

Novel Corona Pandemic Affecting Dentistry and ENT Enigmatically and Its Systematic Review

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ABSTRACT

The coronavirus expansion alarmed all health professionals throughout the world. Especially in dentistry, the growing concern is due to its high virulence and routes of transmission through saliva, aerosol generation. The virus stays viable in air and on surfaces for hours and thus the ENT & dental setups are high-risk settings for cross-infection. Viral load is a concept that suggests the amount or an actual number of virus particles that invaded a body and shows the impact on how badly a person will suffer from the disease. The viral titer of SARS-CoV 2 is higher in the saliva of COVID 19 patients and highest during a patient clinical presentation.

Keywords- Viral load, SARS-CoV-2, aerosol, throat swab, RT-PCR

INTRODUCTION

SARS CoV-2 causes Novel coronavirus disease 2019 or COVID-19 which is an infectious disease and which mainly attacks the respiratory system of infected humans. [1] The term 'coronavirus' derived from the Latin word *corona* which means "crown" or "wreath", belongs to the coronaviridae family of single-stranded RNA virus.

We as dentists deal directly with infection's house in the human body i.e. oral cavity. Considering this in March 2020, the Center for Disease Control and Prevention (CDC), American Dental Association (ADA), as well as the Indian Dental Association (IDA), recommended and divided categorized and consider in

moderate risk field ENT & Dental faculties worldwide to postpone all elective procedures, surgeries, etc. and to prioritize emergency ENT & dental procedures only. [1][6]

As many dental procedures produce aerosols and the virus stays viable in air for 3 hours which if inhaled directly can get deposited on various surfaces and thus is the potential cause of cross-infection. [5][2]

In this pandemic, ENT & Dentistry is facing the darkest hour as the ENT Surgeons Dental surgeons are at the highest risk of contact and transmitting the virus, alongside with other health care workers so the clinics have been shut down for over 2 months and with the pandemic still on the growth curve, there is no hope of revival soon compounded by zero earnings of dental practitioners. Practicing is a challenge as most of the practices including dental institutions are not compatible with the government norms and regulations on COVID 19. Fraternity needs to be very careful as a small slip can turn out to be very expensive. Dentistry today needs a complete structural change to prevent doctors as well as patients from getting infected and psychological counseling of patients must be considered. [10]

REVIEW OF LITERATURE

WHAT IS COVID 19?

The coronavirus disease 19 (COVID-19) is a virogenic and transmittable viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which first

emerged in Wuhan, China, and spread around the world. Genetically SARS-CoV-2 is phylogenetically related to severe acute respiratory syndrome-like (SARS-like) bat viruses, therefore bats are considered as the primary reservoir. The intermediate source of origin along with transfer to humans is not known yet; however, the rapid human to human transfer has been confirmed. Classical signs and symptoms of COVID 19 – pneumonia with the unknown origin of the fever. Few broad-spectrum antiviral drugs, hydroxychloroquine, steroid, plasma convalescent therapy has been evaluated against COVID-19 in clinical trials which have resulted in clinical recovery.

Coronaviruses belong to the Coronaviridae family in the Nidovirales order. It was named as a coronavirus because it represents crown-like spikes on the outer surface (fig shown below). Coronaviruses are of minute size (65–125 nm in diameter) which contains a single-stranded RNA as a nucleic material and the size ranging from 26 to 32kbs in length (Fig. 1)

