

# The effect of covid-19 infection on the oral manifestations



CrossMark

Asmawati,<sup>1\*</sup> Bahruddin Thalib,<sup>2</sup> Alqarama M. Thalib,<sup>3</sup> Nurlindah Hamrun,<sup>1</sup>  
Nabilah A. Putri,<sup>1</sup> Eshin UN. Rahman<sup>1</sup>

## Abstract

**Objective:** COVID-19 is a disease of the respiratory system caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which is thought to have originated from animals traded in a wet market in Wuhan, China in 2019. Inside the body, SARS-CoV-19 will bind to the angiotensin converting enzyme 2 (ACE2) receptor using its spike protein. The main location where SARS-CoV-19 binds to the ACE2 receptor and replicates is on epithelial cells in the oropharynx. In addition, ACE2 receptors can also be found on the oral mucosa (especially on the dorsum of the tongue and salivary glands in the buccal and palate mucosa). The presence of ACE2 in the oral cavity can facilitate the infectious process of SARS-CoV-2 and cause oral manifestations.

**Purpose:** This study was conducted to determine the effect of COVID-19 infection on the manifestations that arise in the oral environment.

**Material and Methods:** This study was conducted in the form of a literature review by collecting secondary data from online scientific article databases, such as PubMed, Google Scholar, and Science Direct.

**Results:** There are various oral manifestations of COVID-19. The most common oral manifestations were xerostomia, impaired taste, burning sensation, and oral/dental pain.

**Conclusion:** COVID-19 can cause manifestations in the oral environment which generally occur as early symptoms or in the acute phase of COVID-19.

**Keywords:** ACE2 receptors, COVID-19, Oral manifestations

DOI: [10.15562/jdmfs.v7i1.0000](https://doi.org/10.15562/jdmfs.v7i1.0000)

<sup>1</sup>Department of Oral Biology, Faculty of Dentistry, University of Hasanuddin, Makassar, Indonesia

<sup>2</sup>Department of Prosthodontics, Faculty of Dentistry, University of Hasanuddin, Makassar, Indonesia

<sup>3</sup>Departement of Dental Material, Faculty of Dentistry, University of Hasanuddin, Makassar, Indonesia

## Introduction

Until now, all countries in the world are struggling to overcome the crisis that occurs in the health system, namely the global pandemic caused by Corona Virus Disease 2019 (COVID-19). COVID-19 is a disease of the respiratory system caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which is believed to have originated from animals traded in a wet market in Wuhan, China in 2019.<sup>1,2</sup> As of 2019 there have been 276.436.619 confirmed cases and caused 5.374.744 deaths globally and in Indonesia there were 4.261.208 confirmed cases and 144.042 deaths since 2020.

Coronavirus belongs to the Coronaviridae family in the order Nidovirales which can cause diseases of the respiratory, digestive and nervous systems of humans and animals (zoonosis). This coronavirus can be further divided into 4 genera based on their genetic and antigenic characteristics, namely  $\alpha$ -Coronavirus,  $\beta$ -Coronavirus,  $\gamma$ -Coronavirus, dan  $\delta$ -Coronavirus. SARS-CoV-2 is a variant of the coronavirus that belongs to the genus  $\beta$ -Coronavirus that can only infect mammals and belongs to the subgenus Sarbecovirus.<sup>3</sup> SARS-CoV-2 is a positive and unsegmented single-chain RNA virus that has an elliptical shape with a diameter of about 65-125 nm and has a crown-like characteristic.<sup>4,5</sup>

SARS-CoV-2 is the 7th derivative of the coronavirus that previously infected humans, namely SARS-CoV, MERSCoV, HKU1, NL63, OC43, and 229E and became the 5th pandemic in the world since the 1918 Spanish Flu Pandemic and became the fifth pandemic in the world. -5 recorded in world history since the 1918 Spanish Flu.<sup>6,7</sup> According to research conducted in Yuannan, China, SARS-CoV-2 has 96.2% of its genome similar to that of a bat-derived coronavirus.<sup>8</sup>

The SARS-CoV-2 virus has an incubation time of about 5 days (2-14 days) until it can cause symptoms in infected individuals.<sup>2</sup> Generally, the symptoms that arise in individuals infected with the SARS-CoV-2 virus are quite varied, ranging from fever, fatigue, dry cough, muscle aches, sore throat, and even diarrhea.<sup>9</sup> Some patients also complain of taste dysfunction on the tongue, namely loss of taste and smell function, the appearance of lesions on the oral mucosa, pain in the oral cavity, gingivitis, dry mouth. In fact, patients also experience a cytokine storm due to an increase in cytokines in the blood. In addition, patients also experience difficulty breathing, respiratory failure, and even death.<sup>10-12</sup> The severity of the infection that occurs also affects the symptoms that arise, ranging from mild, moderate, to severe. The severity of the COVID-19 disease is influenced by several factors, namely age (individuals > 69 years), gender (death data shows

Correspondence to: Asmawati. Department of Oral Biology, Faculty of Dentistry, University of Hasanuddin, Makassar, Indonesia  
[asmaamin281068@gmail.com](mailto:asmaamin281068@gmail.com)

Received 27 September 2020  
Revised 19 November 2020  
Accepted 15 March 2021  
Available online 1 August 2022

70% male), comorbid (30% hypertension, 19% diabetes, and heart disease). %), and obesity (47.6% of patients treated at the Intensive Care Unit had a body mass index > 30 kg/m2).<sup>9</sup>

