

Prevention and infection control measures for oral health professionals in India Amidst covid-19 outbreak- A Review

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Abstract

Background: A novel corona virus (now known as SARS-Cov-2) spill-over event, with its epicentre in Wuhan, People’s Republic of China, has emerged as a public health emergency of international concern. Corona virus represents a major group of viruses mostly affecting human beings through zoonotic transmission.

Aim: The aim of this review article is to provide complete insight of all the precautionary measures to be followed for dental practices and hospitals in the areas that are potentially affected with COVID-19, strict and effective infection control protocols are urgently needed, so as to avoid the dental setups turning into hotspot for further spread of disease.

In order to provide a comprehensive review, a thorough study of literature about novel corona virus, infection control, guidelines and precautionary measures in dental office were taken into consideration. This review is based on relevant guidelines and research, introduces essential

knowledge about covid-19 and nosocomial infection in dental settings .All the latest literature of this context has been thoroughly studied and concised, including the guidelines. The data pertaining to the statistic has been taken from the standard authorized organization, both worldwide and in India.

Conclusion: Infection control measures are necessary to prevent the virus from further spreading and to help control the epidemic situation. Acumen is provided about the protocols to be followed in the dental set up, during the emergency treatment procedures in such infectious pandemic situation. This review summarizes the emerging evidence, which can guide the public health response, particularly in India.

Keywords: Infection Control, Dental Public Health, Dental Education, Transmission, Dental Practice Management.

Introduction

In the past two decades, this is the third instance of emergence of a novel corona virus, after Severe Acute Respiratory Syndrome (SARS-CoV) in 2003 and Middle-East Respiratory Syndrome corona virus (MERS-CoV) in 2012.^{1,2} On January 8, 2020 a novel corona virus (now known as SARS-CoV-2) was found as causative pathogen for a disease causing viral pneumonia (now known as COVID-19) by the Chinese centre for disease control and prevention.³ Indian council of medical research, National institute of virology (ICMR-NIV) has carried out extensive data collection from bats, which provides critical insight for the ongoing spill over event. However, given the current state of the evidence, it remains difficult to say, whether this virus could become entrenched with endemic, seasonal for annual epidemics (like pandemic H1 N1 influenza)^{4, 5} or it would extinguish like SARS-CoV.

It's been a catastrophe for dentist to continue their health care services in such pandemic infectious disease conditions. In order to guide them for continuing their services to the community, The present review article provides ample insight and guidelines of all the precautionary care to be taken for dental practices and hospitals in the areas that are potentially affected with COVID-19. Comprehensive measures needed for strict and effective infection control are discussed, so as to avoid the dental setups turning into hotspot for further spread of disease.

Materials and Methods

A thorough study of literature about novel corona virus, infection control, guidelines and precautionary measures in dental office were taken into consideration, In order to provide a comprehensive review. This review is based on relevant guidelines and research, introduces essential knowledge about covid-19 and nosocomial

infection in dental settings. All the latest literature of this context has been thoroughly studied and concised, including the guidelines.

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Epidemiology

The epidemics of Corona virus disease 2019 (COVID-19) started from Wuhan, China, last December and have become a major challenging public health problem around the world. As of 15th April Covid-19 has been recognized in 213 Countries, with a total of 1,84,8439 Laboratory confirmed cases and 117217 Deaths (WHO 2020). The same in India is about 9756 Confirmed cases and 377 Deaths (ICMR2020). Covid-19 has been labelled as public health emergency of international concern (PHEIC)⁶. On Jan 30th 2020 and the epidemic curves are still on the rise.⁷ The high mortality observed in China, at the beginning of the outbreak, was only a part of whole story. The differences could be accounted by missed cases in the initial days, and the effectiveness of the critical care protocol and aggressive management techniques utilized outside China.⁸ Integrated early warning and response system are an effective way to raise a timely alarm about emerging and re-emerging pathogens, but few tools are available to enable pre-emptive prediction of such disease. Incubation Period:

The mean incubation period was 5.2 days, 95th percentile of the distribution was at 12.5 days, in a study covering 425 cases, and median incubation period was 3.0 days (range 0- 24 days) in another study based on 1324 cases.^{9, 10}

It might be possible that, the single case, with an outline incubation period of 24 days was actually a second

exposure. This assertion was made at a WHO press conference (link of video: <https://youtu.be/a0Nu5MURFe4>) has led WHO to reinforce the current recommendation about isolation and quarantine.¹⁰

