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Novel COVID-19 – Origin, Emerging Challenges, Recent Trends, Transmission Routes and Control -A Review

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ABSTRACT

A novel corona virus 2019 (2019-nCoV) or the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) was the causative agent of acute respiratory disease that lead to the unprecedented outbreak in Wuhan City, Hubei, China emerged in December 2019. This was termed as COVID -19 by World Health Organisation (WHO). It was declared as pandemic and health emergency of international concern on 30th January 2020. The severe global containment efforts and quarantine efforts were taken worldwide in response to this global outbreak. This article summarises a brief overview and essential knowledge about COVID - 19 and it also provides management protocols for dental professionals and orthodontists in particular to combat the novel epidemic coronavirus.

Keywords- Coronavirus, COVID -19, Epidemic, SARS-COV-2.

INTRODUCTION

An emergent pneumonia outbreak originated in Wuhan City, during 31st December 2019^[1] On 7th January 2020, the Chinese scientists isolated a severe acute respiratory syndrome corona virus 2 SARS-COV-2^[2] from a patient within a short time and came out to genome sequencing of the SARS -Cov -2^[2]. A cluster of pneumonia cases, caused by β -coronavirus which was initially named as the 2019-nCoV on 12th January 2020

by World Health Organisation (WHO), which officially named it as coronavirus disease 2019 (COVID -19) and Coronavirus study group (CSG) of the International committee proposed to name the new coronavirus as SARS-CoV-2 on 11th February 2020. The genome of COVID-19 shares sequence identity with both SARS-CoV and Middle East Respiratory Syndrome (MERS-CoV).^[3]

On 20th April 2020 2,285,210 confirmed cases were reported worldwide claiming 1,55,124 confirmed deaths and affecting 213 countries, areas and territories according to WHO Health emergency dashboard depicts the severity of contagion associated with it and 17,265 active cases, 543 deaths in India have been reported. Studies estimated the basic reproduction number (R0) of SARS-CoV-2 to be around 2.2^[4] or even more (range from 1.4 to 6.5)^[5], and familial clusters of pneumonia^[6] outbreaks add to evidence of the epidemic COVID-19 steadily

growing by human-to-human transmission.^[7]

The R0 of COVID-19 ranges from 2.6 - 4.7. Importantly, this is higher than that of SARS or MERS. Other than SARS CoV-2, there are six known coronaviruses in humans: HCoV-229E, HCoV-OC43, SARS-CoV, HCoV-NL63, HCoV-HKU1, and MERS-CoV with low pathogenicity cause mild respiratory symptoms similar to common cold, respectively. The other two known β -CoVs, SARS-CoV and MERS-CoV lead to severe and potentially fatal respiratory tract infection. Coronaviruses have caused two large-scale pandemics in the last two decades: SARS and MERS.^[6-12]

ORIGIN AND TRANSMISSION

Based on virus genome sequencing results and evolutionary analysis, bat has been suspected as natural host of virus origin, and SARS -CoV -2 might be transmitted from bats via unknown intermediate hosts to infect humans. SARS-CoV -2 could use angiotensin converting enzyme 2 (ACE2), same receptor as SARS-CoV to infect humans. (Fig 1.)^[7]

