



2019-nCoV Routes, Current Trends and Future Dental Challenges in India

Himangi Dubey^{*1}, Abhishek Kumar Tiwari², Pallavi Singh³, Palkin Mehta⁴, Swati Srivastava⁵, Syed Haider Mehdi⁶

¹Department of Periodontology, BBD University, Lucknow, India

²Department of Applied Mechanics, MNNIT, Allahabad, India

³Public health dentistry, Saraswati Dental College, Lucknow, India

⁴Saraswati Dental College, Lucknow, India

⁵Department of Periodontology, Career Postgraduate Institute of Dental Sciences and Hospital, Lucknow, India

⁶Department of Conservative Dentistry Endodontics, Sardar Patel Postgraduate Institute of Dental and Medical Sciences, Lucknow, India



Article History:

Received on: 25 Sep 2020

Revised on: 28 Oct 2020

Accepted on: 29 Oct 2020

Keywords:

2019-nCoV,
Coronavirus,
Dental Settings,
Guidelines,
Micro-Droplet Inhalation

ABSTRACT

Coronavirus outbreak (2019-nCoV) emerged as a global health threat. World Health Organization (WHO) unveiled it as an international emergent situation. 2019-nCoV person-to-person transmission typically occurs through coughing, sneezing, droplet inhaling, and surface touch. Containment measures are needed to prevent further spread. It is worth mentioning that the risk of cross-infection among patients and dentists are high as oral investigations and treatment measures involve one-on-one contact, exposure to blood, saliva, and other bodily fluids. Therefore, effective countermeasures shall be planned to inhibit 2019-nCoV transmission in the dental setting as well. This review article highlights the essential knowledge of possible transmission routes of 2019-nCoV in dental settings. It also focuses on effective practice to be followed by dental health care practitioners (DHCP) to block the routes of transmission in dental clinics and hospitals. The article also attempts to highlight future challenges involved in a dental setting in India. This review will be especially helpful for dentists and maxillofacial in following the informed guidelines to prevent the spread of coronavirus disease (COVID-19).

*Corresponding Author

Name: Himangi Dubey

Phone: 80042 43129

Email: himangidubey11@gmail.com

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL1.3602>

Production and Hosted by

IJRPS | www.ijrps.com

© 2020 | All rights reserved.

INTRODUCTION

Disease Control and Prevention Center of China officially announced about the novel coronavirus 2019-nCoV on January 8, 2020. The 2019-nCoV outbreak started in Wuhan city of China, which has become a severe health issue globally (Meng *et al.*, 2020). World Health Organization (WHO) even declared it as a global pandemic (Li and Meng, 2020).

The clinical signs to identify the infection of the virus are cough, fever, and fatigue, which may become severe even as pneumonia. Least common clinical signatures are phlegm development, sore throat and diarrhoea (Mahase, 2020). It is observed that 2019-nCoV causes severe respiratory illnesses in older males (Huang *et al.*, 2020). The clinical character-

istics of 2019-nCoV, e.g. person-to-person transmission, are dissimilar from SARS-CoV occurred during the year 2002 to 2003 (Wang *et al.*, 2020a). Chinese researchers identified and named it as a new Coronavirus (2019-nCoV), the seventh member of a coronavirus family which vitiates humans (Chen *et al.*, 2020). WHO designated this viral pneumonia as "Coronavirus Disease (COVID-19)," whereas, International Committee on Taxonomy of Virus (ICTV) envisaged the new trademark of coronavirus as "SARS-CoV-2" (Chan *et al.*, 2020). COVID-19 is spreading rapidly in India which a severe concern for the population as well as health infrastructure and medical practitioners. Similar to other medical practitioners 2019-nCoV is a threat for dental practitioners as well. Dental healthcare personnel's exposure is even more due to direct contact of patient saliva, breath, and body fluids. This review attempts to highlight the necessary information on 2019-nCoV along with precautionary guidelines which can be of help for the dentist in rescuing themselves from the exposure of coronavirus and further community transmission (Meng *et al.*, 2020).

Novel Coronavirus Characteristics

Coronavirus belongs to Nido virales family Corona viridae, the consisting genome of large, single, plus-stranded RNA (Zhou *et al.*, 2020). Currently, there are four clades of coronaviruses: α cov, β cov, γ cov, and δ cov. Most coronaviruses can because of infectious diseases in humans and vertebrates. α cov and β cov mostly infect human beings and mammals through the respiratory system, gastrointestinal system vis-a-vis central nervous system, (Yin and Wunderink, 2018) whereas, birds are predominantly affected by γ cov and δ cov. Coronavirus group causes mild respiratory disease, whereas, Severe acute respiratory syndrome-related coronavirus (SARS-CoV) emerged in 2003 and Middle East respiratory syndrome coronavirus (MERS-CoV) emerged in late 2012 caused severe respiratory diseases (Liu *et al.*, 2019).

