



(REVIEW ARTICLE)



COVID-19 outbreak challenging dentist's safety

Gadwal Mounika *

Department of Periodontics, MNR Dental College and Hospital, Fasalwadi, Sangareddy, Telangana 502294, India.

Publication history: Received on 10 June 2020; revised on 20 June 2020; accepted on 22 June 2020

Article DOI: <https://doi.org/10.30574/wjarr.2020.6.3.0199>

Abstract

The emergent outbreak of SARS-CoV-2 has originated in Wuhan, China during December 2019. This caused emergency in worldwide health system and World Health Organisation declared the pandemic diffusion of COVID-19, and restrictive measures to limit contagion have been taken in several countries. In period of time, it transmitted around 212 countries and territories around the world. The virus spread through respiratory transmission through droplets and aerosols. Dentists have a high risk of infection so the effective infection control protocol has to follow for treating patients and limit the spread. Thorough research on literature about COVID-19 was performed. This review is focused on current trends on COVID-19 structure, pathogenesis, clinical features and effective measures which should be taken by dentists as well as patients to prevent transmission of this global threat.

Keywords: SARS-CoV-2; Aerosols; Dentists; Infection control.

1. Introduction

The outbreak of the Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) and its diffusion, responsible for the coronavirus disease (COVID-19), has caused an emergency in the health system worldwide. It became rapid challenging disease in most of the countries. The spread of COVID-19 has posed significant challenges for all health care professionals in all affected countries. The role of dental professionals is important in preventing the transmission of COVID-19.

In December 2019, patients presenting with pneumonia of unknown origin. The novel coronavirus was identified in Wuhan, China. After a rapid escalation, on January 9, 2020, the World Health Organization declared the discovery a new coronavirus, first called 2019-nCoV and then officially named SARS-CoV-2, which had never been identified in humans before. On February 11, the respiratory disease deriving from SARS-CoV-2 infection was named COVID-19 [1,2].

2. History

Coronaviruses are enveloped positive sense RNA viruses. It has diameter ranging from 60 nm to 140 nm with spike like projections on its surface giving it a crown like appearance under the electron microscope; hence the name coronavirus [3]. Four corona viruses namely HKU1, NL63, 229E and OC43 have been in circulation in humans, and generally cause mild respiratory disease.

In the past two decades, there have been two events wherein crossover of animal betacoronavirus to humans has resulted in severe disease. The first such instance was observed in 2002–2003 when a new coronavirus of the β genera which is of bat origin crossed over to humans via the intermediary host of palm civet cats in the Guangdong province of China. This virus, designated as severe acute respiratory syndrome coronavirus affected 8422 people mostly in China and Hong Kong and caused 916 deaths (mortality rate 11%) before being contained [4]. Almost a decade later in 2012,

* Corresponding author: Gadwal Mounika

the Middle East Respiratory Syndrome Coronavirus (MERS-CoV), also of bat origin, emerged in Saudi Arabia with dromedary camels as the intermediate host and affected 2494 people and caused 858 deaths (fatality rate 34%).

3. Structure

The Coronavirus belongs to the Coronaviridae family having ssRNA genome. Coronavirus virions are spherical to pleomorphic enveloped particles. The envelope is studded with glycoproteins which are projected on its surface, and surrounds a core which consist of matrix protein enclosed. It has a single strand of positive-sense RNA associated with nucleoprotein

The envelope glycoproteins are responsible for attachment to the host cell and also carry the main antigenic epitopes, particularly the epitopes recognized by neutralizing antibodies. OC43 also possesses a haemagglutinin [5].

