SIGNIFICANCE OF ORAL CAVITY IN THE ERA OF COVID-19: A REVIEW

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ABSTRACT

The recent pandemic of Covid-19 have necessitated the need for early diagnosis and treatment. The spread of this virus through salivary droplets raises a question whether the oral cavity is relevant and if oral manifestations could be an indicator of Covid-19. Various studies taken place have successfully shown oral manifestations and mucosal changes seen in patients suffering from Covid-19. The immunocompromised patients suffering from an underlying systemic illness other than Covid-19 could also show oral lesions as secondary changes. The medications used for treating patients with Covid-19 have also been documented for side effects leading to these manifestations. Poor oral hygiene could also have some effects on the severity of the Covid-19 complications. There is a need to increase the oral examination of patients to conclude if oral manifestations or mucosal changes are a manifestation of Covid-19 and whether they can be of any value in early diagnosis of Covid-19.

KEYWORDS: COVID - 19, diagnosis, drug side effect, oral hygiene, oral manifestations, saliva.

INTRODUCTION

The outbreak of the coronavirus disease 2019 (Covid-19) which originated from Wuhan in China has spread all around the globe giving rise to a pandemic.[1] India has confirmed more than 7,909,590 cases of Covid-19 and 119,030 deaths so far. Coronaviruses are a large family of viruses that cause illnesses ranging from common cold to severe diseases. Some of the various symptoms shown by this virus include fever, cough, sore throat and headache, olfactory and gustatory disturbances. The severe cases studied reported with acute respiratory stress syndrome, septic shock, pneumonia and various organ failures leading to death.[2] It has been successfully proven that the spread of this virus is essentially by the spread of droplets through coughing, sneezing or coming in contact to sites harbouring those droplets.[3] It is also known that the entry point for Covid-19 is through the oral cavity and therefore it can be hypothesized that the earliest or initial symptoms of Covid-19 may involve the oral cavity. Studies regarding the spread of Covid-19 at microbic level have conclusively proven that ACE2 receptor cells act as host cells for this virus. The presence of ACE2 receptor cells not only in kidney, intestines and lungs but also in the oral mucosa especially on the dorsum of tongue and salivary glands further question the potential of Covid-19 to manifest changes of the oral cavity.[4] Various studies have been done around the world which have successfully documented oral mucosal changes in Covid-19 patients.[5,6,7,8] These oral manifestations might not only play an important role in early diagnosis of Covid-19 but also necessitate the role of dentists for early intervention.

Is oral cavity crucial in Covid-19 pathogenesis?

Coronaviruses are single stranded positive-sense RNA viruses, among which Alpha coronavirus and Beta coronavirus are the ones which mostly infect humans.[9] There is strong evidence that SARS-COV2 infects human by binding to the spike glycoprotein present on its Angiotensin 1 Converting Enzyme 2 (ACE2) receptor cells.[9] ACE2 receptor cells have been documented to be present in the intestine, lungs, kidney and also in the salivary glands in detectable amount.[4,10] Evidence based studies have found that the level of ACE2 receptor cells increases by 75% in critically ill patients.[11] The presence of SARS-COV2 RNA in the saliva even before it's diagnosed in the lungs explains its spread in asymptomatic patients and also proves the significance of saliva in spread of Covid-19.[12] Evidence have also supported that the pathogenic virus in saliva can cause biological alteration which can lead to an increased aggregation and communibility of the virus. The major cause of infection of Covid-19 is through droplet spread caused mostly due to coughing of the infectious patients

or touching surfaces which have been in contact of the Covid-19 infected patient resulting in them being infected with the virus and therefore explains the rapid transmission among humans.[3]

All these factors strongly support the significance and relevance of oral cavity in Covid-19 spread.

Effects of covid-19 on oral cavity
Oral manifestations
The pathogenesis for Covid-19 showing ACE2 receptor cells as hosts and its spread through droplet transmission strongly supports the hypothesis that oral cavity may show initial signs or manifestations of Covid-19. Xerostomia and dysgeusia are the commonly encountered symptoms in both symptomatic as well as asymptomatic patients. The presence of high number of ACE2 receptor cells in the mucosa of tongue and salivary glands explains the prevalence of xerostomia and dysgeusia in Covid-19 patients.[4] Numerous studies conducted have successfully shown various other oral manifestations and mucosal changes in Covid-19 infected patients. These oral manifestations are seen in the form of gingivitis, blisters, oral ulcers, facial pain, dry mouth, vessiculobullous lesions, petechia, red macules, masticatory pain, burning sensation, candidiasis and geographic tongue.[5,6,7,8]

Secondary Changes Or Side Effects Of Drugs
Covid-19 infected patients that have been clinically tested show decreased number of T-cells which signifies their impaired immunity.[13] The T-cells are found to be significantly decreased in critically ill patients and those with underlying co-morbities like diabetes, hypertension and asthma.[13] This leads to an increase in opportunistic viral, fungal and bacterial infections like candidiasis and recurrent herpetic ulcers in Covid-19 suffering patients. The presence of gingivitis, periodontitis and halitosis could also be a result of increased bacterial load. Also, the stress resulting from the fear of spread of pandemic along with the sudden Lockdown and work could also contribute to the occurrence of these oral lesions.[3,14,15]