Clinical Manifestations

The most common symptoms at the onset of illness are

- Fever-99%,
- Fatigue-70%,
- Dry cough-60%,
- Myalgia-44%.
- Dyspnoea.^{11, 12, 13}

However, it's also known that most of the patients do present with gastrointestinal aspect of the disease like diarrhoea, vomiting and abdominal pain.¹² Studies have identified RNA in the stool specimen of these infected patients.¹²

The most common complication reported with COVID-19 is Acute Respiratory Distress Syndrome, Arrhythmias, Acute Cardiac Injury, Shock and Acute Kidney injury.^{14, 15, 10}

Diagnosis and Transmission

The diagnosis of COVID 19 can be based on a combination of epidemiologic information (H/O travel to or residence of affected region 14 days prior to symptom onset) clinical symptoms, CT image findings and laboratory test. WHO recommends that culture of the virus must be done in a BSL-3 laboratory and RT-PCR be done in a BSL-2 laboratory.^{16, 17} seroconversion can be confirmed by ELISA or indirect fluorescent antibody test (IFA).¹⁸

The Transmission although started with a single animal to human transmission, followed by sustained human to human spread.¹⁹ Interpersonal transmissions occur mainly via respiratory droplets and contact transmission. In addition, there may be risk of faecal-oral transmission;

researchers have identified SARS-CoV-2 in stools of patient from China and USA.²⁰ However, whether it can be spread through vertical transmission is yet to be confirmed. (WHO 2020C)

Observations suggest that patients in incubation period are also carriers of covid-19.¹⁹ This epidemiological feature of covid-19 has made its control extremely challenging, as is difficult to identify and Quarantine these patient in time, which can result in accumulation of covid-19 in communities.

Health Assessment in Dental Practice

Considering the Higher Risk posed by Oral Health Professionals (OHP) to SARS-CoV-2, Preventive and infection control measures in dental practice becomes of absolute importance with unprecedented priority. Among which, knowing medical history & travel history of the patient helps in triaging.

Chair side Questionnaire given as mentioned in Table 1 can be used for screening patients:

If a Patient ticks (✓) in the column YES for any of the questions and his/her temperature is BELOW 37.3 °C, Dentist should,

- Defer the treatment until 14 days after the exposure event.
- Instruct Self isolation at home
- Ask the patient to report to the local health department in case of fever/ Flu-like symptoms.

If a Patient ticks (✓) in the column NO for all of the questions and his/her temperature is BELOW 37.3 °C, Dentist should,

- Treat the patient with extra precaution and with complete PPE
- Avoid spatter or aerosol generating procedures to the best

If a Patient ticks (✓) in the column NO for all of the questions and his/her temperature is ABOVE 37.3 °C, Dentist should,

- Instruct the patient to report any fever clinics/ COVID-19 screening centre immediately for further medical care

Personnel Protective Measures

As per the hand hygiene in clinical settings (Figure 1), The oral health 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.

It should be ascertained at all times that dental professionals avoid touching their own eyes, mouth and nose.

Universal precaution for infection control is always advisable in such condition. Also it is noted that airborne droplet transmission of infection is considered as the main route of spread, particularly in dental clinics and hospitals, barrier-protection equipment, including protective eyewear (Completely sealed and should not be exposed to droplets), N95 mouth masks, double gloves, head caps, face shields, and protective outwear, is strongly recommended. Types of gloves can be selected as per the indications given in Figure 2.

Based on the possibility of the spread of SARS-CoV-2 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 if 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). (Patient with 2019-nCoV infection should not be treated but it is advisable only in emergency conditions.)

Prior Precautions for Treatment

Since SARS-CoV-2 is vulnerable to oxidation, pre-procedural mouth rinse containing oxidative agents such as 1% hydrogen peroxide or 0.2% Povidone-Iodine is recommended.

Isolation of Operating Field

It has been reported that the use of rubber dam could significantly reduce airborne particles in ~3-foot diameter of the operational area by 70%.²² When rubber dam is applied, extra high-volume suction for aerosol and spatter should be used during the procedures along with regular suction.²³

In this case, the implementation of a complete four-hand operation is also necessary. If rubber dam isolation is not possible in some cases, manual devices, such as Carisolv and hand-scalers, are recommended for caries removal and periodontal scaling, in order to minimize the generation of aerosol methods in Table 2 can be followed. Use of anti-retraction hand piece should be used to reduce the chances of aspirate and expel the debris and fluids during the dental procedures.

