



Role of Oral Hygiene in COVID-19 Pandemic.

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Abstract

Oral hygiene constitutes an important part of body hygiene and has been much emphasized. The ongoing COVID-19 pandemic has made us realize that proper hygiene practices are the need of the hour for healthy living, with hand hygiene being much highlighted. Well, under such circumstances, it is evident that oral hygiene practices have become secondary and less important to hand hygiene. This is a mirage. The oral cavity forms a major contact of the internal body environment with the external world and may play a pivotal role in nurturing the SARS-Co-2 virus and helping it to spread. Thus, it becomes highly significant that oral health and hygiene are taken care of with utmost vigilance which may help stop the disease at some level.

Keywords: COVID-19, pandemic, oral hygiene.

List of Abbreviations

1. **COVID-19:** Coronavirus Disease
2. **SARS-CoV-2:** Severe Acute Respiratory Syndrome Coronavirus 2
3. **MERS-CoV:** Middle East Respiratory Syndrome Coronavirus

4. **BMI:** Body Mass Index
5. **ARDS:** Acute Respiratory Distress Syndrome
6. **ACE 2:** Angiotensin Converting Enzyme 2
7. **RNA:** Ribonucleic Acid
8. **UV:** Ultraviolet Rays
9. **HSV:** Herpes Simplex Virus
10. **HIV:** Human Immunodeficiency Virus
11. **ABHR:** Alcohol Based Hand Rub

Objectives

- 1.To discuss the potential role of oral hygiene in preventing the spread of COVID-19 and any form of illness in patients with COVID-19.
- 2.To identify connections between the oral cavity and the SARS-CoV-2.
- 3.To discuss various oral hygiene measures.

Introduction

COVID-19, a pandemic as declared by the World Health Organisation (WHO) on March 11, 2020, has put the entire human race to test. According to WHO, the COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes. Droplet transmission occurs with people in close proximity (within 1 m) to persons having respiratory symptoms (e.g., coughing or sneezing) and therefore exposes his/her mucosae (mouth and nose) or conjunctiva (eyes) to possibly infective respiratory droplets.[1] WHO also confirms the spread of the virus by fomites in the immediate atmosphere around an infected person. Touching infected objects consciously or unconsciously by hands can be risky, as studies tend to show that people touch their face about 23 times in an hour, thus making it easy for the virus to enter through oral, nasal or conjunctival mucosae.[2]

Various symptoms of COVID-19 that generally appear after an incubation period of 5.2 days are, fever (98.6%), fatigue (69.6%), dry cough (59.4%), myalgia (34.8%) and sore throat (17.4%), and sometimes diarrhea, unlike in SARS-CoV and MERS-CoV.[3,4,5,6]. These are considered to be the mild to moderate symptoms of the disease. Well, the disease also manifests as severe illness depending upon various risk factors such as age (the mean age was 69 years old), gender (men represented 70% of deaths) underlying

comorbidity in 48% of cases (hypertension 30%, diabetes 19%, or heart disease 8%) and obesity(47.6% of patients in intensive care units (ICUs) having a BMI over 30 kg/m²)[7,8] Among the severe clinical manifestations, there are severe pneumonia, ARDS, as well as extrapulmonary manifestations and Systemic complications such as sepsis, and septic shock.[9]

The oral cavity can serve as an entry point and a reservoir for the SARS-CoV-2, and its possible role as a protective/aggravating factor in the infectivity and in the progression of this viral infection has been contentious, although recent scientific evidence indicates a significant role of the oral cavity and its mucosae in the transmission and pathogenicity of SARS-CoV-2.[10] Thus maintaining proper oral hygiene is very important during times of such crisis.

According to the American Dental Association, oral hygiene is defined as the process of maintaining the cleanliness of teeth and related structures. The importance and relevance of oral hygiene during the COVID-19 pandemic is a serious matter of discussion. To support the article, various online searches were made on the Google search engine of the World Wide Web with search keywords- “Oral hygiene”, “COVID-19”, “the importance of oral cavity in the COVID-19”.