Currently there is no specific vaccine or drug developed for the treatment of Covid-19 infected patients. The drugs that are used for treating patients maybe effective against coronavirus but they also have documented side effects on the oral mucosa. Antiviral drugs like lopivavir and ritonavir may be responsible for oral side effects like stomatitis, dry mouth and mouth ulcers. Interferons used to decrease symptoms of severe respiratory illness may cause dry mouth leading to oral thrush. Also, the use of broad spectrum antibiotics used in treating Covid-19 patients may lead to an imbalance of the natural microbial flora of the oral cavity.[16] Least importance given to maintaining oral hygiene in treating Covid-19 patients can lead to deteriorating oral health and also lead to upper respiratory track infections.[16,17]

Does Covid-19 play a role in Odontogenesis?
During pregnancy if mother get infected it may affect the health of the newborn,it also includes tooth morphogenesis. Infection can be bacterial,fungal or viral. There are studies going on the vertical transmission of COVID-19 and it's effect on new born. But there is very less data available on it.Previously there are studies who have also claimed various effects of infections on odontogenesis. This infections may disturb the development of tooth and cause tooth anomalies. It can affect any stage of tooth development which includes tooth initiation morphogenesis, cytodifferentiation and mineralization. Various viruses which can affect the tooth development include Varicella Zoster, Parvovirus B-19,Herpes infection, Cytomegalovirus and Rubella. Due to the less data available on involving vertical transmission of SARS-COV-2 & Covid-19 there is no certainty about the effect of Covid-19. But the possible dental alterations associated with this scenario are Hypodontia, Microdontia, Enamel Hypoplasia, Enamel Hypomineralization, Impacted teeth, Dens in dens, Dens invaginatus and Dens evaginatus, Taurodontism and Ghost teeth.[18]

Oral Hygiene- An Aggravating Factor in Covid-19?
Researchers are trying to find out the relation between poor oral hygiene & severity of Covid-19 disease caused by severe acute respiratory syndrome corona virus 2 (SARS-COV 2).

There are certain enzymes such as aspartate aminotransferase, lactate dehydrogenase, creatine kinase, alkaline and acidic phosphatase, gamma glutamyl transferase which is detected in saliva of personal suffering from periodontitis. These enzymes cause certain changes in oral mucosa which lead to the bacteria causing lung infection to stick to mucosa and grow over it. The bacteria which can cause infection include Porphyromonas Gingivalis, Fusobacterium nucleatum and Prevotella intermedia. These bacteria cause the formation of cytokines such as Interleukin-1(IL-1) & Tumour Necrosis Factor (TNF) which is detected in saliva. During lung infection there is a risk of aspirating the oral secretion into the lungs which may lead to infection. So poor oral hygiene can increase the risk of inter bacterial exchange between the lungs and the mouth, increasing the risk of infection.[17]

Salivary Diagnosis- the Future For Covid-19 Testing?
Covid-19 was recently identified in saliva of infected patients hence it presents as a potential method for early diagnosis. Documented studies have shown that ACE2 receptor cells present in saliva and tongue mucosa are attacked by coronavirus has host cells.[4,12] Theoretically saliva can be used for the diagnosis of Covid-19. According to studies done some virus strains can be found in the saliva even after 29 days indicating that it can be used for reliable diagnosis. One of the advantages of using saliva is that it can be self collected which reduces the contact between the health professional and

the patient. This in turn reduces the risk of spread of infection. It also reduces the need for trained professional which decreases the cost. It can also be used in cases where nasopharyngeal swabs are contraindicated like in bleeding disorders. The presence of Covid-19 in the saliva can be attributed to the minor and major salivary glands which may act as a reservoir for the virus. The second reason for the presence of virus in the saliva could be the mixing of it with the upper and lower respiratory track secretions. Sensitivity of tests done using saliva in Covid-19 patients was 91% as compared to nasopharyngeal swabs which had a sensitivity of 98%. Further studies are needed to investigate the potential diagnostic ability of saliva for Covid-19. Saliva can play an important role in the human-to-human transmission, and salivary diagnostics may provide an easy, non-invasive and cost efficient way to detect the virus. Not only can it be used for diagnosis but it can be used to check for antibodies and prognosis of the disease.[19]

CONCLUSION

The theory that Covid-19 can be indicated in presence of oral manifestations can be well supported by the pathway of spread and its pathogenesis. An increase in oral examination of Covid-19 infected patients is of utmost importance to document whether oral manifestations can be an indication for Covid-19 and more importantly if they can be considered as an aid for its early diagnosis. Also the relevance of saliva for early diagnosis should be considered. This will not only help in early implementation of treatment but also improve the prognosis and reduce the mortality rate for Covid-19 infected patients. Mouthwash, antifungal regimes and scaling as a measure to improve oral hygiene can also be introduced as a treatment modality in treating covid-19 infected patients. Efforts should be made for early diagnosis and treatment to improve the prognosis of infected patients.

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