Disinfection of Clinical Settings

Public areas and appliances should also be frequently disinfected and cleaned, including door handles, chairs, and desks. To ensure that all low contact areas are also

disinfected, Fumigation with a quaternary ammonium compound must be performed every day. Minimal use of Air Conditioners and restrict its use while aerosol generating procedures. Also regular cleansing its filters and during Fumigation/Fogging, should be on as the fumigant reaches the filters. Ensure all electronic equipment has been wiped and covered with a plastic cover (important to prevent the fogged liquid from going into the machines). No electronic equipment may be left uncovered Prepare solution of "an aldehyde based product containing Glutaraldehyde and chemically bound formaldehyde as principal disinfecting agents" e.g. Bacillocid solution in the fogger tank (quantity as per manufacturer recommendations). Fogger has to be placed on trolley, in one corner of the clinic (preferably near a door so it can be taken out easily). Direct the nozzle to the opposite corner of the room elevated at 45 degrees. Close the doors of the clinic and start the fogger until a fog can be seen in the clinic atmosphere. Check through the door/window. Once a suspended fog is seen, wear a cap and mask, turn off the fogger and get it out of the clinic. Keep the dental clinic closed for at least one hour throughout (Note: Inspect the floor for wet patches after opening the operating area. Make sure all surfaces should be dry. If water deposits are present keep it closed to allow them to dry naturally (turn AC on if available). Do not wipe the water with sterile mop. Check floor and working surfaces for excess stickiness (the foot slips or there are white streaks of deposit). This can be removed using soap and water. If excessive stickiness or deposits are observed, check the dilution of the cleaning and fogging solution and correct it if excess chemical was added during preparation. If the problem still persists, reduce the fogging time by 1-2 minutes and monitor.²⁴

Respiratory Hygiene and Cough Etiquette

These are the measures taken by a person having signs and symptoms of respiratory infection to contain respiratory secretions and prevent the transmission of the infection to other persons. The following measures are recommended:

²⁴ Cover mouth and nose with a tissue when coughing or sneezing

- Dispose the tissue after use in the nearest waste container.
- Perform hand hygiene after contact with respiratory secretions and contaminated objects or materials.
- If resources permit, clinics should ensure the availability of materials such as tissue paper and foot-operated waste bins for adhering to respiratory hygiene and cough etiquette in waiting areas for patients and visitors.
- In the absence of handkerchief or tissues, patients should be instructed to cover their nose and mouth with their arm during coughing and sneezing.
- Provide conveniently located dispensers of alcohol based hand rub.
- Where sinks are available, ensure that water and soap for hand washing are available at all times.
- Posters elaborating cough etiquette and hand hygiene must be displayed. Posters in the local language should be put up at appropriate locations such as the OPD entrance, emergency department and doctors' clinics with instructions for patients and their attendants to inform the healthcare staff if they have symptoms of respiratory infection and on how to practice respiratory hygiene and cough etiquette.

The following information (in Figure 3) must be displayed in patient-care areas for educating patients, staff and visitors:

Safe Handling of Patient-Care Equipment

Equipment that has been soiled with blood or body fluids should be decontaminated and cleaned to prevent transfer of microorganisms to other patients and the environment. Cleaning of patient-care areas and equipment should be carried out by a team of dedicated personnel trained in the appropriate cleaning procedures. A new equipment or serviced and repaired equipment should be cleaned and disinfected before patient use as per hospital policy. Heavy duty or strong utility gloves must be worn during decontamination, cleaning and disinfection of instruments. Soiled patient-care equipment should be handled in a manner that prevents exposure of skin and mucous membranes and contamination of clothing and environment. Disposable patient-care equipment should not be reused and must be discarded into an appropriate container in accordance with the hospital waste management policy and the Biomedical Waste Management and Handling Rules 2016, 2018. Patient-care supplies (e.g. lotion, cream, soap) shall not be shared by patients.

