

## ORAL HYGIENE IMPORTANCE IN THE TIMES OF COVID-19- A MINI REVIEW

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### Abstract

Oral cavity is one of the portals of entry into the human body, and as such it also holds a variety of micro flora, both pathogenic and non-pathogenic, which can traverse the respiratory tracts due to its proximity and in turn leads to infection. It is imperative that the oral health is maintained by performing standard hygiene practices using toothbrushes and antiseptic mouth washes regularly. Therefore, in this Covid-19 era, oral hygiene maintenance should also be given the same importance as hand hygiene to reduce the spread of corona infection.

**Key Words:** Covid-19, Oral hygiene, Gingivitis, Mouthwash

### INTRODUCTION

In the late of 2019, the new coronavirus SARS-CoV-2 was first discovered in Wuhan Hubei Province of China resulting swiftly into a global pandemic bringing about major trouble to the medical community.<sup>1,2</sup> The virus not only affected the human health but also the economy of the world.<sup>2</sup> The WHO on January 30, 2020 declared the outbreak to be a Public Health Emergency of International Concern as its rampant spread continued, creating an increased risk to numerous countries and as a pandemic on March 11, 2020.<sup>3,4</sup>

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has distinctive features i.e. exterior glycoprotein configuration that forms spicules which help the virus binds to human cells and it also has a double layer lipid that act as a protective function to its genetic contribution.<sup>5</sup> The virus invades the human cells through the ACE (Angiotensin Converting Enzyme) 2 receptors. These receptors are distributed in the upper respiratory tract and the epithelial cells lining the salivary glands ducts which are also the early targets of infection. The virus can be found in the mouth especially, on the tongue area.<sup>6,7</sup> The SARS-CoV-2 has been also known to survive on plastic surfaces and stainless steel up to 72 hours.<sup>8</sup>

SARS-CoV-2 infected patients are mostly asymptomatic. Symptomatic cases present mostly with fever, cough, dyspnoea,

and myalgia.<sup>9</sup> Some other patients have also given complaints of headache, dizziness, loss of taste or smell including gastrointestinal symptoms such as nausea, vomiting, and diarrhoea.<sup>10</sup> Death occurs as a result of acute respiratory distress syndrome.<sup>11</sup> One of the salient features of SARS-CoV-2 is their capacity to activate an exaggerated immune response in the host, known as 'cytokine storm' resulting in substantial damage to tissues specifically to the lung parenchyma.<sup>12</sup> The pathological features of lung in patients with SARS-CoV-2 pneumonia includes edema, focal reactive hyperplasia of pneumocytes with patchy inflammatory cellular infiltration, and multinucleated giant cells.<sup>13</sup>

A person can get infected by SARS-CoV-2 by immediate inspirations of nasal or respiratory droplets residue in the surroundings and maintaining hand-hygiene is one of the key methods in preventing the indirect transmission of the disease.<sup>14</sup> Hands act as a pool for numerous pathological microorganisms as they are always in touch with various animate and inanimate surfaces including contaminated surfaces. Thus, this global pandemic has brought to light the notable role of keeping hand sterile and clean to fend off extremely infectious diseases.<sup>15</sup>

People have an inbuilt tendency to touch their faces and certain researches have reaffirmed this by reporting on the fact that people end up touching their faces subconsciously for at least 23 times in a given hour; and in this pandemic time, this habit

poses a threat of accidental transmission of the SARS-CoV-2 directly to mouth, nasal cavity or through the eyes.<sup>16</sup>

Oral cavity is regarded as the doorway of entry of numerous microorganisms into the body of a person, hence it became quite relevant to give oral hygiene the same importance as maintenance of hand hygiene. This will eventually play a pivotal role in limiting infection in the oral cavity thereby, eventually cutting its movement into the airways.<sup>17</sup>

### **Oral cavity the gateway to the human body:**

The oral cavity plays a significant role as one of the points of entry of the SARS-CoV-2 along with its convenient location near the airway as well as the salivary glands. The oral cavity also acts as a pool for a great many pathogens of the airway including *Chlamydia pneumoniae*, thus, complications in the form of nosocomial pneumonia may develop in individuals with periodontal disease.<sup>18</sup>

