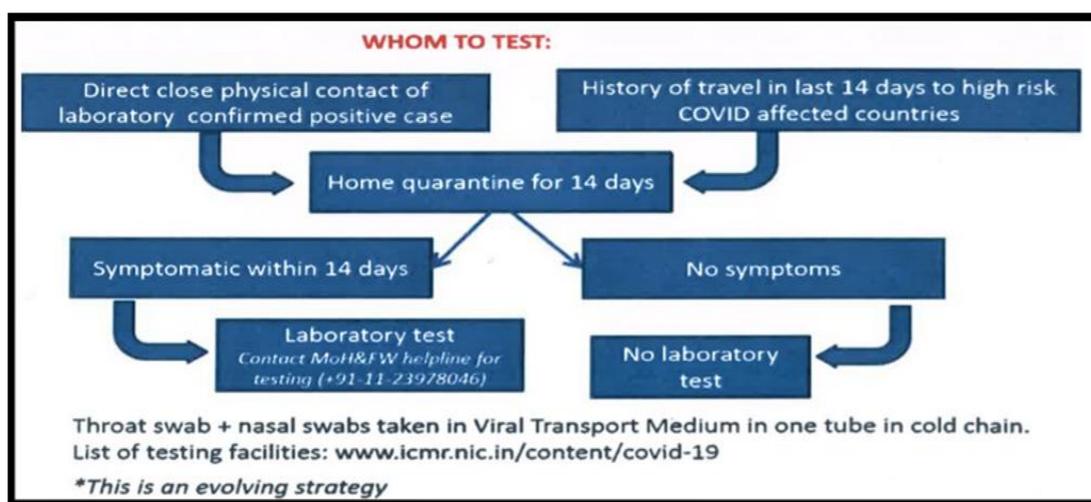
According to a recent study data, SARS-CoV-2 was detectable in aerosols for up to 3 hours, up to 4 hours on copper, 24 hours on cardboard and up to 2 to 3 days on plastic and stainless steel. This indicates that aerosol and fomite transmission of SARS-CoV-2 is plausible, since the virus can remain viable and infectious for many hours.⁹ Since, there is tremendous aerosol production and contact with saliva and blood along with being in close proximity to the patients while carrying out dental treatments. Due to these factors, dentists are at higher risk of contracting COVID-19. Also, dental clinics can become a source of infection if due precautionary and infection control measures are not taken.¹⁰

Diagnosis-

Clinical diagnosis of COVID-19 is mainly based on epidemiological history, clinical manifestations and other auxiliary examinations, such as, CT scan, enzyme-linked immunosorbent assay (ELISA), blood culture immune identification technology of IgM/IgG.³

Another study showed that the positive rate of SARS-CoV-2 was 91.7% (11/12) in the patients’ self-collected saliva by using RT-qPCR, which suggests that saliva is a promising non-invasive specimen for the diagnosis.

The Indian Council of Medical Research has come up with the following guidelines regarding their Testing strategy as dated on 9/3/2020.



Source- www.icmr.nic.in

This approach differs from countries such as South Korea which did mass testing. Few experts suggest that testing should move beyond at-risk groups.

Treatment-

Just like SARS-CoV and MERS-CoV, there is currently no clinically proven specific antiviral agent available for SARS-CoV-2 infection. Broad-spectrum antibiotics to cover secondary bacterial infection and supportive treatment, including oxygen therapy, conservation fluid management, happens to be the most important management strategy for COVID-19.

INFECTION CONTROL STRATEGIES IN DENTAL SET-UPS:

Dentists should employ the following strategies to prevent the contraction and further spread of COVID-19.