Injection Safety

Injection safety is an important component of standard precautions. Practical guidance on the use of injection devices is given below:

Use a new injection device for each procedure, including for the reconstitution of a unit of medication or vaccine. Inspect the packaging of the injection device to ensure that the protective barrier has not been breached. Discard the device if the package has been punctured, torn or damaged by exposure to moisture, or if the expiry date has passed. Single-dose and multi-dose vials. Whenever possible, use a single-dose vial for each patient, to reduce cross-contamination between patients. Open only one vial of a particular medication at a time in each patient-care area. If possible, keep one multi-dose vial for each patient, and

store it with the patient's name on the vial in a separate treatment or medication room. Do not store multi-dose vials in the open ward or general patient-care area, where they could be inadvertently contaminated. Before use, examine the vial for turbidity, particulate matter or discoloration, and discard if any are present. Never leave a needle or cannula inserted into a medication vial via the rubber stopper.

Also, discard a multi-dose vial

- If sterility of contents is compromised;
- If the expiry date or time has passed;
- If found to be without a specific date or time, improperly stored or contaminated regardless of the expiry date.

Normally, it is 28 days from the date of opening, even if it is within the expiry date.

Medical Waste Management

The medical waste (including disposable protective equipment after use) should be transported to the temporary storage area of the medical institute timely. The reusable instrument and items should be pre-treated, cleaned, sterilized, and properly stored in accordance with the Biomedical waste should be discarded as per Rules (2016) Ministry of health and environment (Government of India). The medical and domestic waste generated by the treatment of patients with suspected or confirmed SARS-CoV-2 infection are regarded as infectious medical waste. Double-layer yellow color medical waste package bags and "gooseneck" ligation should be used. The surface of the package bags should be marked and disposed.

Treatment

Treatment of COVID-19 is mostly supportive based on the organ system affected.

So far, there has been no evidence from randomized control trials to recommend any specific anti-viral

treatment, so the management of COVID-19 has been largely supportive. (WHO2020a).

A series of clinical trials are being carried out to investigate interventions that are potentially more effective.(e.g.: Lopinavir, Remdesivir)²⁵ FDA approves the use of convalescent plasma to treat critically ill patients. Its been found that the use of chloroquine to be more potent inhibitor of SARS-CoV 2 infection and spread²⁶.

WHO research and development blueprint and its working group conveyed an informal consultation on priority association of vaccine candidates against SARS-CoV-2 on Jan 30th 2020.

Conclusion

There have been several lessons to glean from the global response to the SARS-COV-2 threat. The original source of the outbreak, the intermediate host, an effective treatment regimen, tools for early diagnosis in asymptomatic patients and tools to predict emergence of novel pathogens all remain elusive. The response mounted to the COVID-19 threat has largely been reactive. Due to the characteristics of dental settings, the risk of cross infection can be high between patients and dental practitioners. This review provides a precise insight among the dental surgeons about the awareness of current novel virology, and measures to be followed to improve the infection prevention and control strategies after epidemic. Review also acumen about the protocols to be followed in the dental set up, during the emergency treatment procedures in such infectious pandemic situation. Also, the probable measures to be taken by oral health professionals henceforth, in response to similar contagious diseases in the future.

We must be constantly aware of infectious threats that may challenge the current infection control protocol

regimen, especially in dental practices and school of dental medicine.

This review summarizes the emerging evidence which can guide the public health response, particularly in India.

The lack of a reliable early warning, alert and response system, inability to mount transparent containment measures, lack of community engagement for self-deferral and isolation, and overdependence on quarantining measures have exposed the fissures in the ability of the health systems across the world. It also emphasizes on the need to invest in health Systems, community-led response mechanism and the need for preparedness for global health security. The review article also raises an open question regarding the same for further discussion and research.

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Legends Table and Figure

Table-1 Screening Questionnaire for Triaging.

Que.N	Questions	Yes	No
1	Do you have fever? Or experienced fever within past 14 days?		
2	Have you experienced a recent onset of respiratory problems such as COUGH or Difficulty in Breathing within the past 14 days?		
3	Have you travelled any areas where documented cases of COVID-19 patients are present?		
4	Have you come in contact with confirmed case of COVID-19 patient?		
5	Are there any people (at least 2) who have experienced fever or respiratory problems within 14 days after coming in contact with you?		
6.	Have you been to any gatherings, meetings or had any close contact with unacquainted person/s?		

