Abstract

Introduction: Coronavirus disease has manifestations in multiple systems with the respiratory system being predominantly the first system to be affected. It is important to know whether coronavirus disease has primary oral manifestations or whether the oral manifestations were due to an overwhelming response to the disease. Understanding its oral manifestations will lead to early diagnosis and proper isolation that may reduce the spread and severity of the disease.

Materials and methods: The study participants were selected among recovered COVID-19 patients. The participants were interviewed through preset questionnaires through telephonic conversation. Oral examination was done only for patients who had negative RTPCR testing from COVID-19 and were still being admitted to the hospital for full recovery.

Results: There were 200 participants, 119 were females and 81 were males. There were oral lesions, such as ulcers, thrush, mucositis, or a combination thereof, observed in 14 patients. Among the 116 patients, oral symptoms such as ageusia were most prominent, with oral lesions and other oral issues being more prevalent in symptomatic individuals and those with systemic conditions compared to asymptomatic and healthy individuals.

Conclusion: The oral manifestations among COVID-19 patients were statistically insignificant due to limited data. However, it was observed that taste alteration is most common and may be associated with COVID-19. The oral lesions are highly likely to be secondary manifestations of the disease.

Keywords: COVID-19, Oral lesions, Oral symptoms.

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Introduction

December 2019 was the last month of the year when the whole world was celebrating for new year and many other festivals. That was the time when severe acute respiratory syndrome (SARS) disease was first reported in Wuhan, the capital of Hubei Province in China. In a very short period it spread globally afflicting millions of people all over the world. It created havoc in life, many lost their jobs, the economy collapsed, the people were affected not only physically but also mentally and it created a fear psychosis among all. The outbreak of COVID-19 has disrupted our everyday normal life.

Coronavirus disease is caused by severe acute respiratory syndrome coronavirus-2 (SAR-CoV-2). It is highly virulent and belongs to the Coronaviridae family. This virus has evolved and mutated to several variants causing a change in severity of the disease.

The most common clinical manifestations of COVID-19 are fever and dry cough; however, shortness of breath, dysosmia, and dysgeusia may also be encountered. Other atypical presentations have been increasingly reported worldwide, including gastrointestinal and dermatological manifestations and chemosensory dysfunctions. Clinical manifestations of COVID-19 vary from asymptomatic to severe respiratory distress causing COVID pneumonia and even multiple organ failure.

Materials and Methods

The study conducted was a cross-sectional study based on a preset questionnaire. The information details of the patients were obtained from the home-based monitoring charts of the
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Data Collection

Data were collected from participants who had having no symptoms to those who had mild to severe degree of signs and symptoms. A preset structured questionnaire was prepared to which a patient response was noted via telephone conversation, interviewing those who attended the dental department and examination of the oral cavity and recording the statement of those recovering from the disease in the hospital after their COVID-19 testing had turned negative. This gives viable information as the oral lesions that erupted during the pre-symptomatic or infective stage of the disease can still be observed as it is still healing or scarring.

The questionnaire included genders, age of the participant, oral manifestations like ulcer, thrush, pigmentation, mucosal inflammation, burning sensation, xerostomia, ageusia, dysgeusia, tongue, and gingival condition, these questions were explained in simple language, easy to understand, and patient answers were recorded as yes or no.

Results

The data were collected from 200 COVID-19 patients. Among them 119 were females and 81 were males. The data were presented as frequencies and percentages. Statistical significance for the association of COVID-19 with different oral lesions and symptoms was calculated using Fisher’s exact test where \( p \)-value = 0.005.

Of the total patients, only 14 were found to have some oral lesions distinctly either oral ulcer, thrush, pigmentation, mucositis, or a combination of all these. Oral symptoms were found among 116 patients with the highest number of patients experienced ageusia (\( n = 94 \)) and four patients had dysgeusia. A total of 16 patients had xerostomia alone or in combination with ageusia, dysgeusia, and burning sensation in the oral cavity. It is shown in Tables 1 and 2.

The study population was categorized into symptomatic and asymptomatic groups. The variations in oral manifestations between the two groups are shown in Figure 1. It was found that the oral lesions as well as the oral symptoms were present at a higher frequency among the symptomatic patients rather than in the asymptomatic group. The study population was also divided into COVID-19 patients with systemic conditions and those with no systemic conditions as shown in Figure 2. Systemic conditions that were included were diabetes mellitus, hypertension, chronic kidney disease, coronary artery disease, pneumonia, and others like traumatic injuries, rheumatic arthritis, neurological disorders, etc.

The five patients who were admitted to intensive care unit (ICU) experienced severe degrees of oral lesions. One female patient aged 54 years tested positive for COVID-19 with rheumatoid arthritis as primary disease and had COVID-19 pneumonia with very low oxygen saturation. The patient had multiple oral ulcers on the tongue, cheek mucosa, and thrush as well as burning sensation as shown in Figures 3 and 4. From the data of 14 pregnancy patients, only two had oral lesions,

Table 1: Distribution of oral lesions among the total population

<table>
<thead>
<tr>
<th>Gender</th>
<th>Ulcer</th>
<th>Ulcer and thrush</th>
<th>Ulcer, thrush and mucositis</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>7.1</td>
<td>3</td>
</tr>
</tbody>
</table>

\( F \), frequency; \% , percentage; \( p \)-value = 0.055 was found between males and females. The study shows no significant difference among gender