1) **Screening of patients-**

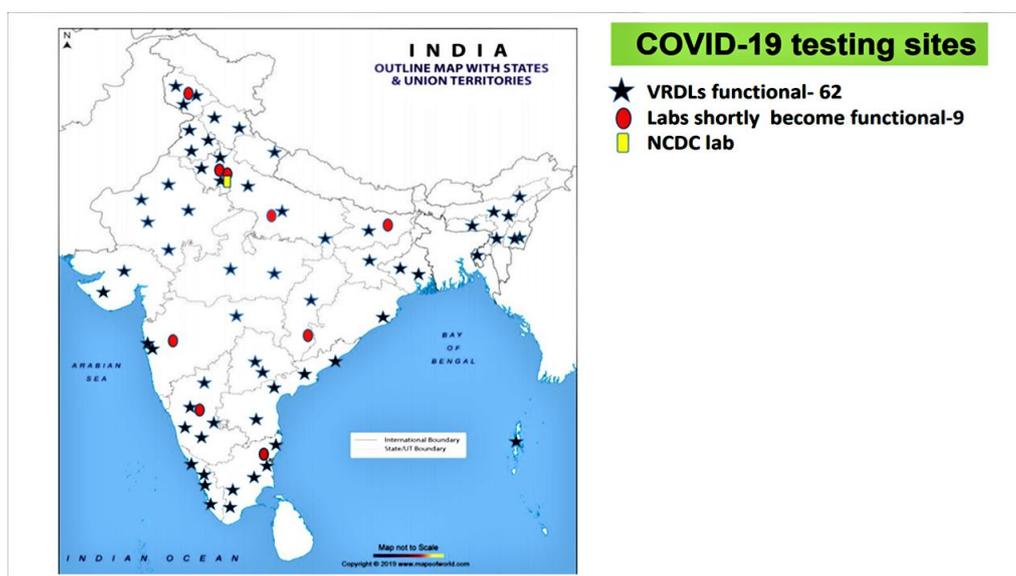
The first and foremost important thing to be carried out by all the dentists before starting any dental procedure is evaluating the patient for any COVID-19 associated symptoms and signs. It is quite essential to maintain a record of all the people who visited the dental clinic and dental institution. Dental intuitions and hospitals should have separate room / corners for screening of suspected cases of Covid-19.

The following questionnaire can be used in dental clinics and institutions for early recognition of the patients.

1) Do you have fever and/or chills?	Yes/No
2) Are you having cough and/or nasal congestion?	Yes/No
3) Are you experiencing fatigue or muscular pain?	Yes/No
4) Are you experiencing shortness of breath?	Yes/No
5) Are you experiencing a sore throat?	Yes/No
6) Are you experiencing headaches?	Yes/No
7) Are you experiencing nausea or vomiting?	Yes/No
8) Are you having diarrhoea?	Yes/No
9) Have you travelled outside India lately? If yes, where.....	Yes/No
10) Have you travelled within India lately? If yes, where.....	Yes/No
11) Have you recently participated in any gathering, meetings, or had close contact with many unacquainted people?	Yes/No
12) Did you come in contact with people who have recently travelled abroad or to the cities where COVID-19 suspects were found?	Yes/No
13) Did you come in contact with people who have / had flu like symptoms in past 2-3 weeks?	Yes/No
14) Have you got yourself checked/screened for corona virus disease?	Yes/No
15) Were you kept in quarantine in the recent past? If yes, then was it self-isolation or in the hospital?.....	Yes/No

If the patient replies “yes” to the one or more of the above mentioned questions he/she should be provided with a medical mask(triple layer) ; if not having ; and should be asked to cover his/her faces with mask and should immediately be referred to a nearby designated hospital which is well equipped with the isolation facilities.

Dentists can refer to the site of Indian Council of Medical Research (ICMR) <https://www.icmr.nic.in/content/Covid-19> to know about and nearby COVID-19 testing sites for Covid-19. Currently, as dated on 18 March, 2020 there are 62 sites for testing in India.



Source- https://icmr.nic.in/sites/default/files/upload_documents/COVID_19_Testing_Sites.pdf

2) **Patient education-**

- i. Dentists can play a very crucial role to prevent this outbreak by imparting knowledge about the precautionary measures which should be followed by the patients such as asking them to maintain proper personal hygiene and to avoid shaking hands and spitting on walls and roads.
- ii. Patients should be advised to maintain a minimum distance of 1 meter from people around them. They should be asked to cover their mouths while coughing with tissues or inner side of elbows (not on palms of hands) and to properly discard the used tissues.
- iii. The OPD rooms and waiting areas of clinics and intuitions should display eye catching, pictorial and easy to understand posters or infographics for patient education regarding the prevention measures which can and should be undertaken by the general public.