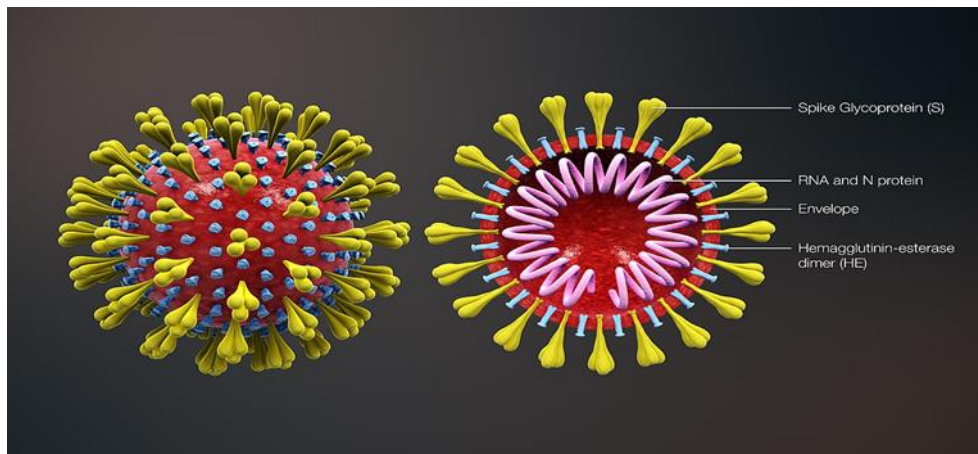


Figure 1 Structure of Corona virus

Source: https://commons.wikimedia.org/wiki/File:3D_medical_animation_corona_virus

4. Classification

Classification of Coronaviruses based on the appearance of the envelope glycoproteins (crown or halo-like) and on characteristic features of chemistry and replication. Human coronaviruses are mostly one of two serotypes. They are OC43-like and 229E-like. They both differ in antigenic determinants and culturing requirements. 229E-like coronaviruses in human embryonic fibroblast cultures can usually be isolated whereas OC43-like viruses can be isolated, or adapted to growth, in suckling mouse brain. There is little antigenic cross-reaction between these two types. They cause independent epidemics of indistinguishable disease [6].

5. Clinical features

The clinical features of COVID-19 are varied, ranging from asymptomatic state to acute respiratory distress syndrome and multi organ dysfunction. The common clinical features include fever (not in all), cough, sore throat, fatigue, headache, myalgia and breathlessness. Conjunctivitis has also been described. Thus, they are indistinguishable from other respiratory infections. In a subset of patients, by the end of the first week the disease can progress to pneumonia, respiratory failure and death. This progression is associated with extreme rise in inflammatory cytokines including Interleukin-2, Interleukin-7, Interleukin-10, Granulocyte Colony Stimulating Factor, Gamma Induced Protein-10, Monocyte Chemoattractant Protein-1 and Tumor Necrosis Factor α [7].

The median time from onset of symptoms to dyspnea was 5 days, hospitalization 7 days and acute respiratory distress syndrome (ARDS) around 8 days. The need for intensive care admission was about 25–30% of affected patients. Acute lung injury, ARDS, shock and acute kidney injury are complications which were observed. Recovery started in the 2nd or 3rd week. The median duration of hospital stays in those who recovered was around 10 days. Adverse outcomes and death are more common in the elderly and those with underlying co-morbidities (50–75% of fatal cases). Fatality rate in hospitalized adult patients ranged from 4–11%. The overall case fatality rate is estimated to range between 2–3% [7].

6. Epidemiology and Pathogenesis

People of all ages are susceptible. Transmission of Infection is through large droplets generated during sneezing and coughing by symptomatic patients (figure-2 Transmission routes of 2019-nCoV and controls in dental practice. Peng et al., 2020 [24]). It can also occur before onset of symptoms from asymptomatic people [8]. Studies between asymptomatic and symptomatic people have shown higher viral loads in the nasal cavity when compared to the throat with no difference in viral burden [9]. Patients even on clinical recovery can be infectious for as long as the symptoms last. Some people may act as super spreaders. These infected droplets can deposit on surfaces and spread 1–2 meters. The virus can remain viable on surfaces for days in atmospheric conditions which are favorable but are destroyed in less than a minute by common disinfectants like sodium hypochlorite, hydrogen peroxide etc [10].