Oral Cavity and the COVID-19

Various articles and newsletters were screened. Based on the search results, the oral cavity can be said to have the following links with the COVID-19 virus-

1. Role of Oral Cavity in the transmission and pathogenicity of SARS-CoV-2: Some studies have found that ACE-2 receptors sufficiently serve as receptors for SARS-CoV-2.[11] It forms a primary portal for the entry of the virus into human cells. Apart from the expression of ACE-2 receptors in the lungs, intestines, heart, and kidneys, certain single-cell RNA-seq profile studies have supported the ACE-2 expression in the oral cavity, with the expression levels being higher in the tongue than buccal or gingival tissues. Since the oral cavity is one of the first interfaces between the exterior and body, there is a high potentiality that this pathway of viral colonization and infection is critical for the onset of COVID-19. Apparently, in the first 10 days after the transmission, when the patient usually remains asymptomatic but is highly contagious, the virus accumulates at the nasal, oral, and pharyngeal mucosa, and only later will further accumulate in the lungs. It has also been shown that the number of ACE2 receptors in the salivary glands is higher than in the lungs has been suggested could be a reservoir area for SARS-CoV-2 in asymptomatic patients.[12,13,14]

2. High bacterial load of the Oral Cavity and post-viral complications: According to a study conducted by the British researchers to find a link between poor oral hygiene and severity of COVID-19 disease, during lung infection, there is a risk of aspirating the oral secretions into the lungs, leading to infections principally caused by certain oral bacteria- “*Porphyromonas gingivalis*, *Fusobacterium*

nucleatum, Prevotella intermedia,”. They explained that periodontitis or infection of the gums is one of the most prevalent causes of harmful bacteria in the mouth which lead to the formation of salivary cytokines such as Interleukin 1 (IL1) and Tumor necrosis factor (TNF), that can reach the lungs causing pulmonary infections. Also, periodontal disease patients are at a 25 percent raised risk of heart disease, thrice the risk of getting diabetes, and 20 percent raised risk of hypertension, which are all risk factors of severe COVID-19. [15]

3. Saliva- a barrier against SARS-CoV-2: Human saliva, has many proteins and peptides with antiviral effects and prevents viral replication and infections and protects against them, especially coronavirus, which illustrates, the protective effect of these salivary proteins against the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Cystatin D, a salivary component, inhibits the replication of coronavirus at its physiologic concentration (Magister & Kos, 2013), and may have an anti-viral role (Collins & Grubb, 1998). Iwabuchi et al. proposed that hyposalivation causes severe respiratory infection by either disrupting the oral and airway mucosal surfaces as a physical barrier, thereby enhancing the viral colonization and adhesion or reducing the secretion of antimicrobial peptides and proteins.[16,17,18]

4. Periodontal pocket as a favorite anatomical niche for SARS-CoV-2: Well, studies have shown viral presence in the periodontal pockets, with the more frequent ones being Herpes simplex virus (HSV), Epstein-Barr virus (EBV) and Human Cytomegalovirus (HCMV) [19-26]. It can be concluded from these studies that periodontal pockets serve as reconcilable environments for viral infections and survival, possibly including SARS-CoV-2, which may replicate and reach continuously the oral cavity and mix with saliva, or travel systemically using the capillary periodontal complex making Periodontal Pockets plausible reservoirs for SARS-CoV-2 viruses.[27] The virus may also infect cells by using its spike protein to bind to the Cluster of Differentiation 147 (CD 147) [28] on cell membranes and not necessarily ACE-2 which makes cells expressing CD 147 at high risk of infection by SARS-CoV-2. It has been shown that oral epithelial cells, of the buccal and subgingival components of PP cells, express CD 147 [29]. Furthermore, the gingival epithelium of periodontitis patients has an increased CD 147 expression[30].