Transmitting Routes

Genetic and epidemiological research indicates that the outbreak of 2019-nCoV began with a single animal to human propagation which is also accompanied by a consistent human to human propagation (Lu *et al.*, 2020). The typical 2019-nCoV transmitting routes include:

1. Active Transmission (coughing, sneezing, and inhalation of droplets)
2. Contact Transmission (communication with mucous membranes in the oral, nasal, and eye) (Lu *et al.*, 2020)

3. Aerosol Transmission

The asymptomatic carriers of the infection are equally capable of transmitting the virus to a healthy population. The 2019-nCoV virus can be observed postoperatively in aerosols for up to 3 hours and can linger on the surface for an extended length of time. The virus may persist for about four hours on metals, for about 24 hours on cartons, and about 2-3 days on the surface of plastics and stainless steel. The 2019-nCoV droplets and the transfer of aerosols are the most critical problems in dental settings and hospitals. It is challenging to prevent large amounts of aerosols and droplets combined with saliva from patients and even the blood during dental procedures (Peng *et al.*, 2020). This concern motivates towards finding the novel ways to block the transmission. Research has shown that respiratory viruses can be transmitted directly or indirectly from individual to individual or through coarse or tiny droplets. 2019-nCoV could also be transmitted actively or passively by saliva (Holshue *et al.*, 2020), which can be a lethal transmission route in the dental setting.

Symptoms, Fatality Rate and High-Risk Groups

The most prevalent symptoms include fever, cough, and dyspnea. 20.3% of patients require admittance to an intensive care unit (ICU) with acute respiratory distress syndrome (ARDS), whereas 13.9% of hospitalized patients had fatal outcomes (Rodriguez-Morales *et al.*, 2020). The presence of co-morbidities such as hypertension, diabetes, cardiovascular and respiratory disorders is identified as significant risk factors (Li *et al.*, 2020). Males are more prone to COVID-19 contraction. The patient discharge rate is around 42%, and the fatality rate is nearly 7% (Backer *et al.*, 2020). The typical incubation period of COVID-19 is 5 to 6 days; however, it can extend up to 14-21 days. This has become the widely accepted duration for medical surveillance and quarantine of infected or suspected individuals or groups (Boyce *et al.*, 2009).

The fatality rate of COVID-19 is around 1 % (young population) to 16 % (aged population), lower than the SARS-CoV (9.7%) and MERS-CoV (34%) and more significant than influenza (1%) (Petersen *et al.*, 2020). Groups tend to be at heightened risk of serious illnesses are pregnant women, infants, young children particularly under the age of 2 years, individuals with severe health conditions such as diabetes, lung, heart, kidney or neurological ailments or individuals with severely impaired immune systems. People above 65 years of age or older are more vulnerable to the infection (Petersen *et al.*, 2020).

Transmission Routes in Dental Setting

The 2019-nCoV transfers via respiratory droplets and also from touch and fomites. It has been established that individuals without symptoms may also potentially spread the virus (Petersen *et al.*, 2020). Patients and clinicians exposed to 2019-nCoV may contract the infection. Dental settings usually carry the risk of 2019-nCoV infection due to the nature of dental procedures which involve face to face patient contact, prolonged exposure to saliva, blood, and bodily fluids, and the management of sharp instruments. In dental environments, pathogenic microorganisms can be spread very quickly by inhaling airborne microorganisms which can also remain stuck in the atmosphere for prolonged periods. Coronavirus exposure can occur due to direct interaction with blood, oral fluid, body material, conjunctival, nasal or oral mucosal interaction with droplets, and aerosol-containing microorganisms (Peng *et al.*, 2020).

Airborne Spread

Dental procedures may involve virus-contaminated aerosols and droplets. It is difficult to prevent the production of large amounts of droplet particles and aerosols during the dental procedure, which can be a route of transmission of 2019-nCoV (Samaranayake *et al.*, 1989). In addition to coughing and breathing of the infected patient, dental devices such as hi-speed dental handpiece often use high-speed gas and to operate with running water which produces a large number of droplets and aerosol mixed with the saliva, and even blood in the patient's oral cavity. Droplet particles and aerosols are sufficiently microscopic to stay airborne for a prolonged time before settling on atmospheric surfaces or entering the respiratory tract. 2019-nCoV seems to have the potential to disperse in droplets particles and aerosols from infected individuals in dental clinics and hospitals.

Contact Spread

A dental professional directly or indirectly encounters with saliva, oral fluids, dental instruments and contaminated surfaces which allow a potential route to spread 2019-nCoV (Wang *et al.*, 2020a). Besides, both dental practitioners and patients are susceptible to conjunctival, nasal, oro-mucosal contact with droplets particles and aerosols with microorganisms. The microorganisms propelled by infected individuals during talking and coughing at a short distance without a mask. Effective infection control strategies shall be planned to prevent the spread of 2019-nCoV through such contact habits.