There are various mechanisms that explain the oral microbe's ability to intensify the lung disease. This involves aspiration of oral microorganisms into the lower airway tract; the restructuring of airway tract mucosal surfaces by enzymes from saliva, which helps in the establishment of microorganisms in the tissues; and pro-inflammatory cytokines from periodontitis aid in attachment to lung epithelium and ultimately colonization.<sup>19</sup>

Inadequate oral hygiene is contemplated as a crucial environmental force that directs a network of microorganism groups in the oral cavity leading to imbalance in the ecosystem and this shift promote a growth in the number of oral pathogens. Mastication, flossing, and tooth brushing are daily activities that bring about bacteraemia facilitating spread of oral microorganisms and mediators of inflammation through bloodstream, instigating inflammation. Person with periodontal infection exhibits micro ulcerated sulcular epithelium with destruction of periodontal tissues, increasing vulnerability to bacteraemia.<sup>20</sup>

Thus, maintenance of oral health through rigorous hygiene practice will greatly help in reducing the oropharyngeal colonization, in turn reducing the risk of respiratory complications and is also vital in managing the total microbial load in the mouth, restoring synergetic balance of the oral cavity, and stopping the spread of microorganisms from oral to other parts of the body.<sup>20</sup> Scientific studies have also proposed optimal oral health maintenance thereby decreasing the risk of hospital-acquired pneumonia.<sup>21</sup>

Periodontopathogens and periodontal disease in general were linked with pulmonary afflictions and unfavourable result, especially due to collaborative interactions with viral

pathogens.<sup>22</sup> This further emphasizes the importance of maintaining optimal oral health in critical hospitalized patients. Though there is lack of clinical research for now, preservation of oral health is a prospectively practical way to decrease the morbidity and mortality associated with SARS-CoV-2 pandemic.<sup>17</sup>

Studies have reported that SARS-CoV-2 can be retrieved from the saliva and nasopharyngeal swabs thus forming the cornerstone of testing methodology. Oral swabs have been preferred over nasal or oropharyngeal swabs and collection of blood sample as it is less invasive and more agreeable by patients especially when it comes to disease tracking and where mass investigation is vital.<sup>22</sup> But, gingival crevicular fluid (GCF) can also be taken into considerations other than saliva. GCF is a serum exudate that seeps into the gingival crevices and it has been a popular approach to analyse this fluid for monitoring the state of the periodontal tissue.<sup>23</sup> Poor oral hygiene is a predilection for increased inflammatory exudate which will be reflected in the GCF levels. GCF has been used for detection of other viruses such as herpes simplex, hepatitis C, HIV, etc.<sup>24</sup> And with studies reporting the discovery of SARS-CoV-2 in GCF of COVID-19 patients, we may find use of this fluid for approximating viral load. Sampling of GCF is also a dependable predetermination of the serum immune response and this can be further utilised to infer cytokine levels manifested in monitoring patients of COVID-19. The ACE2 receptor expressed in the oral cavity epithelium plays a vital role in initiating SARS-CoV-2 infection. Thus, we can confer that GCF and ACE2 receptor expression could form a foundation in interpretation of the potential route of infection and the inflammatory status of the periodontium which depends on oral health, which will ultimately impact SARS-CoV-2 infection.<sup>25</sup>

S. Gupta et al. reported the finding of SARS-CoV-2 from asymptomatic carriers and mildly symptomatic cases. This fact brought about a concerning notion as this can lead to infection of unwary health care professionals. The results of this study will not only influence healthcare providers during screening investigations when practices open up, but will also play a major role in policy formulation.<sup>25</sup>

Addy M. in 2020 wrote a letter to the British Dental Journal editor stating his surprise on the fact that oral hygiene practice was not given the same importance as hand hygiene in the fight against SARS-CoV-2. He suggested the use of social media and news platform by concerned authorities to emphasize the importance of oral health and their maintenance. Regular dental care practice will also decrease the infection of COVID-19 among individuals staying in isolation centre and hospital care.<sup>26</sup> Reasoning for the judgement are given in Table 1.<sup>17</sup>

Table1: Why maintaining good oral hygiene is important?