Source- <https://www.mohfw.gov.in/>

3) **Recommendations regarding dental care-**

- i) IDA recommended on 17 March, 2020, that all the practicing dentists in country to voluntarily suspend non-essential or non-urgent dental care up to 31 March, 2020.
- ii) The Indian Endodontic Society recommends that those dental conditions like uncontrolled bleeding, diffuse extra oral swelling and severe traumatic injuries need to be attended immediately. Other symptomatic dental conditions should be handled by pharmacological means and should be followed up telephonically. If there is worsening of symptoms then the patient should be called for emergency care treatment. Asymptomatic patients should only be tele counselled and should be scheduled when regular dental practices are restored.
- iii) As per the DCI (Dental Council of India) recommendations for safe clinical practice in dental clinics/hospitals in view of COVID-19 outbreak as published on 17-3-2020, patients should be scrubbed with iso-propyl alcohol extra orally and pre procedural rinse of 0.2% Povidone iodine is recommended.
- iv) Every patient who enters or exits the clinic should be asked to sanitize their hands.
- v) The waiting room/clinic including the handles and door as well as dental chairs and other surfaces should be wiped several times in a day with alcohol-based disinfectants along with periodical fumigation of clinics.
- vi) Dentist and supporting staff of hospitals and clinics should refrain themselves from touching their face especially ears, nose and mouth.
- vii) Disinfection of the floor and walls with 1000 mg/L chlorine-containing disinfectant through floor mopping, spraying or wiping should be carried out.
- viii) It was reported that dental practice should be postponed at least 1 month for convalescing patients with SARS. The same can be applied for COVID-19.
- ix) Efforts should be made to provide a treatment with least invasive approach and causing minimalistic to no aerosol production; for e.g., employment of hand scalers instead of ultrasonic scalers would prevent aerosol production and use of chemico-mechanical techniques for caries removal rather than using handpieces to prevent aerosol and droplet infection and filling with temporary restorative materials.
- x) Extraoral radiographs should be advised rather than opting for intraoral radiographs since contamination with saliva is more in the latter method of radiography.

xi) It is advisable that the treatment of patients with oral and maxillofacial compound injuries and fascial space infections should not be attempted in the dental clinic and they should be referred to nearby hospital where all the adequate infection control measures can be undertaken.

xii) Single use equipment is to be preferred. These items are local anaesthetic needles and cartridges, scalpel blades, suction tubes, matrix bands, impression trays, surgery burs, patient gown, working area covers.

xiii) WHO recommended on March 18, 2020 that people suffering with COVID-19 symptoms should avoid taking ibuprofen, after French Health Minister Olivier Veran warned that anti-inflammatory drugs would worsen the symptoms.