Infected Surfaces Spread

Coronaviruses such as SARS-CoV, MERS-CoV or endemic human coronaviruses (HCoV) may persist on substrates such as metal, glass, and plastic for up to several days (Wang *et al.*, 2020b). Infected surfaces that have been regularly affected by healthcare environment are a potential source of coronavirus transmission. Also, it has been observed that HCoV stays transmissible between 2 hrs to 9 days at room temperature and endures stronger at 50%, particularly in comparison to 30% relative humidity. Clean, dry environment well in the dentist's office may significantly reduce the pervasiveness of 2019-nCoV.

Faecal-Oral Transmission

2019-nCoV infection typically involves respiratory symptoms which occur through droplet transmission. However, it has also been reported that patients with SARS-CoV-2 infection also developed some gastrointestinal symptoms. These patients have viral RNA or live infectious virus present in faeces. This indicates the possibility of faecal-oral transmission route (Hindson, 2020). It was also observed that clinical features such as abdominal discomfort, diarrhoea, vomiting, and nausea, which varied significantly among study populations. These symptoms came early, and then it is followed by typical respiratory symptoms. Angiotensin-converting enzyme 2 receptors which is an entry point of SARS-CoV-2 to human cells, are dominantly expressed in gastrointestinal epithelial cells which indicates that digestive system can be an alternative route of infection and transmission for the SARS-CoV-2.

Infection Control of Dental Settings

Dental practitioners must be aware of how 2019-nCoV transmits, how to classify patients with 2019-nCoV infection, and what extra-protective steps shall be taken to prevent 2019-nCoV transmission during practice. The present review also outlines some prevention steps to be taken by dental professionals assuming the fact that droplets particles and aerosols are the critical transmission route of 2019-nCoV. These guidelines are formed based on the Novel Guideline for Diagnosis of Coronavirus Pneumonia and Treatment, (National Health Commission, 2020).

Summary of Protocols for Effective Infection Control in Dental Setting

Telescreening and Triage

Initial telephonic screening may be performed remotely before appointment to recognize the patients with suspicious or potential COVID-19 infection (Figure 1). Three most important initial screening questions are:

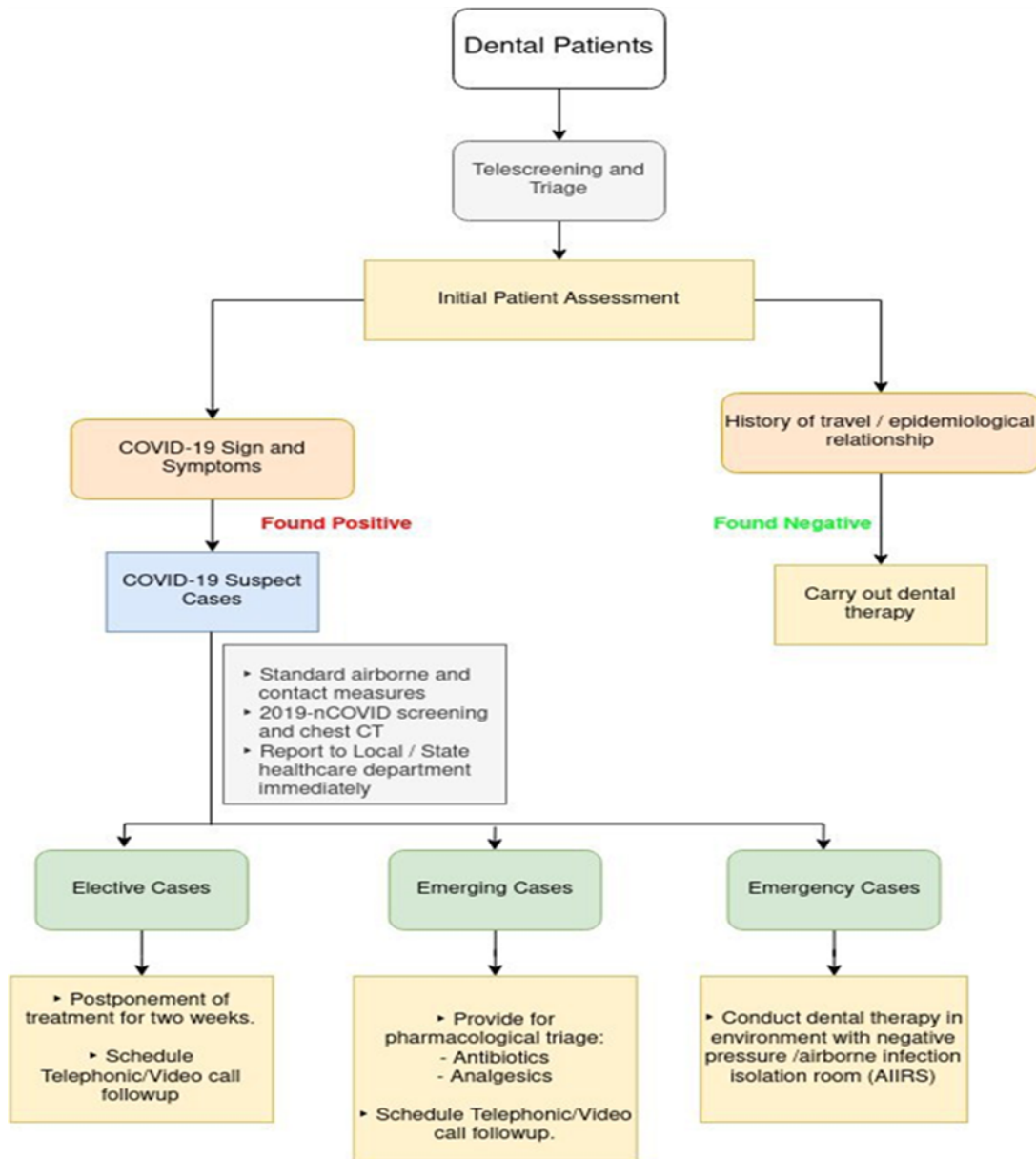


Figure 1: COVID-19 Patient Screening and Dental Care Evaluation

1. Any exposure to a person with COVID-19 confirmed or suspicious?
2. Any recent travel track record to a province with a high prevalence of COVID-19?
3. Any signs of febrile respiration illness such as fever or cough occur?

Live tracking of reported cases may be carried out using a dashboard allocated by Government of India.

A positive reaction to the three questions, as mentioned earlier, shall give rise to initial suspicion. Accordingly, dental care should be postponed for at least 2-3 weeks. This is to avoid exposure to coronavirus during the incubation period, which may vary from 0 to 14 or 21 days. The patients may be urged

for self-quarantine and also to make an appointment to health care provider by telephone or online.

Patient Assessment

Dental practitioners shall recognize suspicious COVID-19 patient. The patient with positive report 2019-nCoV shall not be treated in the dental office. The patient will, therefore, be noted to the relevant health department as quickly and as efficiently possible, especially during the epidemic period of 2019-nCoV. Patients should be screened with a detailed medical history form upon arrival in the dental office, which shall include COVID-19 screening questionnaire and emergency questionnaire. Dental practitioners shall ascertain that the patient shall be recorded using the zero-contact thermal screening device (Wang et al., 2020a).

Patients with symptoms of fever (100.4°F or 38°C) and respiratory ailments shall be discouraged by suggesting elective dental care for at least two weeks. An individual with COVID-19 infection shall sit in a clear, excellently vented sitting area of 6 feet from an unaffected population. According to Center for Disease Control and Prevention's guidelines, patients should also be advised to wear an operating mask and practice appropriate respiratory sanitation such as covering nasal passages and mouth with the towel during coughing and sneezing and then throwing the tissue away (Peng *et al.*, 2020). Dentists themselves advise patients to notify their clinicians to rule out the likelihood of COVID-19.

Hand hygiene

2019-nCoV faecal-oral transmission highlights the importance of hand hygiene in dental practices as well. The World Health Organization recommends bringing hand hygiene practices to health care, which states that hand hygiene practices are the most effective means to prevent infections (Boyce *et al.*, 2009).

Hand rinsing or water cleansing is required when hands are dirty or defiled with body fluids or after use of the toilet. Alcohol-based hand rub (ABHR) with 60-95% alcohol shall be used for this purpose or hands shall be washed with soap for at least 20 seconds.

This aligns with evidence which suggests 15-30 seconds washing removes more germs from hands than washing for shorter periods. A Two-before-one during (if required) - and-three-after hand hygiene guideline should be followed by dental professionals to strengthen manual washing compliance:

Before:

1. The patient's examination
2. The Dental Procedure

During:

1. If gloves are torn or damaged

After:

1. Contact with potentially infectious material
2. After removing personal protective equipment (PPE), including gloves
3. The patient is touched
4. Touching the surroundings or equipment which are not disinfected

Personal protection measures for dental professionals

Airborne droplet infection is seen as the primary transmission route in dental hospitals and clinics. Safety devices such as safety glasses, caps, gloves, masks, protective face coverings and protective suits are highly recommended for all clinics/hospitals and healthcare professionals. A few preventive measures for the Dental Professionals during COVID-19 outbreak are (Coulthard, 2020):

All health care professionals within 1-2 meters of the patient should wear a triple-layered surgical mask Particular respirators (N-95 masks approved by the European Union's National Institute for Occupational Safety and Health, or regular filtering facepiece-2 (FFP2) masks) are recommended for routine dental practices.

If an FFP3 standard mask is available, it shall be considered necessary in COVID-19 positive patients as standard procedure.