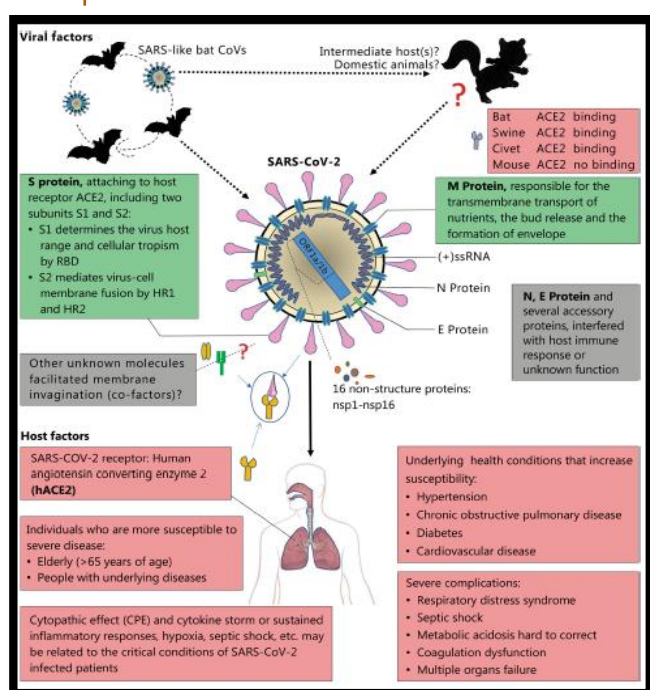


Fig. 1.^[7] Viral and host factors that influence the pathogenesis of SARS-CoV-2. Bats are the reservoir of a wide variety of coronaviruses, including severe acute respiratory Syndrome coronavirus (SARS-COV)-like viruses. SARS-CoV-2 may originate from bats or unknown intermediate host and cross the speed barrier in humans, Virus-host interactions affect viral entry and replication. Upper panel Viral factor. SARS-CoV-2 is an enveloped positive single-stranded RNA (SSRNA) coronavirus. Two-thirds of viral RNA, mainly located in the first open reading frame (ORF lab), encodes 16 non-structure proteins (NSPs). The rest pan of the virus genome encodes four essential structural proteins including spike (S) glycoprotein, small envelope (E) protein, matrix (M) protein, and nucleocapsid (N) protein and also several accessory proteins S glycoprotein of SARS-CoV-2 binds to host cell receptors, angiotensin-converting enzyme 2 (ACE), that is a critical step for virus entry. The possible molecules facilitated membrane invagination for SARS-CoV-2 endocytosis are still unclear. Other virus proteins may contribute to pathogenesis Host factors (lower panel) can also influence susceptibility to infection and disease progression. The elderly and people with underlying disease are susceptible to SARS-CoV-2 and tend to develop into critical conditions. RBD, receptor-binding domain HR1, heptad repeats 1; HR2 heptad repeats ^[7]

COVID-19 is an emerging challenge to the dental practitioners and patients as there is high risk of cross infection amongst the both. Since no vaccine or antiviral dose is discovered till date 10,11 this is turning out to be more serious

issue and strict and effective infection control protocols are urgently needed.

SOCIAL DISTANCING

It has been encouraged/expected by many nations as a single primary factor to reduce the rate of infection spread and to “flatten the curve” (fig.2, 3) of numbers of those infected over a period of time. Along with social distancing, other measures

taken to limit the doubling time and rate of infection is constantly updated by the Centre for Disease Control, USA ¹². This minimizes the potential for people to contract the disease from a contagious person.

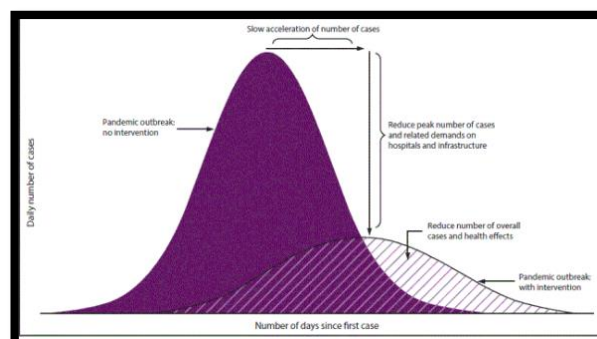


Fig.2 Flattening the curve refers to community isolation measures that keep the daily number of disease cases at a manageable level for medical providers. (Image: © CDC)

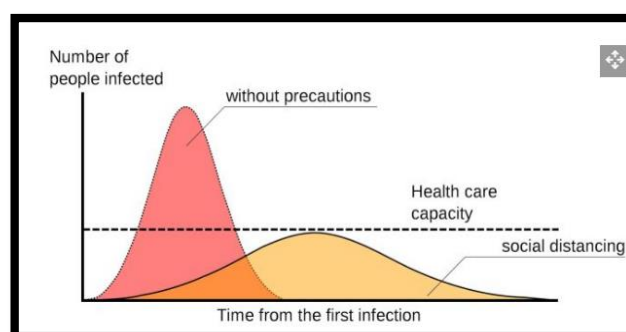


Fig.3 A sample epidemic curve, with and without social distancing. (Image credit: Johannes Kalliauer/ CC BY-SA 4.0)

SELF-ISOLATION

For individuals 70 years of age and above is also recommended. The Indian Government have imposed restrictions on public gatherings beyond fifty and recommends self-isolation of the elderly population.^[13]