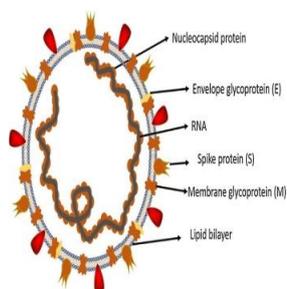


Figure-1

The basic structure of the novel corona-19

The following are the subgroups of the corona virus's family; alpha (a), beta (b), gamma (c), and delta (d) coronavirus. The severe acute respiratory syndrome coronavirus (SARS-CoV), H5N1 influenza A, H1N1 2009, and Middle East respiratory syndrome coronavirus (MERS-CoV) cause acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) which causes pulmonary failure and result in fatality. It was thought that these viruses

only affect animals until the world witnessed a severe acute respiratory syndrome (SARS) outbreak caused by SARS-CoV, 2002 in Guangdong, China. Only a decade, another pathogenic coronavirus, known as Middle East respiratory syndrome coronavirus (MERS-CoV) have caused an endemic in Middle Eastern countries. Recently at the end of 2019, Wuhan an emerging business hub of China has experienced an outbreak of a novel coronavirus. Group b of coronaviruses reports this virus. The novel virus was named as Wuhan coronavirus or 2019 novel coronavirus (2019-nCov) by the Chinese researchers. The International Committee on Taxonomy of Viruses (ICTV) named the virus as SARS-CoV-2 and the disease as COVID-19. In history, SARS-CoV (2003) have infected 8098 individuals with a mortality rate of 9%, across 26 countries worldwide and on the other hand, novel coronavirus (2019) infected lacs of individuals but with a lower mortality rate.

ORIGIN AND TRANSMISSION

To develop preventive strategies to contain the infection the source of origin and transmission are important to be determined. Anti-SARS-CoV antibodies were found in Rhinolophus bats which suggest the bats as a source of viral replication. The The Middle East respiratory syndrome (MERS) coronavirus has first emerged in 2012 in Saudi Arabia. In a recent study, MERS-corona virus was detected in Pipistrellus and Perimyotis bats, concluding that bats are the key host and transmitting medium of the virus. [9] In many cases, the infection of SARS-CoV-2 is resulting from the rapid human-to-human transmission which includes direct contact with patients along with the transmission through droplets and aerosol particles (Xu et al., 2020). The respiratory syndrome which is caused by this virus is severe and even fatal (Li et al., 2020). It is being reported that ACE2 is the main host cell receptor of SARS-CoV-2 and it plays a crucial role in the entry of the virus into the cell (Zhou et

al., 2020). Interestingly it shows that ACE2 is highly expressed on the epithelial cells of oral mucosa which suggests that the oral cavity could be at high risk for SARS-CoV-2 infection. [13] Investigation of the virus is being done with sputum, blood, body fluids for viral culture and PCR because of the viral load present in it.

VIRAL LOAD

Viral load also known as viral titer is a numerical expression of the quantity of virus in a given volume of fluid sputum/blood/plasma. The quantity of virus per ml can be calculated by estimating the live amount of virus in an involved fluid. For example, it can be RNA copies per ml of sputum. Tracking of viral load is used to monitor therapy during the viral infection. As the world is facing a novel coronavirus pandemic.

TECHNIQUES OF VIRAL LOADING TESTING

2010 – Review study of PUREN ET AL [2] Categorized viral loading testing into three types

1. NATs [Nucleic Acid Test] – this is same as we are using for COVID testing

2. Homebrew or in house NATs

3. Non-Nucleic Acid test

1. NATs – Target amplification which uses the nucleic acid itself like mRNA. The more common method is PCR (Polymerase Chain Reaction). It can be divided into – method in vitro used DNA templates, primes, nucleotides

2. RT-PCR (Reverse Transcription) THROAT AND NASAL SWAB – it is same as the described cycle threshold value of RT-PCR of a sample could be used for identifying super spreading ability of the COVID infected case. As ct value is the number of cycles required to detect the viral antigen lower the value (more viral load) higher the risk.

Ct values significance-

A value between -17 to 24-High viral load

A value between -24 to 31 moderate viral load

A value above 31- low viral load

High viral load case spreads 6.25 new cases, low viral load means cycle >31 spreads only 0.85 cases on average.

What does Ct Mean?