Mouth rinse before dental procedures

The antibacterial preoperative mouth rinse reduces the amount of oral microbiota. 2019-nCoV is susceptible to oxidation and chlorhexidine (commonly used as a mouth rinse in dental practices), and thus these agents may not be able to destroy 2019-nCoV. It is advocated that pre-procedural mouth rinse, which included oxidative agents like 1% hydrogen peroxide/0.2% povidone may be used to minimize the salivary load of oral microbiota including potential carriage in 2019-nCoV. A pre-procedural mouth rinse would be most effective in cases where a rubber dam cannot be used (Lin and Li, 2020).

Isolation of rubber dam

The use of rubber dams may dramatically reduce the output of saliva, and blood-contaminated spatter while using high-speed handpieces and ultrasonic dental devices. It is estimated that the use of rubber dam can substantially reduce particles in the air by 70 fold in the functional field's 3-foot diameter. Exceptionally high volume suction for aerosol and spatter together with normal suction should also be used during the procedures when applying a rubber dam. The complete 4-hand operation is also required in this scenario. It is advisable to avoid the aerosol-generating procedures, or it can be scheduled as the last appointment if necessary (Bhanushali *et al.*, 2020). Dental health care personnel may prioritize the usage of hand instruments, e.g. spoon excavators in combination with chemo-mechanical removal agents. The utilization of portable HEPA purifiers for SARS-CoV-2 shall also be considered as an adjunctive infection control

measure.

Handpiece anti-retraction

High-speed dental handpiece lacking anti-retraction valves can discharge contaminants and fluid in air. Specifically, pathogens such as bacteria or viruses will contaminate the air and water tubes of the dental clinic, possibly causing cross-infection. The high-speed dental anti-retraction handpiece can significantly reduce the back-flow of oral microbiota to the handpiece and dental tubes in comparison to handpiece lacking anti-retraction. The use of dental handpieces without anti-retraction mechanism shall be avoided during the epidemic era of COVID-19. As an additional precautionary measure against cross-infection, it is strongly recommended to use dental anti-retraction handpiece with specially made anti-retractive valves and other anti-reflux functions. The use of dental handpieces without anti-retraction mechanism may be outlawed during the COVID-19 epidemic era ([Patil and Yan, 2003](#)).

Clinic setting disinfection

Health institutions shall take effective and systematic disinfection steps in both clinic and public settings. Close attention is essential for environmental cleaning of high-touch surfaces High-touch surfaces, and then floors shall be frequently cleaned at least twice daily, especially in the screening area. Shared/common surfaces, patient table etc. shall be cleaned with new cloth for each table if possible. Sharing of toilet shall be avoided between patients and staff. Door handles, light switches, counters, faucets, sink bowls, toilets, shall be cleaned at least three times daily. Examination bed shall be thoroughly cleaned and disinfected after each patient visit. A detailed SOPs regarding the surface type and cleaning frequency shall be instructed to house-keeping or clinical staff. It shall be mandatory to disinfect all touchable surfaces daily with close monitoring. Cleaning practices shall also optimize with several cleaning workers to minimize the exposure ([World Health Organization, 2020](#))

Dental waste management

Timely transport of dental waste to a temporary storage region of the dental institution shall be prioritized. The reusable equipment and goods should always be pretreated, cleaned, sterilized and adequately maintained in compliance with the Dental Instrument Disinfection Sterilization Procedure ([Bizzoca et al., 2020](#)). Infectious medical waste is considered dental waste that is generated by treating patients with 2019-nCoV infection who are suspected or confirmed. Medical kit bags and the

ligation "gooseneck" should be used in double-layer yellow colour. The surface area of the product bags must be labelled and discarded according to medical waste management requirements. Besides, India is a populated country, and thus the amount of waste generated during a pandemic will also be a challenge to dispose of. Scientist and researchers shall be encouraged to design effective strategies for waste management.

Recommendations on Management

It is recommended that all health workers use safety measures similar to those seen in the group, infections a subset set aside for exceptionally infectious pathogens, such as cholera and plague. In all Indian cities, dental emergencies shall be treated when the prevention and treatment measures for the infections are strictly implemented. Regular dental procedures may be terminated as per the epidemic scenario. Furthermore, during the COVID-19 outbreak, Indian Dental Association (IDA) and other professional organizations in several territories and towns must forward the dental care guidelines to ensure quality prevention and control of infection ([Wong et al., 2004](#)). All the management practices mentioned above require financial burden on dental healthcare. Hence, the cost of treatment may also increase for the patient and may not be affordable easily in the Indian scenario. This challenge shall be taken as a future scope, and cost-effective treatments may be opted to reduce the burden on patients.

Recommendations for Dental Education Practices

There are considerable educational challenges for both dental colleges and dental hospitals. Active interaction among students, teachers and administrative staff have been reported to boost mutual trust and facilitate good collaboration. Based on our experience of SARS and even highly pathogenic diseases, we offer some general guidelines for dental education in outbreaks. First, online lectures, clinical trials and real-life online learning tools need to be accepted during the epidemic time to prevent needless human clustering and thereof the inherent risk of infection.