ROUTES OF TRANSMISSION

The routes of transmission of betacorona-viruses i.e. biological details can pass from one individual to another through exhaled droplets^[14], aerosol^[15], contamination of surfaces^[16], and possibly ^[17] through faecal-oral contamination^[13]. The SARS-CoV-2 virus can be detected in aerosols up to 3 hours post operatively, and can persist on surfaces for extended periods. The nature of the surface alters the persistence of the virus. On copper surfaces the virus can persist for up to four hours, on cardboard up to 24 hours and on plastic and stainless steel up to 2-3 days ^[18]. The droplet and aerosol transmission of SARS-CoV-2 are the most important concerns in dental clinics and hospitals ^[19], because it is hard to avoid the generation of large amounts of aerosol and

droplet mixed with patient's saliva and even blood during dental procedures.

Since COVID-19 can be passed directly from person to person by respiratory droplets, emerging evidence suggested that it may

Table 1 showing a comparison of CDC versus WHO diagnostic criteria based on symptoms and travel. (49,50)

	CDC	WHO
Clinical features	Fever Lower respiratory tract infection (possibly requiring hospitalization)	Acute respiratory infection (ARI) Fever or measured temperature $\geq 38^{\circ}\text{C}$ Cough Onset within the last ~10 days Requires hospitalization
Epidemiological Risk	History of travel from Hubei Province History of travel from mainland China Close contact with laboratory-confirmed COVID-19 patients within 14 days of symptom onset	History of travel from Hubei Province Healthcare workers who have worked in an environment where patients with ARI are being cared for Unexpected clinical course follows despite treatment, including rapid deterioration Close contact (within 2 meters for over 15 minutes) with confirmed SARS-CoV-2 infection Present in healthcare facilities and hospitals in countries where COVID-19 has been reported. All of the above occurring within 14 days prior to symptom onset

Specifically, here we propose four categories of transmission:

I. Symptomatic transmission: direct transmission from a symptomatic individual, through a contact that can be readily recalled by the recipient.

II. Pre-symptomatic transmission: Direct transmission from an individual occurs before source individual experiences noticeable symptoms. (for example based on whether it is the source or the recipient who is asked whether the symptoms were noticeable.)

III. Asymptomatic transmission: Direct transmission from individuals who never experience noticeable symptoms that can be established by follow-up, as single time-point observation cannot fully distinguish asymptomatic from pre-symptomatic individuals.

IV. Environmental transmission: It is via contamination, and specifically in a way that would not typically be attributable to contact with the source in a contact survey (i.e., this does not include transmission pairs who were in extended close contact, but for whom in reality the infectious dose passed via the environment instead of more directly). These could be identified in an analysis of spatial movements.^[20]

TRANSMISSION ROUTES OF 2019-NCOV IN DENTAL CLINICS

be transmitted through contact and fomites ^[21,22]. The asymptomatic incubation period for individuals infected with 2019-nCoV has been reported to be as 1–14 days, and after 24 days individuals were again reported, and it was confirmed that those without symptoms can spread the virus ^[23,24,25]. To et al reported live viruses were present in the saliva of infected individuals by viral culture method^[21].

Dental care settings invariably carry the high risk of 2019-nCoV infection due to the specific procedures, involving face-to-face communication with patients, and frequent exposure to saliva, blood, and other body fluids, and the handling of sharp instruments ^[19]. The pathogenic microorganisms can be transmitted in dental settings through inhalation of airborne microorganisms that can remain suspended in the air for long periods^[26], direct contact with blood, oral fluids, or other patient materials^[27], contact of conjunctival, nasal, or oral mucosa with droplets and aerosols containing microorganisms generated from an infected individual and propelled a short distance by coughing and talking without a mask^[28,29], and indirect contact with contaminated instruments and/or environmental surfaces^[30]. Infections could be present through any of these conditions involved in an infected individual in dental clinics and hospitals, especially during the outbreak of 2019-nCoV (Fig. 4).^[19]