4) ***Following proper hand hygiene-***

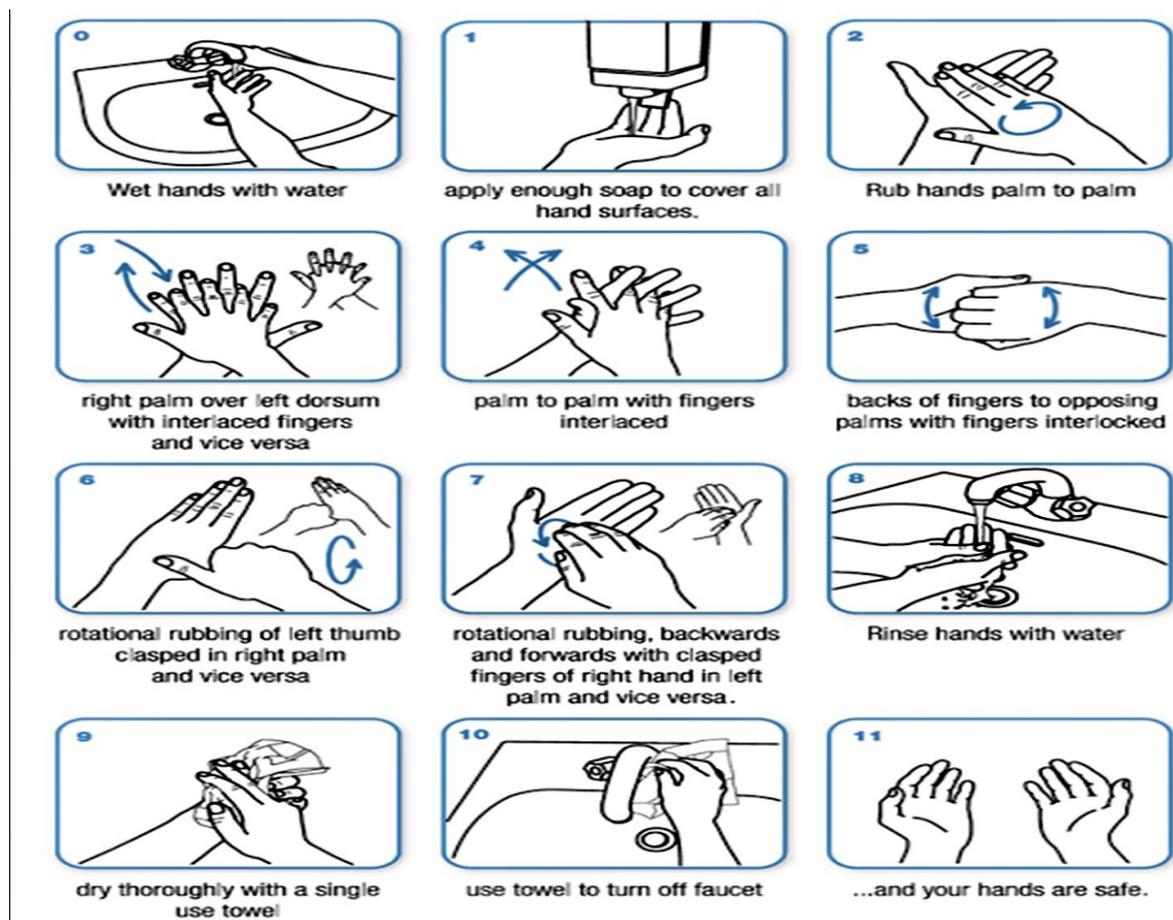
Providing and maintaining a certain level of hand hygiene is of great importance in protection techniques. All member of the dental team must adapt the habit of maintaining providing hand hygiene.

Indications for hand hygiene and Selection of hand-hygiene agents-

- When hands are visibly dirty or contaminated with proteinaceous material or are visibly soiled with blood or other body fluids, it is advisable to wash hands with either a nonantimicrobial soap and water or an antimicrobial soap and water.
- If hands are not visibly soiled, alcohol-based hand rub can be used.
- It is necessary to decontaminate hands before and after having direct contact with patients and after contacting inanimate objects (including medical equipment) which lie in immediate vicinity of the patient/s.
- Decontamination of hands before and after removing gloves is a must.
- Before eating and after using a restroom, wash hands with a non-antimicrobial soap and water or with an antimicrobial soap and water.

Technique of hand washing-

- Rings, watches, and bracelets should be removed before starting the surgical hand scrub.
- Debris from underneath of the fingernails should also be removed by using a nail cleaner under running water.
- When decontaminating hands with an alcohol-based hand rub, apply product to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry. Manufacturer's recommendations should be followed regarding the volume of product to use.
- When washing hands with soap and water, wet hands first with water, apply an amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 20 seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet.
- Use of hot water should be avoided, because repeated exposure to hot water may increase the risk of dermatitis.
- Liquid, bar, leaflet or powdered forms of plain soap are acceptable when washing hands with a nonantimicrobial soap and water. When bar soap is used, soap racks that facilitate drainage and small bars of soap should be used.
- Multiple-use cloth towels of the hanging or roll type are not recommended for use in health-care settings.