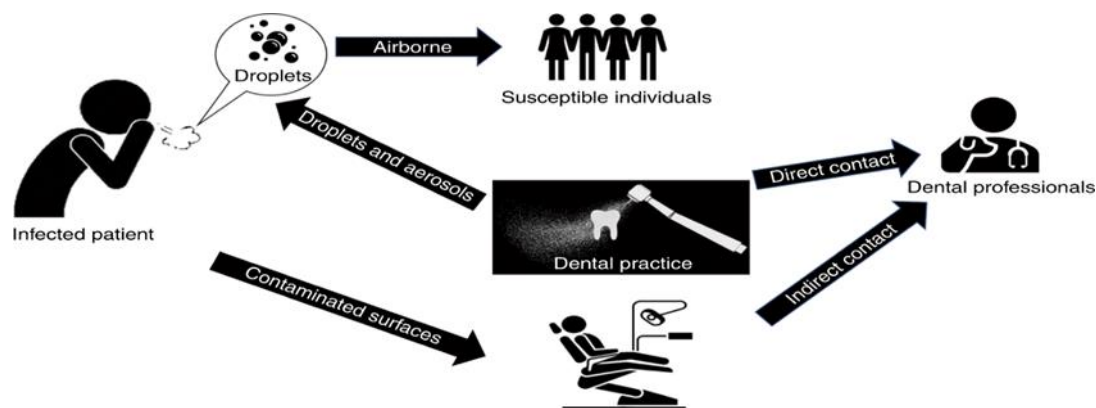


Figure 2 Transmission routes of 2019-nCoV in dental clinics and hospitals

Source: Peng et al., 2020 [24]

Infection is acquired both by inhalation of these droplets or touching surfaces contaminated by them and then touching the nose, mouth and eyes. The virus is also present in the stool and contamination of the water supply and subsequent transmission via aerosolization/feco oral route is also hypothesized [9]. The transplacental transmission from pregnant women to their fetus has not been described till present information but the neonatal disease due to post-natal transmission is described [11]. The incubation period varies from 2-14 days and in some people it is increased to 20-21 days. Angiotensin Converting Enzyme 2 (ACE2) as the receptor through which the virus enters the respiratory mucosa was identified in most of the studies.

7. Infection control in the dental setting

7.1. Identification

Dentists are more prone for infection as the oral cavity is one of the common route for transmission. To prevent nosocomial infection definitive care should be taken. For dentists, transmission is through aerosols. Examination of patient, proper medical history and travel history should be taken. Recording body temperature by non-contact thermometer or thermal sensors. Any symptoms like fever, cold, cough, sore throat, headache, nausea, vomiting, diarrhea, hemoptysis & conjunctival congestion are noted.

Patient should be asked about their travel history in the last 14 days or being in contact with such person having travel history. While confirming appointments or during the arrival of patients for treatment, appropriate questions should be asked which includes whether patients have been in close contact with someone who has been diagnosed with or is under investigation for COVID-19 [12]. Treatment should be started after obtaining full information from the patient. If dentists or staff member comes in contact with a COVID-19 patient, screening should be done immediately.

7.2. Effective Infection Control Protocols

In dental procedures, a large number of droplets and aerosols could be generated. The standard protective measures in daily clinical work are not effective enough to prevent the spread of COVID-19, especially when patients are in the incubation period and asymptomatic. They are unaware of their infection, or choose to conceal their infection.

Reducing the risk of transmitting microorganism to patients, hand hygiene has been considered the most critical measure to be taken [13]. According to the studies which have shown that SARS (Severe acute respiratory syndrome) and MERS (Middle East respiratory syndrome) were highly susceptible to povidone iodine mouth rinse. Therefore, preprocedural mouth rinse with 0.2% povidone-iodine to minimize the load of corona viruses in the saliva should be done [14 -16].