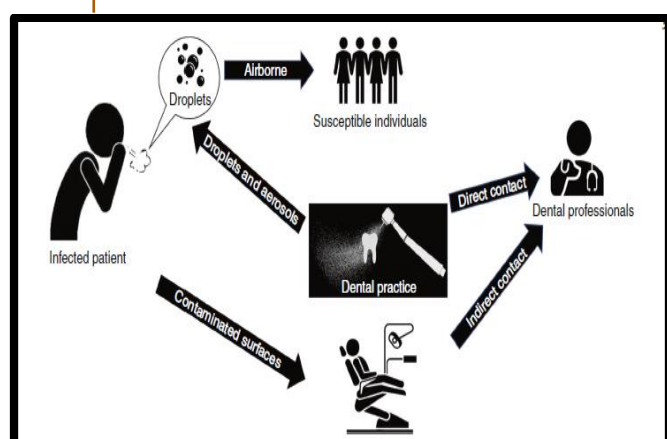


Fig.4 showing Illustration of transmission routes of 2019-nCoV in dental clinics and hospitals 20

THE INCUBATION PERIOD

The incubation period of COVID-19 [28] has been estimated at 5 to 6 days on average and there is evidence that it could be as long as 14 days, which is now the commonly adopted duration for medical observation and quarantine of (potentially) exposed persons [31,32,33].

incubation period of COVID-19 is around 6.4 days, but can range from 0-24 days. Males were generally affected more (60%) and the patients had a discharge rate of 42% and the fatality rate was 7% [37]. The WHO and Centres for Disease Control and prevention (CDC) have both issued guidance on key clinical and epidemiological findings suggestive of a COVID-19 infection (Table 1) [38]. Specific diagnosis is by molecular test on respiratory samples (throat swab/ nasopharyngeal swab/sputum/endotracheal aspirates and bronchoalveolar lavage. Fever and cough are the dominant symptoms whereas upper respiratory symptoms and gastrointestinal symptoms were rare suggesting the difference in viral tropism as compared with SARS-CoV [39], MERS-CoV [40] and influenza [41].

Extensive laboratory tests should be requested for patients with suspected infection. Patients may present with an elevated C-reactive protein, erythrocyte sedimentation rate, lactate dehydrogenase, creatinine, and a prolonged prothrombin time [42].

Full genome sequencing and phylogenetic analysis on fluid from bronchoalveolar lavage can confirm COVID-19 infection [43]. Investigations for other respiratory pathogens should also be performed.

Table 2. showing Differentiating features between Cold, Flu and Coronavirus (Acc.to Coronavirus No-Panic help guide by 1mg.)

	COLD	FLU	CORONAVIRUS
Time between catching the virus and beginning to show symptoms	1-3 DAYS	1-4 DAYS	2-14 DAYS
Symptom onset	Gradual	Abrupt	Gradual
How long does symptom last	7-12 days	3-7 days	Mild cases -2 weeks. Severe or critical disease 3-6 weeks.
Major symptoms			
Fever	Sometimes	Common	Common
Running nose	Common	Sometimes	Less common
Sore throat	Common	Sometimes	Less common
Cough	Common	Sometimes	Common
Bodyache	Rare:if occurs mild	Common	Less common
Difficulty breathing	Rare	Rare	Common

DIAGNOSIS

Clinical features of includes dry cough, fever, diarrhoea, vomiting and myalgia. Individuals with multiple comorbidities are prone to severe infection and may also present with acute kidney injury (AKI) and features of ARDS. [34-35]

The presence of comorbidities like 5 hypertension, diabetes, cardiovascular diseases and respiratory system disease are identified as major risk factors [36]. The mean

CLINICAL SYMPTOMS

A recent study led by Prof. Nan-Shan Zhong's team, by sampling 1099 laboratory-confirmed cases, found that the common clinical manifestations included fever (88.7%), cough (67.8%), fatigue (38.1%), sputum production (33.4%), shortness of breath (18.6%), and sore throat

(13.9%), and headache (13.6%) [46]. Patients eventually die of multiple organ failure, shock, acute respiratory distress

syndrome, heart failure, arrhythmias, and renal failure.^[47,48, 49]