Table 2: Distribution of oral symptoms among the total population (\( n = 116 \))

| Oral symptoms | Male | | | | Female | | | | Total | | |
|----------------|------|-----------------|-----------------|-----------------|------|-----------------|-----------------|-----------------|------|-----------------|-----------------|-----------------|------|-----------------|
|                | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage | Frequency | Percentage |
| Ageusia        | 32 | 71.1 | 62 | 83.9 | 94 | 81 |
| Dysgeusia      | 2 | 4.4 | 2 | 2.7 | 4 | 3.4 |
| Xerostomia     | 2 | 4.4 | 1 | 1.3 | 3 | 2.6 |
| Burning sensation | 0 | 0 | 1 | 1.3 | 1 | 0.9 |
| Ageusia + Xerostomia | 6 | 13.3 | 2 | 2.7 | 8 | 6.9 |
| Dysgeusia + Xerostomia | 1 | 2.2 | 0 | 0 | 1 | 0.9 |
| Ageusia + Burning sensation | 0 | 0 | 1 | 1 | 1 | 0.9 |
| Ageusia + Xerostomia + Burning sensation | 2 | 4.4 | 2 | 2.7 | 4 | 3.4 |

Fig. 1: Oral manifestations among symptomatic and asymptomatic COVID-19 patients
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xerostomia as well as a burning sensation. Among six patients, ageusia was reported, while eight patients did not exhibit any oral symptoms. Additionally, only one pregnant patient in her third trimester was diagnosed with COVID-19 pneumonia. She had multiple oral ulcers on the cheek mucosa, soft palate, oral thrush, and xerostomia as shown in Figures 5 and 6. Multiple lesions that were healing in the soft palate were spotted in a male patient that was being admitted showed in Figure 7.

**Discussion**

The SARS-COV2 mainly attacks cells containing ACE-2 receptors. So, the mucosa lining containing ACE-2 receptors becomes the target organ for the virus. Looking at the varied distribution of ACE-2 receptors; presented the possibility of COVID-19 disease having multisystem manifestations.

The ACE-2 receptor was most highly expressed in tongue epithelial cells, followed by buccal and gingival tissue and oral fibroblasts in oral tissues. Minor salivary glands also express the ACE2 receptor. The early SARS-COV-2 infection may have been caused by the virus that is released from the salivary glands.
inflammation are not mandatory for taste impairment in patients with COVID-19. The peripheral nervous system is affected by the new coronavirus, and as gustatory buds are innervated by cranial nerves, related functions may be impaired resulting in taste disorders. The tongue has high expression of ACE2 receptors. Severe acute respiratory syndrome COVID-2 has a high affinity for these receptors that may affect the normal gustatory functions through dopamine and serotonin synthesis pathway coregulation.

Apart from taste dysfunction, this study showed a very low occurrence of other oral manifestations. Only 8% for xerostomia along with other symptoms like taste dysfunction and burning sensation. Oral lesions like ulcers, thrush, and mucositis were found to be only 7% (n = 14). The result of this study contradicts other researchers as they have reported a higher prevalence particularly for xerostomia; where El Kady et al. reported xerostomia to be 39.7%, (n = 23) and oral mucosal changes to be 22.4% (n = 13). Salivary gland infection was also found to be 22.4% but the result of this study was not considered significant due to very limited data. Elamrousy et al. reported about 84% (n = 104) of patients having xerostomia. Oral manifestations were present in 90.3% of cases, while 62% of individuals showed no symptoms.

A very low frequency (14 patients) of oral lesions in the form of ulcers, thrush, and mucositis were observed in the study, which is contradictory to the findings of Elamrousy et al. Aragoneses J et al. in a systematic review have concluded that many oral afflictions seen in COVID-19 patients are not directly caused by SARS-CoV 2 infection and thus should not be classified as oral manifestations of the disease. Lesions can also be caused by mechanical trauma due to prolonged intubation and other invasive procedures employed.

Many case reports and case series were there that showed the presence of oral ulceration and pseudomembranous candidiasis in COVID-19 patients. Many reported on the herpetic like oral ulceration. Reactivation of the virus depends largely on immune suppression that could happen in the face of SARS-CoV 2 infection. Similarly, Candida albicans a normal commensal in the oral flora that does not cause candidiasis in healthy individuals; however, in an immune suppression state it can cause infections of the superficial skin and mucous membranes and even systemic infection.

Samaranayake et al. had shown in COVID-19 commentary that the various oral manifestations of COVID-19 that had been reported could not be regarded as pathognomonic features of the disease unlike ageusia and dysgeusia that were very common and generally considered a hallmark for COVID-19.

The oral lesions that occurred during COVID-19 very often happened due to a state of inflammatory response and immune suppression of coronavirus disease itself. There were very few quality prevalence studies in the literature hence the oral manifestations preceding COVID-19 infection or pathognomonic of the disease remain inconclusive.

Limitations
- The response may be biased and unreliable as interviews of some participants were taken when the disease had resolved.
- Oral examinations were carried out among very few patients who were recovering in the hospital.
- Inability to examine the patients during the pre-symptomatic or infective stage of the disease due to various shortcomings or lack of resources.
CONCLUSION
Taste alteration is encountered among many COVID-19 patients in comparison to other oral signs and symptoms. Significant association of the disease could not be determined due to various shortcomings. Involvement of dental clinicians in COVID ward and intensive care unit for the purpose of research is highly recommended for extensive oral examination and investigation of COVID-19 patients along with a large sample size; this would bring more information and knowledge so as to draw a definitive conclusions whether oral manifestations are the primary signs or secondary of the coronavirus disease.

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REFERENCES