To control infection, the 4-handed technique is beneficial. The use of rubber dams can reduce exposure to infectious agents and saliva ejectors with low or high volume can minimize the production of droplets and aerosols [17-18]. Aerosol-generating procedures, such as the use of a 3-way syringe, should be minimized as much as possible. Intraoral x-ray examination is the most common radiographic technique must be avoided as it can stimulate saliva secretion and coughing [19]. Extraoral radiographies like panoramic radiography and cone beam CT can be used as alternatives during the COVID-19 outbreak. Thorough disinfection by using 0.1% sodium hypochlorite or 70% isopropyl alcohol for the disinfection of all surfaces within the dental clinic and fumigation should be done in dental office. Disinfectant devices commonly advised in health care settings include chemical/physical disinfectant devices and ultraviolet (UV) disinfectant devices. Hand pieces, scaler units and tips, all instruments should be autoclaved and sterilized after each use. On inanimate surfaces or objects survival time of Corona virus is up to 9 days at room temperature, with a greater preference for humid conditions. So, dry conditions should be maintained to prevent the spread of SARS-CoV-2. Disinfection should be done using chemicals recently approved for COVID-19 [23]. Disposal of waste containing blood, saliva and other discarded masks, gowns should be done in medical waste package bags regularly. As a precautionary measure, double-layered bags (two bags) should be used for the collection of waste to ensure adequate strength and no-leaks.

7.3. Self-protection

The use of personal protective equipment, including masks, gloves, gowns, shoe cover and goggles or face shields, is recommended to protect skin and mucosa from (potentially) infected blood or secretion (figure-3 Bariyy feed & bioenergy suppliers).



Figure 3 Personal Protective Equipment kit (PPE kit)

Source: Bariyy feed & bioenergy suppliers

As respiratory droplets are the main route of transmission, particulate respirators (e.g., N-95 masks authenticated by the National Institute for Occupational Safety and Health or FFP2-standard masks set by the European Union) are recommended for routine dental practice [20]. Dentist or staff who are experiencing flu-like symptoms should not report to work.

7.4. Postponement of elective dental procedures

According to The CDC's Guidelines for Infection Control in Dental Healthcare Settings - 2003, all the elective dental procedures should be avoided until the patient is no longer contagious with the airborne transmitted disease [21].

7.5. Treatment of emergency cases

Dental emergencies can occur and aggravate in a short period of time and therefore may need immediate treatment. Emergencies like severe tooth pain, diffuse oral swelling and abscesses, tooth fractures, 3rd molar pain/ pericoronitis & uncontrolled bleeding should be treated with advice on strict personal protection and measures to reduce and avoid production of droplets and aerosols. If a patient suspected, infected or at high risk of COVID-19 needed emergency treatment in a case of swelling or severe tooth pain should be advised medication like antibiotics and analgesics. Acetaminophen is a drug of choice for analgesia in treating COVID-19 infected patients as ibuprofen is contraindicated which has interference with immune function according to World Health Organization (WHO) which endorsed this recommendation on March 18, 2020 [22]. If a suspected patient must be treated, patient could be treated in an isolated and well-ventilated room or negatively pressured rooms if available but not in routine dental practice room.

Prevention of COVID-19 should be given utmost importance in the current scenario. Prevention is the best to control the spread of disease. Besides preventive measures, building up immune system by taking healthy diet and maintenance of self-hygiene.

8. Conclusion

COVID-19 outbreak has almost at the pandemic stage, appropriate containment is necessary. All the preventive measures should be followed by dentists as well as by patients to prevent transmission. Emergency dental services should be attended following infection control protocol. Physical distancing is present drug so far till the vaccine arrive. Looking past and future, considering the pandemic issues which suggests that we can never be too prepared. All the pandemics have same basic course – “they begin, they escalate, they attenuate and they end”. What one can do at this situation is decline the curve during the escalation phase. We hope for its decline and lead a conventional life in near future.