In a real-time PCR assay a positive reaction is detected by the accumulation of a fluorescent signal's is defined as the number of cycles required for the fluorescent signal to cross the threshold (ie exceeds background level).

Ct levels are inversely proportional to the amount of target nucleic acid in the sample (i.e. the lower ct level the greater the amount of target nucleic acid in the sample.

3. NASBA (Nucleic Acid Sequence-Based Amplification) – Method is a transcription-based amplification system variation of PCR.RNA is used as the target and the DNA copies then transcript into RNA and amplified

4. Probe –Molecular a probe is a group of molecules or atoms which is used in molecular biology to study the properties of other structure or molecule

COVID 19 and its relation to Dentistry

The dental health care professionals require a face to face communication exposing them to virus transmission through salivary droplets while during the procedure patient sneeze or coughs, another mode of transmission is caused by the production of fomite. Therefore, the following are the risk factors involved in dentistry are:

· Inhalation of aerosols which contain salivary droplets using air rotor during cavity preparation and access opening while root canal treatment

· Use of ultrasonic cleaners which cause aerosol production that would contaminate areas of the face especially around the nose and inner corner of eyes

· Contaminated surfaces which are touched by infected patients

· Direct Spitting or water gargle by the patient into dental chair spittoon which can be spill to floor and can become a source of contamination

· Exposure to Blood during extraction or any surgery including periodontal or dental implants surgeries

· Dentist may get hurt during the use of contaminated sharp instruments etc.

And thus as mentioned above the dentists are advised to do only emergency procedures and the procedures that can produce aerosols should be postponed. [8]

DISCUSSION

IMPACT OF COVID 19 ON ECONOMIC GROWTH OF DENTISTS

According to DCI's advisory which is released on 16th April 2020, dentists must now strictly follow all the protocols to decontaminate, disinfect and sterilize their clinics as prescribed, enabling us to treat a maximum 3 or 4 patients a day. Dentists and our assistants will now need mandatorily use of PPE suits, goggles, face shields, N95 FFP3 masks, surgical gloves and shoe covers, single use chair covers etc., and more for all procedures. With this, the *already exorbitant treatment costs will double*. If practitioners choose to compromise on the quality of PPE used or sanitization maintained in their clinics than the resulting impact on social health will be catastrophic. Apart from the huge monetary investments required to continue safe dental practice; there is also the equally important issue of proper training and process management in following these protocols for ensuring minimal risk to patients and dentists. The advisory had also recommended only emergency dental services in the near future that would further impact the financial plight of dentists [10]

Precautionary measures which we as dentists are taking to reduce viral load

We are following the guidelines given by ICMR regarding the precaution against COVID 19 along with it, we made it compulsory for the patient to do the gargle with chlorhexidine and povidone-iodine mouth rinses before any dental procedure as Chlorhexidine is widely used for oral health which is being especially effective against Gram-positive bacteria, but to a lesser

extent Gram-negative bacteria and fungi. A recent review of corona virus literature has identified that chlorhexidine exposure for 10 min only weakly inactivated coronavirus strains in suspension tests although the concentration used was low at 0.02% [3]

Povidone-iodine mouthwash has been widely studied about broad-spectrum antimicrobial and virucidal actions. At 0.23%, which is routinely used in Japan which rapidly had inactivated SARS-CoV, MERS-CoV, influenza virus A (H1N1), and rotavirus in vitro? So we are using the same [4] for reducing the viral load in the aerosols.

CONCLUSION

1-Dentists should enact universal infection control procedures to the highest standard and champion this behavior through their team

2-Disruption of the transmission chain

3-Awareness towards coronavirus

4-Psychological counseling of patients

5-Don't ignore or severe ties with your patient manage remotely

6-Myth regarding coronavirus should not be hyped or propagated but at last, COVID-19 will have a long term impact in future on dental clinical practice, dental research, dental education

Declaration of Competing Interest

The authors of this manuscript declare no conflict of interest.

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