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Chemosensory dysfunctions as potential risk factors for tooth demineralization process: The feasible impact of coronavirus disease 2019 on oral health

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Letter to Editor

Editor in Chief

The coronavirus disease 2019 (COVID-19) is continuing its spread across the world and threatening people's lives worldwide. Several studies are being performed to find the essence of the disease, accurate diagnosis, appropriate treatment, and effective vaccines for it.[1] Given the results of a recent systematic review and meta-analysis study, a significant number of people infected with COVID-19 experienced chemosensory dysfunctions, which were related to loss or distortion of the sense of smell and/or taste. The analysis demonstrated that the rates of olfactory and gustatory dysfunctions were 52.73 and 43.93%, respectively, among patients infected with COVID-19.[2] In a recent study on the recovery rate of chemosensory dysfunctions in large Brazilian samples infected with COVID-19, olfactory/gustatory dysfunctions were evaluated after a median of 76 days from the beginning of the COVID-19 symptoms. Among these samples, complete and partial recovery rates for olfactory dysfunctions were 53.80 and 44.70%, respectively; while complete and partial recovery rates for gustatory dysfunctions were 68.30 and 27.60%, respectively. Besides, no recovery was observed in less than 5.00% of the patients with these chemosensory dysfunctions.[3] In another study, the recovery time of 75 patients with COVID-19 who experienced sudden olfactory and gustatory dysfunctions was investigated, and it was revealed that less than 5 patients had these chemosensory dysfunctions for up to 51-60 days.[4]

Olfactory dysfunctions observed in the early phase of COVID-19 is subsequent to olfactory nerve dysfunction during invasion and multiplication of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[2,3] Moreover, this dysfunction may cause gustatory dysfunctions as a secondary consequence.[4] In addition, upper respiratory tract (URI) infection can cause acute-onset olfactory and gustatory dysfunction due to viral damage to olfactory epithelium, and taste from regional areas of cranial nerve innervation.[5] Severe loss of regional areas may lead to altered oral sensation in affected individuals by impairing taste balance, oral somatosensory, and retronasal sensation.[5] In addition, damage to angiotensin-converting enzyme 2 (ACE2) receptors, which are greatly expressed in epithelial cells of oral mucosa and salivary glands, may explain gustatory dysfunction observed in the early phase of COVID-19.[2-4] Since saliva is essential for taste sensation and also maintenance of oral health, conditions that change the amount or composition of saliva (such as damage to salivary glands) can alter the taste and retronasal olfactory sensations, and subsequently, lead to oral neuropathy or neurological transduction interruption.[1] A recent survey on the oral health status of patients with COVID-19 infection has reported dry mouth (46.30%) and dryness

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and inflammation of mouth (11.10%) among the infected individuals.[6] Additionally, dry mouth has been recently suggested to be a potential risk factor for COVID-19.[7] The aforementioned evidence may elucidate the pathogenic mechanism concerning these chemosensory dysfunctions in patients infected with COVID-19.

Since there are evidence concerning the lack of recovery and partial recovery of olfactory/gustatory dysfunctions in patients infected with COVID-19, these chemosensory dysfunctions may have the potential to be permanent.[2-4] Additionally, since the majority of patients infected with COVID-19 have olfactory/gustatory dysfunctions,[2] they may have changes in their smell/taste perception and food preferences.[5,8] Therefore, considering the permanency of these chemosensory dysfunctions, and their relationship with changes in patients' smell/taste perception and food preferences, it was hypothesized that patients infected with COVID-19 who have a history of olfactory/gustatory dysfunctions, may be more vulnerable to the tooth demineralization process.

Olfactory dysfunctions can influence both food choices and caloric intake.[5] In an evaluation of older adults with olfactory dysfunction, lower preference for many nutritious foods as well as a higher intake of sweets and fats were observed.[5] Moreover, individuals with olfactory dysfunction may have preference for sweet and salty foods, particularly those with healthy fats (olive and vegetable oils).[5] In individuals with altered taste, acceptance and intake of some vegetable and fruits may be increased due to reduced sensation of unpleasant flavors.[5] To mask the bitterness, those who dislike vegetables would add either sugar or salt to their food, which apparently is not healthy concerning oral and dental health.[5]

In healthy older adults, gustatory dysfunctions are modest at most; however, there are variations in taste perception of these adults both in detection of the taste (distinguishing a tastant from water) and in recognition of the type of taste.[5] These changes are exacerbated more commonly among older adults who have chronic medical conditions and take multiple medications.[5] Additionally, elderly individuals who had one or more medical problems and took an average of 3.4 medications, had a detection threshold 4.3 times higher for acids and 2.7 times higher for sweeteners. These taste changes have a variety of dietary complications.[5] A study by Mattes-Kulig and Henkin has shown that in patients with gustatory dysfunctions, as the severity of this dysfunction increased, the nutrient intake, especially for vitamin A, C, and calcium, decreased progressively.[8]

It is clear that several risk factors such as higher intake of fermentable carbohydrates and acids as well as lower salivary flow and calcium intake can exacerbate the tooth demineralization process.[9] The first step of demineralization begins with metabolizing fermentable carbohydrates by bacteria and producing acids that diffuse into the tooth crystals. As demineralization progresses, the mineral loss become deeper into enamel; however, it can be reversed or arrested by absorbing calcium and phosphate from saliva.[9] Generally, cycles of demineralization and remineralization continue in the mouth and the balance between pathological factors such as COVID-19 and its consequences, as well as protective factors determine the process which is proceeding at the time.[9] Nevertheless, people suffering from chemosensory dysfunctions may experience changes in the composition and amount of saliva which make the remineralization process complicated. Furthermore, the demineralized areas of the tooth are more susceptible for caries formation. As a result, bacteria along with their own acid formation are able to easily colonize and penetrate into the demineralized area of the tooth, and

consequently, cause dental caries.[9]

Since the majority of patients infected with COVID-19 have olfactory/gustatory dysfunctions, they may be more vulnerable to the tooth demineralization process due to the changes in their smell/taste perception and food preferences. Therefore, during this pandemic, dental healthcare workers (DHCWs) should pay more attention to the patients with COVID-19 who have a history of these chemosensory dysfunctions, especially older individuals. In addition, appropriate caries prevention recommendations such as instructions to reduce the amount and frequency of carbohydrate consumption, limiting sugary snacks between meals, having a healthy diet that limits added sugars and acidic foods, chewing sugar-free gum with Xylitol, maintaining regular oral hygiene (brushing teeth with fluoride toothpaste twice a day and flossing), and using fluoride-containing mouthwashes should be given with high priority.[10] Nevertheless, since there is not sufficiently strong evidence on the duration and recovery time of chemosensory dysfunctions in patients infected with COVID-19, and there is not enough information in order to conclude a significant association between chemosensory dysfunctions and tooth demineralization/dental caries, further investigations are crucial to prove this hypothesis.

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