Smart devices, mobile applications and animations have already made it possible for the students to listen to and review lectures whenever and wherever possible. It is worth promoting dental students to participate in self-learning, make use of online tools, and learn about the latest trends in academia. Students are frequently impacted by illness-related anxiety and distress. Dental colleges shall offer counselling resources to those who require them.

Table 1: Dental emergency management guidelines during COVID-19 outbreak

Diagnosis	Triage
Acute Necrotizing Ulcerative Gingivitis	<p>Specific oral hygiene instructions to use antibacterial mouthwash twice daily:</p> <ul style="list-style-type: none"> • Chlorhexidine 0.12% <p>Pain management:</p> <ul style="list-style-type: none"> • Ibuprofen 400-600 mg tds <p>For any signs of systemic involvement:</p> <ul style="list-style-type: none"> • Amoxicillin, 250 mg tds x 7 days and • Metronidazole, 250 mg tds x for 7 days <p>Perform debridement under local anaesthesia Remove pseudomembrane using cotton pellet dipped in chlorhexidine</p>
Periapical Abscess	<p>Intraoral swelling:</p> <ul style="list-style-type: none"> • Incision drainage • Clindamycin 300 mg q.i.d x5 days /augmentin 500 mg b.i.d x 5 days • Acetaminophen 325-500 mg+ ibuprofen 600mg <p>Consideration for immediate pain management</p> <p>Extraoral swelling:</p> <ul style="list-style-type: none"> • Clindamycin 300 mg q.i.d x5 days /augmentin 500 mg b.i.d x 5 days • Acetaminophen 325-500 mg+ ibuprofen 600mg <p>Call the oral maxillofacial surgeon for further guidance on possible referrals</p>
Dental Avulsion /Dental Subluxation	<ul style="list-style-type: none"> • If the tooth is replanted, follow the pain management protocol. • Pain management: Acetaminophen 325-500 mg+ ibuprofen 600mg • If the tooth has not been replaced, replant and follow the guidelines as quickly as possible. <p>Pain management:</p> <ul style="list-style-type: none"> • Acetaminophen 325-500 mg+ ibuprofen 600mg <p>Vital pulp therapy</p> <p>Please refer to an oral maxillofacial surgeon</p>
Tooth Fracture	<p>Pain management:</p> <ul style="list-style-type: none"> • Acetaminophen 325-500 mg+ ibuprofen 600mg <p>Vital pulp therapy</p> <p>Please refer to an oral maxillofacial surgeon</p>
Facial Bone Trauma, Potentially Compromising The Patient's Airway	Please refer to an oral maxillofacial surgeon
Cellulitis / Infection Into Facial Planes	Please refer to an oral maxillofacial surgeon
Caries/ Pulpitis/ Apical Periodontitis	<p>Pain management:</p> <ul style="list-style-type: none"> • Acetaminophen 325-500mg + ibuprofen 600 mg • Dexamethasone 0.07-0.09mg <p>Consideration for urgent pain relief with long-acting local anaesthetic 0.5 % bupivacaine</p> <p>Pulpotomy</p>

Improved awareness of viral features, epidemiological characteristics, clinical scope, and treatment, practical approaches to avoid, track, and stop COVID-19 spread shall be taken as soon as possible. Internet connectivity and availability is also a challenge in India at remote places which should be addressed by the internet providers for smooth conduct of online teaching.

DISCUSSION

Worldwide distribution of 2019-nCoV increases the possibility of patient population subset being served by dental healthcare providers. It needs countermeasures which include effective patient prescreening. Additional treatment steps may be required in patients already contracted with COVID-19. Therefore, a guideline for treating dental emergencies is illustrated in Table 1 to support dental practitioners.

All dental practices must review infection management procedures, engineering control, and resources. Dental healthcare personnel shall update themselves with the latest information and guidelines. Accordingly, appropriate preparation shall be planned for preventive interventions. COVID-19 pandemic exposed dentistry to a potential challenge which is to avoid disease transmission in the community while delivering the cure to patients (Balaji, 2020).

Current reality requires revised policy guidelines which must include dental and oral health services as well to inhibit transmission. In addition to the recommendation mentioned above, a comprehensive guideline is indeed required to prevent 2019-nCoV transmission during dental care and treatment. Patient assessment, hand disinfection, personal safety measures for dentists, mouth rinses before dental surgery, rubber-dam isolation, handpieces anti-retraction are few procedures which are recommended in this review. However, it is always recommended to prioritize the most critical dental services. The procedures should be planned in such a way that they provide care to minimize harm to patients from delaying care and harm to personnel from potential exposure to COVID-19. It is also advisable to use minimally invasive/traumatic restorative techniques (only hand instruments) (Balaji, 2020).

What can we do to strengthen the current and post-epidemic approaches for the prevention and control of infectious diseases? How will we respond to different infectious diseases in the coming years? Those are open questions which require further debate and future studies.