Oral Hygiene and COVID-19

The above literature provides an insight into the importance of the oral cavity, especially during the COVID-19 times. Here is how significant it is to maintain a healthy oral environment-

1. Good oral hygiene prevents inter-bacterial exchange between the lungs and oral cavity, thus preventing airway infections in patients, reducing the potential risk of bacterial superinfection especially in those over the age of 70 or with diabetes, heart disease, or hypertension.[15]

2. The intervention in oral or dental hygiene such as mouthwashes that reduce oral flora colonization with potential pathogens; toothbrushing, tongue-brushing, and even full dental hygiene care may reduce the rate of pneumonia in the elderly (based on limited data).[31-34]

3. In a study to determine whether manual, or electric, brushing of the teeth, tongue, and palate modulates whole salivary flow rate in older adults free of major systemic disease, it was found that tooth brushing stimulates saliva production for up to five minutes in adults aged 60 years and older. This transient salivary flow rate may contribute to reducing oral microbial load.[35]

4. Periodontal pockets develop due to progressive deposition of calculus over teeth surface, beginning as tiny ulceration of the crevicular epithelium and eventually leading to apical migration of the epithelial attachment on the tooth. Prevention of formation of calculus is dependent upon removal by the patient of fresh uncalcified deposits with a toothbrush and dental floss.[36]

Standard Oral Hygiene practices

At present, standard oral hygiene practices include thorough daily cleaning of all surfaces of teeth, interdental areas, and tongue using a toothbrush with toothpaste for not less than 2 min. Toothbrushes should be changed every 3 months or when visibly frayed.[37] Often toothbrushes are kept in bathrooms or combined toilet/bathrooms, which are warm and moist, and an ideal place for the growth of microorganisms.[38] Studies have shown that toothbrush sanitization with UV rays for 2 h and overnight immersion in 0.12% or 0.2% chlorhexidine helps in decontamination.[39,40]

General Recommendations	Personalized Recommendations	Lifestyle Considerations
Twice daily brushing with fluoride toothpaste	Those with high risk of gum disease: antimicrobial mouthwashes and toothpastes to be used	Avoid do-it-yourself-orthodontic-treatments
Interdental cleaning	Those with high risk of caries: Fluoridated mouth rinses to be used	Consume fluoridated water
Limited sugary intake	Those with difficult interdental cleaning: interdental cleaning aids to be used	Tobacco consumptions to be stopped
Regular Dental Checkups	For improved plaque removal: use power toothbrush	Avoid oral piercings

Table 1: Oral Care Recommendations as per ADA [41]

Toothpaste contains sodium lauryl sulfates [SLSs], which have antimicrobial and plaque inhibitory properties. The anionic surfactant SLS inactivates various nonenveloped as well as enveloped viruses including retrovirus, rotavirus, poliovirus, HSV2, and HIV infectivity[42-44]

Like SARS and MERS, the SARS-CoV-2 is also considered to be vulnerable to oxidizing agents. Regular mouth washing with Povidone-iodine and dilute sodium hypochlorite (considered to be the first-choice antiseptics for treatment and periodontal disease prevention by Slots) may help in reducing the viral load of saliva and the oro-pharyngeal cavity. Being a highly active cytotoxic oxidant, sodium hypochlorite (NaOCl) is an effective antiseptic and disinfectant agent against bacteria, fungi, and viruses. [37,45]

Oral hygiene practices in the context of COVID-19

Well, various articles have stated how oral hygiene practices have to be revised in the wake of the pandemic. Some postulated brushing before stepping out and coming home is suitable during COVID-19.[46]

For COVID-19 positive patients, washing hands with soap and water, or sanitizing with ABHR before touching the toothbrush; keeping personal oral hygiene products including a new soft toothbrush, toothpaste, and a mouthwash/gargle; storing their oral health products separately and disinfecting their brush regularly. Powered toothbrushes and water-pik/oral irrigators may have aerosols production more than manual toothbrushes and should be avoided. [37,47,48]

Conclusion

Hence, it is not a matter of doubt that a healthy oral cavity is very important to be maintained even during the times of COVID-19. Thus, similar to vigorous hand hygiene education programs being promoted by the government to prevent the spread of COVID-19, various dental bodies should come forward and join the league to explain the necessity of proper oral hygiene along with hand hygiene. Oral Hygiene education should be imparted to the general public by the dental health care providers. Inculcating proper oral hygiene practices will help curb the spread of infection and superinfections to a significant extent.

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