Source- https://www.who.int/gpsc/clean_hands_protection/en/

Indications for and limitations of glove use

- Wearing gloves does not replace the need for hand hygiene.
- Not only the dentist but also other members of the dental team must put on gloves during dental procedures.
- Hand contamination may occur as a result of small, undetected holes in examination gloves.
- Contamination may occur during glove removal.
- Failure to remove gloves after caring for a patient may lead to transmission of infection from one patient to another.
- Gloves should not be washed or reused.
- Use of petroleum-based hand lotions or creams is proven to adversely affect the integrity of latex gloves.
- It should be noted by dentists that after use of powdered gloves, certain alcohol hand rubs may interact with residual powder on the hands of personnel, resulting in a gritty feeling on the hands and hence one should the occurrence of same.
- Personnel should be reminded that failure to remove gloves between patients may contribute to transmission of organisms.
- When cleaning dental appliances and instruments more durable gloves than regular non-sterile ones must be utilized to prevent injuries.

5) **Protective clothing recommendations –**

- **Mask-**
 - i) Masks should be placed over the nose, mouth and chin and should be adjusted in such a way that there are no gaps on either side of the mask.
 - ii) CDC (Centre for disease control and prevention) has warned that facial hair may interfere with the effectiveness of face masks.
 - iii) Masks are effective only when used in combination with proper hand hygiene.
 - iv) Hands should be cleaned with alcohol-based hand rub before putting on the mask as well as after it's discard.
 - v) Dentists and staff should avoid touching the mask while wearing it.

- vi) To remove the mask, WHO recommends to remove it from behind (do not touch the front of mask).
- vii) Proper disposal of the masks should be done.

- *Eyewear/face shields-*

- i) Sides and upper edges of the protective eyewear must adapt the face well and provide protection against all kinds of infection agents.
- ii) Face shields are more practical than protective glasses for dentists who also have to wear medical glasses and also a lower level of misting is experienced when using the same.

- *Personal Protective Equipment (PPE)-*

Protective clothing should be utilized instead of daily clothing. This way, contact of pathogens with skin can be avoided. In case the clothing gets wet, they should be changed immediately with new ones and should be taken off when the clinician is to leave the operation area.

Protocol for Donning PPE (Personal Protective Equipment):

1 Always remove PPE under the guidance and supervision of a trained observer (colleague). Ensure that infectious waste containers are available in the doffing area for safe disposal of PPE. Separate containers should be available for reusable items.

2 Perform hand hygiene on gloved hands.¹

3 Remove apron leaning forward and taking care to avoid contaminating your hands. When removing disposable apron, tear it off at the neck and roll it down without touching the front area. Then untie the back and roll the apron forward.

4 Perform hand hygiene on gloved hands.

5 Remove outer pair of gloves and dispose of them safely. Use the technique shown in Step 17

6 Perform hand hygiene on gloved hands.

7 Remove head and neck covering taking care to avoid contaminating your face by starting from the bottom of the hood in the back and rolling from back to front and from inside to outside, and dispose of it safely.

8 Perform hand hygiene on gloved hands.

9 Remove the gown by untying the knot first, then pulling from back to front rolling it from inside to outside and dispose of it safely.

10 Perform hand hygiene on gloved hands.

11 Remove eye protection by pulling the string from behind the head and dispose of it safely.

12 Perform hand hygiene on gloved hands.

13 Remove the mask from behind the head by first untying the bottom string above the head and leaving it hanging in front; and then the top string next from behind head and dispose of it safely.

14 Perform hand hygiene on gloved hands.

15 Remove rubber boots without touching them (or overshoes if wearing shoes). If the same boots are to be used outside of the high-risk zone, keep them on but clean and decontaminate appropriately before leaving the doffing area.²

16 Perform hand hygiene on gloved hands.

17 Remove gloves carefully with appropriate technique and dispose of them safely.

18 Perform hand hygiene.

¹ While working in the patient care area, outer gloves should be changed between patients and prior to exiting (change after seeing the last patient)
² Appropriate decontamination of boots includes stepping into a footbath with 0.5% chlorine solution (and removing dirt with toilet brush if heavily soiled with mud and/or organic material) and then wiping all sides with 0.5% chlorine solution. At least once-a-day boots should be disinfected by soaking in a 0.5% chlorine solution for 30 min, then rinsed and dried.