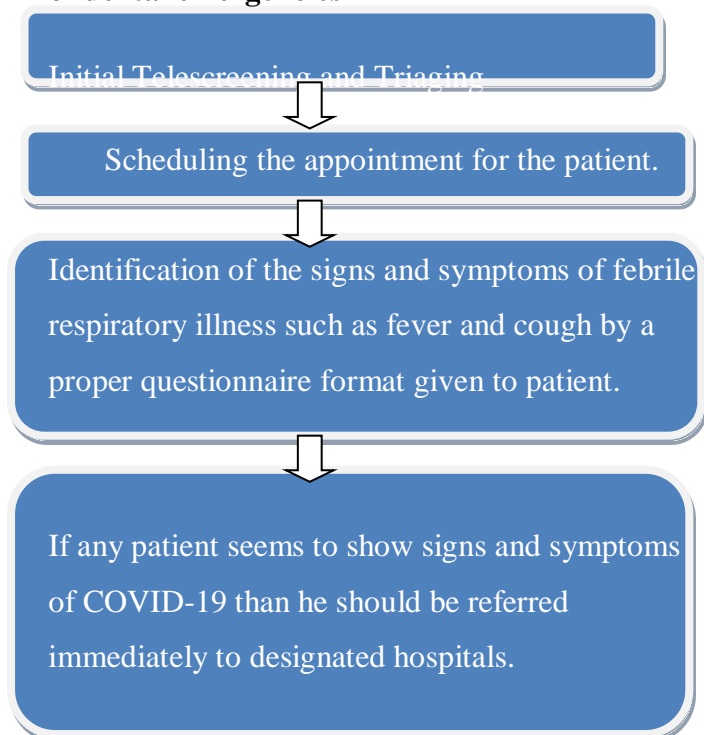
We should therefore pay attention to potential multiorgan injuries and the protection and prevention thereof in the treatment of COVID-19. Differentiating features between Cold, Flu and Coronavirus should be understood.

SPECIFIC DENTAL TREATMENT RECOMMENDATIONS

Based on the experience and cumulative data on COVID-19 outbreak certain measures should be appropriately taken for screening and management of dental emergencies.

Identifying high-risk areas, live global tracking of reported cases can be done using the dashboard made accessible by the Centre for Systems Science and Engineering at Johns Hopkins University.^[50]

Measures Taken for screening and management of dental emergencies -



According to Xu et al^[35], confirmed the presence of ACE2 receptors in oral mucosa and the epithelial cells of tongue bringing into the light the infection susceptibility of oral cavity and potential risk it poses to dentist and dental professionals.^[51] VanDoremalen, et al^[36] in the recent research concluded that the virus remained viable in aerosols throughout the duration of the experiment (3 hours) with the reduction in the infectious titre from 103.5 to 102.7.^[18] Since in dental procedures, large no. of droplets and aerosols are generated, standard routine protective procedures are not effective enough to prevent the spread of COVID-19.^[18]

Correct use of personal protective equipment (PPE) and strict compliance with the behavioural guidelines at the dental office established by the competent authorities and recently published.^[20] (fig .5)

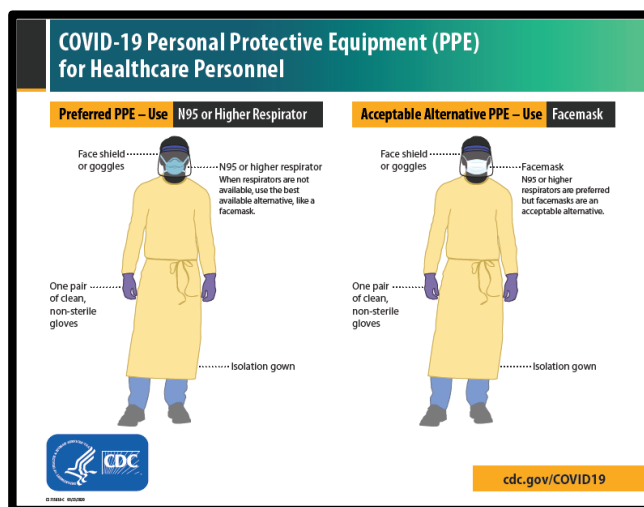


Fig 5.PPE FOR HEALTH CARE PERSONNEL

Management of Orthodontic Emergencies- An orthodontic emergency might be described as a problem arising from an orthodontic appliance, where an unscheduled appointment is required to resolve the issue. When a patient has such an issue, a timely additional appointment may need to be arranged with a specialist.^[52]

Patients who present with an orthodontic emergency may be experiencing pain or discomfort should be scheduled in priority.