We should be hyperconscious of emerging hazards which can disrupt the existing system of infection control in dental settings and dentistry schools. COVID-19 pandemic situation is rapidly moving and, as such, guidelines are updated and revised regularly, which should reflect as soon as possible in practice without any delay. The COVID-19 outbreak exposed the dental staff with extraordinary and unforeseen challenges and difficulties. Dental healthcare personnel must ensure themselves up-to-date with national guidelines which should be responding effectively. Dental practice future must also look at treating COVID-19 patient medical emergency with full prevention and control strategies (Balaji, 2020).

COVID-19 pandemic in India may have long term impacts. Dental practices guidelines need to be reframed and restructured to get prepared to handle any such occurrence of a pandemic in future. Indian population is itself a challenge in following the COVID-19 guidelines, e.g. social distancing and hence full proof guidelines are indeed required in future to contain infectious disease spread. COVID-19 shall be taken as a challenge in the dental community to explore human oral microbiome, drug delivery method and interaction, oral immunology, and how evidence-based practice shall be incorporated in future. COVID-19 also challenges dentists to re-standardize the infection control and sterilization protocols which Indian Dentists used during pre-COVID-19. The challenge in Post-COVID-19 will also be to come out with better research ethics, emergency protocols, teledentistry, cost-effectiveness and economic analysis of dental practice management (Balaji, 2020). There is indeed a scope of robotic surgeries and robotic diagnosis device to be developed and used in dental practices; however, the feasibility of implementation in Indian population shall be evaluated. Internet speed and connectivity is also a challenge for online consultation and remote operation. Overall, this pandemic will indeed challenge the Indian population and researchers to innovate evidence-based models, guidelines, and opportunities for future-readiness in India.

CONCLUSION

This review attempts to provide a logical and practical clinical decision-making process and guidelines in a dental setting which involves a screen, protect, and serve our patients to contain the spread of COVID-19. A big challenge in dental practices in India is failing to adhere the sanitization, hygiene, sterilization and protocols which increase

the risks in performing emergency dental procedures. Complete structural changes in dentistry practices are indeed required to prevent doctors as well as patients from getting infected. Cultural changes in dentistry approaches are also a challenge in the Indian scenario. Introducing telementoring and preventive dental care in the Indian population is also challenging. COVID-19 pandemic provided an opportunity to introduce minimally invasive techniques; however, challenges are indeed involved in introducing them. Besides, a significant monetary investment is indeed a challenge with the economic crisis, which is essentially required to continue safe dental practices, training and process management to contain the spread.

Source of Funding

The authors declare that they have no funding support for this study.

Conflict of Interest

The author declares no conflict of interest among them for this study.

REFERENCES

- Backer, J. A., Klinkenberg, D., Wallinga, J. 2020. Incubation period of 2019 novel coronavirus (2019-nCoV) infections among travellers from Wuhan, China, 20–28 January 2020. *Eurosurveillance*, 25(5):20–28.
- Balaji, S. 2020. COVID-19-future of dentistry. *Indian Journal of Dental Research*, 31(2):167–168.
- Bhanushali, P., Katge, F., Deshpande, S., Chimata, V. K., Shetty, S., Pradhan, D. 2020. COVID-19: Changing Trends and Its Impact on Future of Dentistry. *International Journal of Dentistry*, 2020:1–6.
- Bizzoca, M. E., Campisi, G., Muzio, L. L. 2020. Covid-19 Pandemic: What Changes for Dentists and Oral Medicine Experts? A Narrative Review and Novel Approaches to Infection Containment. *International Journal of Environmental Research and Public Health*, 17(11):3793.
- Boyce, J., Chartier, Y., Chraiti, M., et al. 2009. WHO Guideline Hand Hyg Health Care Geneva World Health Organ. 1-262.
- Chan, J., Yuan, S., Kok, K. H., To, K. K. W., Chu, H., Yang, J., Xing, F., Liu, J., Yip, C. C. Y., Poon, R.-S., Tsoi, H. W., Lo, S. K. F., Chan, K.-H., Poon, V. K. M., Chan, W.-M., Ip, J. D., Cai, J. P., Cheng, V. C.-C., Chen, H., Yuen, K. Y. 2020. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The Lancet*, 395(10223):30154–30163.
- Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y., Wei, Y., Xia, J., Yu, T., Zhang, X., Zhang, L. 2020. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*, 395(10223):30211–30218.
- Coulthard, P. 2020. Dentistry and coronavirus (COVID-19) - moral decision-making. *British Dental Journal*, 228(7):503–505.
- Hindson, J. 2020. COVID-19: faecal–oral transmission? *Nature Reviews Gastroenterology & Hepatology*, 17(5):259.
- Holshue, M. L., DeBolt, C., Lindquist, S., Lofy, K. H., Wiesman, J., Bruce, H., Spitters, C., Ericson, K., Wilkerson, S., Tural, A., Diaz, G., Cohn, A., Fox, L., Patel, A., Gerber, S. I., Kim, L., Tong, S., Lu, X., Lindstrom, S., Pallansch, M. A., Weldon, W. C., Biggs, H. M., Uyeki, T. M., Pillai, S. K. 2020. First Case of 2019 Novel Coronavirus in the United States. *New England Journal of Medicine*, 382(10):929–936.
- Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Cao, B. 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan. *China. The Lancet*, 395(10223):30183–30188.
- Li, L., Huang, T., Wang, Y., Wang, Z., Liang, Y., Huang, T., Zhang, H., Sun, W., Wang, Y. 2020. COVID-19 patients' clinical characteristics, discharge rate, and fatality rate of meta-analysis. *Journal of Medical Virology*, 92(6):577–583.
- Li, Z. Y., Meng, L. Y. 2020. The prevention and control of new coronavirus infection in the department of stomatology. *Zhonghua Kou Qiang Yi Xue Za Zhi = Zhonghua Kouqiang Yixue Zazhi = Chinese Journal of Stomatology*, 55:E001.
- Lin, L., Li, T. S. 2020. Interpretation of “Guidelines for the Diagnosis and Treatment of Novel Coronavirus (2019-nCoV) Infection by the National Health Commission. *Zhonghua Yi Xue Za Zhi*, 100.
- Liu, P., Chen, W., Chen, J. P. 2019. Viral Metagenomics Revealed Sendai Virus and Coronavirus Infection of Malayan Pangolins (*Manis javanica*). *Viruses*, (11):979.
- Lu, C., Liu, X., Jia, Z. 2020. 2019-nCoV transmission through the ocular surface must not be ignored. *The Lancet*, 395:30313–30318.
- Mahase, E. 2020. China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ*, page m408.
- Meng, L., Hua, F., Bian, Z. 2020. Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine. *Journal of Dental Research*, 99(5):481–487.