Compliance with ethical standards

Disclosure of conflict of interest

There are no conflicts of interest.

References

- [1] Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, Wang W, Song H, Huang B, Zhu N, et al. (2020). Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet*, 395(10224), 565–574.
- [2] Mahase E. (2020). China coronavirus: WHO declares international emergency as death toll exceeds 200, *British Medical Journal*, 408.
- [3] Richman DD, Whitley RJ and Hayden FG. (2016). *Clinical Virology*, Fourth edition. Washington, ASM Press.
- [4] Chan-Yeung M and Xu RH. (2003). SARS: epidemiology. *Respirology*, 8(s1), S9–S14.
- [5] Baron Samuel. (1996). *Medical Microbiology*. Fourth edition. Galveston (TX): University of Texas Medical Branch at Galveston, chapter, 60.
- [6] Chen N, Zhou M, Dong X, et al. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*, 395(10223), 507–513.
- [7] Singhal T. (2020). A Review of Coronavirus Disease-2019 (COVID-19). *The Indian Journal of Pediatrics*, 87(4), 281-286.
- [8] Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. (2020). Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. *New England Journal of Medicine*, 382(10), 970-971.

- [9] Cheng ZJ and Shan J. (2020). 2019 Novel coronavirus: where we are and what we know. *Infection*, 48(2), 155-163.
- [10] Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. (2020). Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *New England Journal of Medicine*, 382(13), 1199-1207.
- [11] Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. (2020). Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet*, 395(10226), 809-815.
- [12] Marwaha J and Shah K. (2020). Safety & preventive measures for dental health care professionals on COVID-19. *International Journal of Science & Healthcare Research*, 5(2), 1-4.
- [13] Larson EL, Early E, Cloonan P, Sugrue S and Parides M. (2000). An organizational climate intervention associated with increased handwashing and decreased nosocomial infections. *Behavioral Medicine*, 26(1), 14–22.
- [14] Wang Y, Chen Y and Qin Q. (2020). 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.
- [15] Eggers M, Koburger-Janssen T, Eickmann M and Zorn J. (2018). *In Vitro* Bactericidal and Virucidal Efficacy of Povidone-Iodine Gargle/Mouthwash Against Respiratory and Oral Tract Pathogens. *Infectious Diseases Therapy*, 7(2), 249–259.
- [16] Kariwa H, Fujii N and Takashima I. (2004). Inactivation of SARS coronavirus by means of povidone-iodine, physical conditions, and chemical reagents. *Japanese Journal of Veterinary Research*, 52(3), 105-112.
- [17] Li R, Leung K, Sun F and Samaranayake L. (2004). Severe acute respiratory syndrome (SARS) and the GDP. Part II: implications for GDPs. *British Dental Journal*, 197(3), 130-134.
- [18] Samaranayake LP and Peiris M. (2004). Severe acute respiratory syndrome and dentistry: a retrospective view. *Journal of the American Dental Association*, 135(9), 1292-1302.
- [19] Vandenberghe B, Jacobs R and Bosmans H. (2010). Modern dental imaging: a review of the current technology and clinical applications in dental practice. *European radiology*, 20(11), 2637–2655.
- [20] Meng L, Hua F and 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.
- [21] ADA Calls Upon Dentists to Postpone Elective Procedures. (April 18, 2020).
- [22] Michael Day. (2020). Covid-19: Ibuprofen should not be used for managing symptoms, say doctors and scientists, *British Medical Journal*, 1086.
- [23] Kampf G, Todt D, Pfaender S and Steinmann E. (2020). Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents. *Journal of Hospital Infection*, 104(3), 246-251.
- [24] Peng X, Xu X, Li Y, et al. (2020). Transmission routes of 2019-nCoV and controls in dental practice. *International Journal of Oral Sciences*, 12(9).

How to cite this article

Gadwal M. (2020). COVID-19 outbreak challenging dentist's safety. *World Journal of Advanced Research and Reviews*, 6(3), 216-221.