Consequently, repeated breakages prolong treatment time and can lead to decreased patient motivation due to a loss of confidence in the appliance or the operator. By providing appropriate timely management, inconvenience and distress to both the patient and parents may be minimized with the efficacy of the appliance still being maintained.^[53]

Orthodontic problems represent urgencies not true emergencies and can be managed step by step protocols firstly by virtual assistance. The orthodontist should not let the patient use anything that could generate and urgency in the office such as appliances that can be activated by patients like elastics, facemask, headgear, lip bumpers or non-removable appliance that can be activated by the patient.^[52] If bracket breakage is present than the spot can be covered with orthodontic wax instead of rebonding it in case of orthodontic emergency.

Table 3-Orthodontic Emergencies can be classified as –

Management protocols in different scenarios in dental clinic during COVID 19 Outbreak.-

China, chlorhexidine, which is commonly used as mouthrinse in dental practice, may not be effective to kill 2019-nCoV. Since 2019-nCoV is vulnerable to oxidation, preprocedural

ORTHODONTIC EMERGENCIES	
Critical Cases	1.Wire pricking or any other component of fixed appliances injuring soft tissues. 2.TPA ,TADS ,Class II correctors which are likely to be ingested or inhaled. 3.Hanging or dislodged molar tubes or dislodgement of fixed appliances. 4.Periodontal abscess around molar bands
Semi critical Cases	Non-Removable appliances activated by patients.eg facemask,headgears ,lip bumpers,palatal expanders
Non-critical Cases	1. Functional Appliances if broken or does not fit. 2. Aligners if lost or broken. 3. Retainers if lost or broken.

1. Pre-check Triage^[54] Every person that enters the clinic should be pre checked by measuring temperature of every staff and patients as a routine protocol. Telephone triaging must be performed and symptoms must be assessed and directives must be provided on the basis of emergency. At the entrance of clinic there should be facilities of providing hand sanitisation and masks for the patient. Any person accompanying the patient should be requested to wait at their own personal vehicle and patient should only be called upon according to scheduled appointments. There should be maintenance of social distancing protocols at the clinic waiting area too. Instructions regarding maintenance of hand hygiene, respiratory hygiene and cough etiquettes should be displayed at the entrance only. If any patient seems to show signs and symptoms of COVID-19 than he should be referred immediately to designated hospitals. Restricted access to the patient's accompanying person in the clinical area should be ensured. There should be at least 15-30 min interval between the scheduled appointments for every patient. Consent form and travelling history should be recorded prior to the onset of any treatment.

2. Consultation Chamber- While consulting with patient in the consultation chamber, certain protocols need to be followed. In multi operatory, distance between two dental chairs should be minimum 6 feet. Split air conditioned rooms are better than centralised air conditioned rooms as there is less chances of spread of infections.

3.Mouth rinse Before Dental Procedure- As instructed by the Guideline for the Diagnosis and Treatment of Novel Coronavirus Pneumonia (the 5th edition) released by the National Health Commission of the People's Republic of

mouthrinse containing oxidative agents such as 1% hydrogen peroxide or 0.2% povidone is recommended, for the purpose of reducing the salivary load of oral microbes, including potential 2019-nCoV carriage. A preprocedural mouthrinse would be most useful in cases when rubber dam cannot be used^[20] Patient is requested to brush his/her teeth before appointments

4. Rubber Dam Isolation- In cases when high-speed handpieces and dental ultrasonic devices are used. It has been reported that the use of rubber dam could significantly reduce airborne particles in ~3-foot diameter of the operational field by 70%⁵⁵. When rubber dam is applied, extra high-volume suction for aerosol and spatter should be used during the procedures along with regular suction^[56]. In this case, the implementation of a complete four-hand operation is also necessary . If rubber dam isolation is not possible then , manual devices , such as Carisolv and hand scaler , are recommended for caries removal and periodontal scaling, in order to minimize the generation of aerosol as much as possible.

5. According to CDC , Sterilisation of handpieces after every patient is recommended.

6. Intraoral X-rays can lead to stimulation of more saliva production and coughing if recorded in posterior segments so during COVID19 outbreak that can be prevented and avoided by advising to go for some extraoral radiographs like orthopantomograph and Cone beam computed tomography as an alternative. Appropriate barriers to cover sensors should be used and barriers should be changed after every patient.

7.12 O'Clock operator's sitting position - is mostly recommended during Covid 19 outbreak as it is considered to be more safe position and preventing from direct aerosols exposure.