- National Health Commission 2020. Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia. *Chinese Medical Journal*, 7(9):1087–1095.
- Patil, N. G., Yan, Y. C. H. 2003. SARS and its effect on medical education in Hong Kong. *Medical Education*, 37(12):1127–1128.
- Peng, X., Xu, X., Li, Y., Cheng, L., Zhou, X., Ren, B. 2020. Transmission routes of 2019-nCoV and controls in dental practice. *International Journal of Oral Science*, 12(1).
- Petersen, E., Koopmans, M., Go, U., Hamer, D. H., Petrosillo, N., Castelli, F., Storgaard, M., Khalili, S. A., Simonsen, L. 2020. Comparing SARS-CoV-2 with SARS-CoV and influenza pandemics. *The Lancet Infectious Diseases*, 20(9):e238–e244.
- Rodriguez-Morales, A. J., Cardona-Ospina, J. A., Gutiérrez-Ocampo, E., Villamizar-Peña, R., Holguin-Rivera, Y., Escalera-Antezana, J. P., Alvarado-Arnez, L. E., Bonilla-Aldana, D. K., Franco-Paredes, C., Henao-Martinez, A. F., Paniz-Mondolfi, A., Lagos-Grisales, G. J., Ramírez-Vallejo, E., Suárez, J. A., Zambrano, L. I., Villamil-Gómez, W. E., Balbin-Ramon, G. J., Rabaan, A. A., Harapan, H., Dhama, K., Nishiura, H., Kataoka, H., Ahmad, T., Sah, R. 2020. Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. *Travel Medicine and Infectious Disease*, 34:101623.
- Samaranayake, L. P., Reid, J., Evans, D. 1989. The efficacy of rubber dam isolation in reducing atmospheric bacterial contamination. *ASDC Journal of Dentistry for Children*, 56(6):442–444.
- Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., Wang, B., Xiang, H., Cheng, Z., Xiong, Y., Zhao, Y., Li, Y., Wang, X., Peng, Z. 2020a. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*, 323(11):1061–1069.
- Wang, Y., Wang, Y., Chen, Y., Qin, Q. 2020b. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. *Journal of Medical Virology*, 92(6):568–576.
- Wong, J. G., Cheung, E. P., Cheung, V., Cheung, C., Chan, M. T., Chua, S. E., McAlonan, G. M., Tsang, K. W., Ip, M. S. 2004. Psychological responses to the SARS outbreak in healthcare students in Hong Kong. *Medical Teacher*, 26(7):657–659.
- World Health Organization 2020. Cleaning and disinfection of environmental surfaces in the context of COVID-19: interim guidance. Accessed on: 23 Sep 2020.
- Yin, Y., Wunderink, R. G. 2018. MERS, SARS and other coronaviruses as causes of pneumonia. *Respirology*, 23(2):130–137.
- Zhou, P., Yang, X. L., Wang, X. G., Hu, B., Zhang, L., Zhang, W., Si, H. R., Zhu, Y., Li, B., Huang, C. L., Chen, H. D., Chen, J., Luo, Y., Guo, H., Jiang, R. D., Liu, M. Q., Chen, Y., Shen, X. R., Wang, X., Shi 2020. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*, 579(7798):270–273.