1.	Scientific evidence suggests that due to a higher level of angiotensin-converting enzyme-2 expression in the salivary glands, the epithelial lining of salivary ducts, and oral mucosa, these are early target cells for coronavirus, thus SARS-CoV-2 virus colonizes in the oral cavity.
2.	The most common portal for entrance and outlet of viral infectious disease transmission through droplets and aerosol is the oral cavity. Oral cavity harbours numerous pathogens, including viruses, and in dysbiosis condition, the oral ecosystem becomes more conducive for the colonization of potential oral and respiratory pathogens. Viral infection colonizes in the oral and periodontal environment, lower and upper respiratory tract, gingival crevicular fluid, and major or minor salivary glands.
3.	Saliva contains discharges from nasopharynx and lung (due to ciliary actions in airway lining); therefore, the potential of a microorganisms-spill over from the oral cavity to the respiratory system and vice-versa cannot be ruled out.

Bains VK, Bains R. Is oral hygiene as important as hand hygiene during COVID-19 pandemic? *Asian J Oral Health Allied Sci* 2020;10:5.

### Oral hygiene practice in the covid era:

A standard oral hygiene measures include proper cleansing of teeth especially between the teeth with a toothbrush and toothpaste daily. Tongue, the most neglected part of the oral cavity that holds a significant number of microbes should also be cleaned properly. The toothbrushing should done for at least 2 minutes however, prolonging for more than 2 minutes have no additional merits. Ideally, a toothbrush must last for at least three months but sometimes fraying can be seen before 3 months indicating that the person has vigorous brushing habit which should be avoided as it can traumatize the oral mucosa, increasing chances of microbial inoculation and infiltration.<sup>17</sup> Li ZY et al. (2020) have reported the transmission of SARS-CoV-2 through oral mucosal abrasion.<sup>27</sup>

The toothbrush is a tool commonly used to clean teeth and most of the time it is exposed to microbial dental plaque and saliva. Thus, microbes can sometimes hold on to the brushes and remain viable for an exceptional period of time, ranging from a day to a week after toothbrushing and may re-contaminate the mouth and spread it to other individuals when toiletry items are shared or kept together.<sup>28,29</sup>

Tomar P et al. (2014)<sup>30</sup> in his studies reported that after a one-time use, in a time span ranging from 30 seconds to 4 minutes, a toothbrush can become exposed and harbour several microbes as most toothbrushes are kept in the bathrooms. The most neglected practice following toothbrushing is the disinfection of toothbrushes, as most individuals merely clean the toothbrush using tap water and leave them out to dry. Some methods for sanitizing toothbrush include UV rays, submersion into antiseptic mouthwash such as chlorhexidine, use of microwave sterilization and herbal agents. Importance should also be given to cleaning the handle of the toothbrushes with an alcohol-based disinfectant after each use and to prevent cross-contamination, the toothbrushes of family members should not be stored in a common holder.<sup>17</sup> So, in this global pandemic time, it has become especially pivotal to have as separate toothbrush holder, as there are many asymptomatic carriers of the virus and storing brushes together can lead to cross-contamination. Toothpaste shouldn't be shared between family members as this promotes cross-contamination.