World Health Organization

Protocol for Removing PPE (Personal Protective Equipment):

1 Always remove PPE under the **guidance and supervision of a trained observer** (colleague). Ensure that infectious waste containers are available in the doffing area for safe disposal of PPE. Separate containers should be available for reusable items.

2 Perform **hand hygiene** on gloved hands.¹

3 Remove **apron** leaning forward and taking care to avoid contaminating your hands. When removing disposable apron, tear it off at the neck and roll it down without touching the front area. Then untie the back and roll the apron forward.



4 Perform **hand hygiene** on gloved hands.

5 Remove **outer pair of gloves** and dispose of them safely. Use the technique shown in Step 17

6 Perform **hand hygiene** on gloved hands.

7 Remove **head and neck covering** taking care to avoid contaminating your face by starting from the bottom of the hood in the back and rolling from back to front and from inside to outside, and dispose of it safely.



OR



8 Perform **hand hygiene** on gloved hands.

9 Remove the **gown** by untying the knot first, then pulling from back to front rolling it from inside to outside and dispose of it safely.



10 Perform **hand hygiene** on gloved hands.

11 Remove **eye protection** by pulling the string from behind the head and dispose of it safely.



OR



12 Perform **hand hygiene** on gloved hands.

13 Remove the **mask** from behind the head by first untying the bottom string above the head and leaving it hanging in front; and then the top string next from behind head and dispose of it safely.



14 Perform **hand hygiene** on gloved hands.

17 Remove **gloves** carefully with appropriate technique and dispose of them safely.



15 Remove **rubber boots** without touching them (or overshoes if wearing shoes). If the same boots are to be used outside of the high-risk zone, keep them on but clean and decontaminate appropriately before leaving the doffing area.²

16 Perform **hand hygiene** on gloved hands.

18 Perform **hand hygiene**.

¹ While working in the patient care area, outer gloves should be changed between patients and prior to exiting (change after seeing the last patient)
² Appropriate decontamination of boots includes stepping into a footbath with 0.5% chlorine solution (and removing dirt with toilet brush if heavily soiled with mud and/or organic materials) and then wiping all sides with 0.5% chlorine solution. At least once a day boots should be disinfected by soaking in a 0.5% chlorine solution for 30 min, then rinsed and dried.



6) **Prevention of infection through aerosol-**

i) High suction vacuum tips/ saliva ejectors must be used.

ii) Rubber dam isolation should be undertaken.

iii) All the dental procedures should be performed in an adequately ventilated room with at least 160 l/s/patient air flow or negative pressure rooms with at least 12 air changes per hour (ACH) and controlled direction of air flow when using mechanical ventilation.

7) *Disposal of biomedical waste-*

Double-layer yellow coloured medical waste package bags and gooseneck ligation should be used to dispose the medical and domestic waste generated due to the treatment of patients with suspected or confirmed 2019-nCoV infection. The surface of the package bags should be marked and disposed according to the requirement for the management of medical waste.¹¹

II. Conclusion

Based on the current research evidence, we can conclude that COVID-19 spreads due to close contacts amongst people through droplet transmission and inhalation and also through contaminated surfaces.

Dental treatments cause frequent direct or indirect contact to patients, aerosol generations and exposure to saliva, blood and body fluids which can be a source of contraction and spread of this disease. It is quite likely that dentists may deliver dental treatment to COVID-19 positive patient/s unknowingly since as mentioned earlier patients develop symptoms after a few days and some patients might not give correct history to her/his dentist. Hence, dentists should treat every patient as potentially infectious for this virus.

Proper history taking with the above given questionnaire along with abiding to the above mentioned recommendations like maintaining proper hand hygiene, wearing of PPE, using rubber dams, disinfection of the surfaces that come in contact of patients, periodic fumigation and appropriate disposal of biomedical waste is recommended to abort the chances of contracting as well as the spread of this disease outbreak.

It is essential for dentists to keep themselves updated about this disease and apply the updated recommended protocols in their dental practices and dental institutions in order to maintain high standards of patient care and infection control.

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