8. Management of medical waste - should be transported to the temporary storage area in a double layered yellow colour medical waste package bags with gooseneck ligation and should be marked and disposed in accordance with the Biomedical Waste Management and Handling Rules 2016,2018^[57,58]

9. Working with Aerosol Generating Equipments – Aerators, 3-way syringes should be avoided of used precautiously. Proper N-95 Mask, use of a face shield over the disposable N95 respirator, or use of engineering controls such as local exhaust ventilation are likely to reduce the levels of respirator surface contamination^[59] eye protection, gloves ,gown and PPE should be used by dentist and assistant. N-95 Mask can't be reused and autoclaved. Ideally these procedures should be performed at isolation rooms in which air should be exhausted directly outside or through high efficiency particulate air(HEPA) filters directly before recirculation, UV filters and lights^[60]

D 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





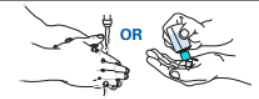
USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

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




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:**

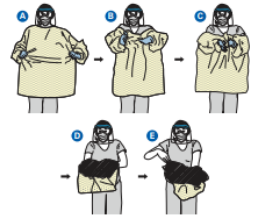


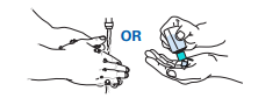
- 1. GLOVES**
 - Outside of gloves are contaminated!
 - If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
 - Using a gloved hand, grasp the palm area of the other gloved hand
 - Hold removed glove in gloved hand
 - Slide fingers of 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




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 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 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 a 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 a waste container
- 4. 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



- Employees working in clinics if not well and showing symptoms of fever and cough should be advised not to come to clinic until they are well and should be advised to report to designated health professionals for the same.
- Reception area staff should use triple layer mask, hand gloves and practise hand hygiene using alcohol based hand sanitizer.
- All staff who is under high risk category should desist from

performing any procedures like aerosol generating procedures.

13. Discard used N-95 following aerosols generating procedures, procedures contaminated with blood, nasal secretions etc.

DISINFECTION AND STERILIZATION PROTOCOLS FOR DENTAL CLINICS TREATING PATIENTS DURING COVID-19 PANDEMIC^[62]

1. 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 e.g. 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.(E.g.: 1 % Sodium hypochlorite or 70% alcohol)
2. Use moistened wipe / cloth to clean all surfaces with freshly prepared disinfectant solution. (E.g.: 1 % Sodium hypochlorite or 3% hydrogen peroxide). Always Discard remnant diluted solution
3. 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
4. Mop heads and cleaning cloths must be decontaminated regularly by Laundering (heat disinfection) with detergent and drying at 80 °c and changed frequently. Do not perform disinfectant fogging.

TREATMENT

At present, no effective anti-viral treatment or vaccine is available for COVID-19. First line treatment for fever includes anti-pyretic therapy such as paracetamol, whilst expectorants such as guaifenesin may be used for non-productive cough^[63]Patients with severe acute respiratory infection, respiratory distress require immediate oxygen therapy. Gubo et al⁴⁵ reports that common antiviral drugs and systemic corticosteroids can be used like neuraminidase inhibitors (oseltamivir,peramivir,zanamivir.etc.)as well as methylprednisolone for influenza virus, are invalid for COVID-19 and not recommended^[64].Remdesivir has been

reported to treat the first case of COVID -19 in United states of America successfully^{65]}Chloroquinine, used to treat malaria has a great potential to treat COVID-19 **Hydroxychloroquine**(400 mgs twice daily on day 1 followed by 400 mg once weekly for next seven weeks)taken with meals can be used as prophylactic measure in SARS-

COV-2 infection in high –risk population. ,according to advisory released by National task force for COVID-19 of Indian council of medical research(ICMR) On 22nd March

2020 is recommended^[66] .Not recommended for children below 15 yrs of age and those with hypersensitivity to hydroxychloroquine 4-aminoquinoline compounds, or person with retinopathy.

CONCLUSION

Recent COVID-19 has been deemed as global health emergency which has affected worldwide everything economically and medically .The treatment of COVID -19 is still distant and thus its spread can only be contained by following strict quarantine protocols.

Therefore, efforts should be made to devise comprehensive measures to prevent future outbreak. A system setup of triage of patients with respiratory illness in outpatient department and health care professionals have the duty to protect the public and maintain high standards of infection control. Further research is required to help define the exact mechanism of human to human transmission to facilitate the development of antidote and virus-specific vaccine. Ever changing statistics, constant unravelling of new data represents the limitation of this review.

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