Table-2 Methods to minimize aerosols (adapted from Ge et al. / J Zhejiang Univ-Sci B (Biomed & Biotechnol))

S. N.	Dental Disciplines	Special Precautions
1	Endodontics	-Use of Rubber dam in all cases -Reduce Fomites by minimal equipment handling
2	Restorative Dentistry and Pediatric Dentistry	-Use of Rubber Dam -Avoid Rotary instruments for cavity preparation. -Chemomechanical Caries removal(CariSolv) or -ART(Atraumatic Restorative

		Treatment)
3	Periodontics	-Hand Scaling (equally effective when compared to Ultrasonics in removing plaque and calculus deposits.- Krishna & De Stefano 2016)
4	Prosthodontics	-Suction with caution to avoid gagging -Select impression trays of the right size to avoid cough reflex. -In highly sensitive patients, consider local anaesthesia application to the throat before impression taking -During crown preparations rubber dam application. -Design supra-gingival margin for posterior bridge or use a split-dam technique (Li et al., 2004) -During try-in, avoid touching other objects in the dental office after contacting patients' saliva -Disinfect dental prosthesis, impressions, and other prosthodontics materials (e.g., bite registration) on removal from patient's mouth.
5	Oral-maxillofacial surgery	When performing simple extraction, treat the patient in a supine position to avoid working in the breath way of a patient.

Figure1: Hand hygiene in Clinical settings (National guidelines for infection prevention and control in healthcare facilities, MoHFW-GOI)

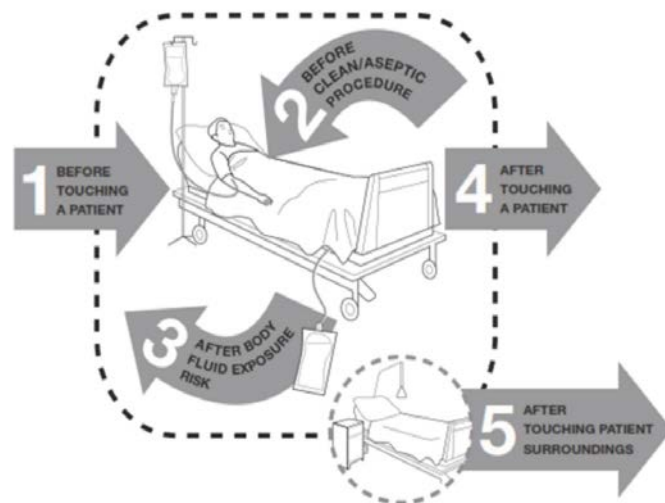


Figure 2: Indication of using gloves in clinical settings- National guidelines for infection prevention and control in healthcare facilities, MoHFW- GoI

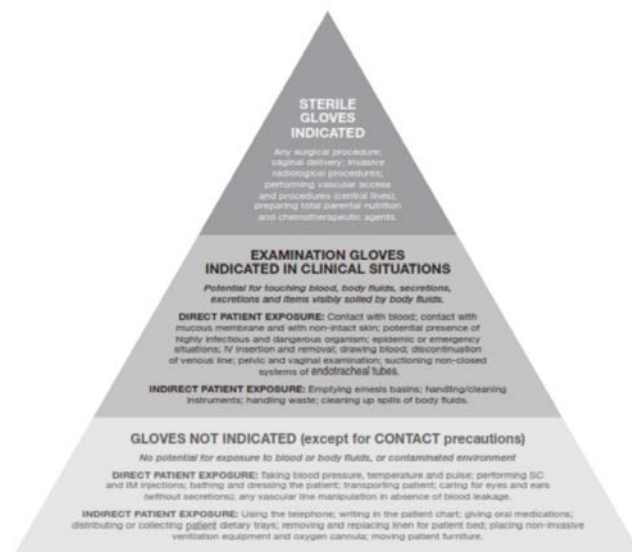


Figure 3: Steps to prevent COVID-19 spread-National guidelines for infection prevention and control in healthcare facilities; MoHFW- GoI.

7 Steps to Prevent COVID-19 Spread

- Avoid close contact with SICK people.
- Stay HOME when sick.
- Cover mouth and nose with a tissue/your arm while you cough or sneeze.
- Wash your hands with soap and water.
- Avoid touching your eyes, nose or mouth.
- Get plenty of sleep, MANAGE your stress,
- Be physically ACTIVE, Drink plenty of fluids and eat nutritious food.