Toothpaste contain sodium lauryl sulfates (SLSs), a synthetic organic compound used in many cleaning and hygiene products. It produces froth and causes dissolution and inactivation of numerous nonenveloped and enveloped viruses such as retrovirus, rotavirus, poliovirus, HSV2, and HIV.<sup>31</sup> The SLSs causes denaturation of the envelop and capsid protein of

viruses, which renders the virus dormant. Toothpaste have been demonstrated to exhibit a medium range substantivity ranging from 5 to 7 hours.<sup>32</sup>

Daily oral hygiene practice is not complete without antiseptic mouthwashes which is frequently use as oral rinses and gargles. After the H1N1 swine flu outbreak of 2009 in Japan, their government officials recommended daily gargling to prevent airway infections in the populace.<sup>33</sup> Dental societies like the American Dental Association and American Association of Endodontics recommended that pre-procedural mouthwashes should be done with 0.2% Povidone-iodine and 1% hydrogen peroxide prior to any procedures to minimise microbial output in aerosols.<sup>34</sup>

Marui et al. in his meta-analysis study found that there is a mean reduction of 68.4% colony-forming units in dental aerosols when pre-procedural mouth-rinse with 10 ml of chlorhexidine (0.1% or 0.2%), cetylpyridinium chloride, and essential oils is used. Like other respiratory viruses SARS-CoV-2 is also reported to be susceptible to oxidation.<sup>35</sup>

Slots<sup>36</sup> in his review of economical periodontal procedures, advocated that Povidone-iodine and dilute sodium hypochlorite should be the initial choice for the management of periodontal disease. Sodium hypochlorite (NaOCl), a cytotoxic oxidant is a potent antiseptic and disinfectant against microbes. The approved dose is 8–10 ml of 6% household bleach, diluted in a quarter litre of water, giving 0.25% of NaOCl oral rinse which should be used about 2–3 times a week for 30 seconds. It acts by altering and interfering with cellular metabolism, with resultant inactivation of essential enzymes necessary for the survival of microbes. Accordingly, a habitual use of mouthwashes will reduce pathogens in the oral cavity and upper airway.

To sum it all up, personal hygiene practices are not complete without proper dental care and should not be neglected. Following diligent oral hygiene practice is a prerequisite but it is also necessary to store toothbrushes properly, keeping them clean, thus preventing them from harbouring potential pathogens. So, the first and foremost thing to do during this pandemic is to clean hands preferably with water and soap or sanitize with alcohol-based hand rub (ABHR) before touching the toothbrush. For SARS-CoV-2 patients, it is recommended that the patients have their own complete personal oral hygiene products such as a new soft bristled toothbrush, toothpaste, and a mouthwash which should be stored in a hygienic environment and disposed of properly after patient improves. Methods that

may likely generate aerosols should be avoided such as the electric toothbrushes and water-pik/oral irrigators in this Covid era. For critical and ailing patients with disability and limited manual dexterity, there is a necessity to plan a professional standard oral hygiene programs such as soft triple head toothbrushes, and associated suction toothbrushes).<sup>37</sup>

The Oral health-care providers can also aid the patients in this pandemic time through new approaches such as Tele dentistry which will not expose patients to the risk of cross-infection. With this ongoing pandemic, one of our major priority is to provide satisfactory dental care to emergency cases while ensuring the safety of healthcare providers.<sup>3</sup>

The dental communities should highlight the importance of a proper and adequate oral hygiene to the general public and hospitalized patients. In the Philippines and Indonesia where the “Fit for School”<sup>38</sup> public health program embraces tooth brushing, hand hygiene, and anti-helminthics in school children, efforts should be made to develop and plan similar dental health programs and policies globally in this pandemic era. We should inculcate a habit of brushing thoroughly daily for “Two times for two minutes” and in this pandemic situation, this should be afforded as equally fundamental as following 20 seconds of hand hygiene.<sup>17</sup>

## CONCLUSION

The present global pandemic has brought in much misery to the world, disrupting normal lives including the global economy. Many people, as well as the health care providers have lost their lives from Covid-19. Since Covid-19 is spread from nasal or mucosal droplets which means the dentists are at a high risk for covid infection. However, a dental practitioner can still provide care for a patient through teledentistry and for emergency cases by taking proper infection control measures. As for the patients, there are simple measures to follow which will aid a lot in halting the Covid-19 infection. These measures include washing hands properly, practicing social distancing and maintaining oral health and regular sanitization of the surroundings. These steps may seem minor, but they will be vital in getting us back to our normal life.

## Conflicts of interest

Nil.

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