This COVID-19 disease is an airborne disease, which is a disease that can be transmitted between humans through direct contact or by inhaling droplets (through coughing, sneezing, speaking, or breathing) containing viruses from infected individuals within 1 m and can be transmitted indirectly. directly through droplets that experience evaporation so that they are left in the air (aerosol) or through smooth surfaces, such as objects made of plastic or stainless steel. These droplets can enter the body through the mucosa (nose and mouth)

or the conjunctiva.<sup>13</sup> SARS-CoV-19 that enters the body will bind using its spike protein at the angiotensin converting enzyme 2 (ACE2) receptor in the human body.<sup>10</sup> The main location where SARS-CoV-19 binds to the ACE2 receptor and replicates is on epithelial cells in the oropharynx.<sup>12</sup> In addition, ACE2 receptors can also be found on the oral mucosa (especially on the dorsum of the tongue and salivary glands in the buccal and palate mucosa).<sup>18</sup>

Thus, the oral cavity can play a role in facilitating the infectious process of SARS-CoV-2 and causing manifestations in the oral cavity.<sup>10</sup>

**Method**

**Table 1. Distribution of types of oral manifestations and their locations in articles**

Types of Oral Manifestations	Number of Articles (%)	Location
Xerostomia	9 (69.2%)	Saliva Gland
Taste Disorder	9 (69.2%)	Tongue
Burning sensation	5 (38.5%)	Oral cavity
Oral/dental pain	5 (38.5%)	Oral cavity
Dysphagia	4 (30.8%)	oropharynx
Ulceration	4 (30.8%)	Tongue, palate, lips and cheeks
Inflammation of the oral cavity	4 (30.8%)	Salivary glands, cheeks, palate, tongue, gingiva and submandibular area
Bleeding	4 (30.8%)	Gingiva, tongue
Plaque	3 (23.1%)	Tongue
Enanthema	3 (23.1%)	palate, lips and cheeks
Aphthous stomatitis	2 (15.4%)	Oral mucosa
Candidiasis	2 (15.4%)	Tongue, palate
Lichenoid or Lichen	2 (15.4%)	Oral mucosa
Erythema	2 (15.4%)	Tongue
Migratory glossitis	2 (15.4%)	Tongue
Sublingual varicose veins	2 (15.4%)	Tongue
Angular cheilitis	1 (7.7%)	Lip corner
Pain in the jaw or TMJ	1 (7.7%)	Jaw and TMJ
Halitosis	1 (7.7%)	Oral cavity
Blister	1 (7.7%)	Tongue and palate
Papillary hyperplasia	1 (7.7%)	Dorsum and lateral idah
Petechie	1 (7.7%)	palate and tongue
Angina bullosa	1 (7.7%)	Soft palate, tongue and cheeks
Fissured tongue	1 (7.7%)	Tongue
Mucositis	1 (7.7%)	Oral mucosa
Lingual papillitis	1 (7.7%)	Tongue
Glossitis + depapilation	1 (7.7%)	Tongue
Cold afternoon	1 (7.7%)	Oral mucosa
Lesions in the form of spots	1 (7.7%)	Mouth, lips

This type of research is descriptive observational through literature review. Literature review is one of the research methods carried out to find, discover, find, and conclude a topic that is relevant to the formulation of the problem that has been determined, research topics, and certain phenomena from sources such as textbooks, scientific articles, the internet, and other reputable sources. The writing style used is Vancouver, which is citation using numbers in the form of superscript, without brackets.

The literature used in this paper is sourced from sites that provide reputable and non-reputable scientific articles and can be accessed for free, such as PubMed, Science Direct, Google Scholar, and various other relevant sites. In addition, some of the literature used comes from textbooks and national and international health data. Data searches were carried out using the keywords "COVID-19 and Oral Cavity", "COVID-19 Oral Manifestations", and "COVID-19 Infection in Oral Cavity". Manual searches were also carried out on references from each relevant journal related to the research topic. Literature that meets the inclusion criteria, namely reputable and unreputed English and Indonesian full-text articles and journals with a publication time span of the last 5 years (2017-2021). Search Time starts in August 2021.

## Results

Based on 13 scientific articles that have been collected, the order of oral manifestations from most to least found is xerostomia and taste disorders (9 articles); burning sensation and oral/dental pain (5 articles); dysphagia, ulceration, bleeding, and inflammation of the oral cavity (4 articles); plaque and enanthema, (3 articles); aphthous stomatitis, candidiasis, lichenoid/lichen, erythema, sublingual varicositis, and migratory glossitis (2 articles); and other lesions were found in 1 article each. The location distribution of the oral manifestations of COVID-19, namely salivary glands, palate, gingiva, lips, oral mucosa, cheeks, oropharynx, tongue, sublingual area, submandibular area, jaw, temporomandibular joint, and oral cavity in general.<sup>15-27</sup>

## Discussion

Oral manifestations of COVID-19 generally occur as an early symptom of COVID-19, along with other common symptoms of COVID-19. The symptoms that appear as early manifestations are oral lesions, dysgeusia, and xerostomia.<sup>16,17,20,21,24</sup> Xerostomia is generally accompanied by difficulty swallowing or pain when swallowing,<sup>17,19</sup> while

taste disturbances are generally associated with lesions of the oral mucosa, pain in the oral cavity, and also xerostomia.<sup>19,20,22,23</sup>

There is no significant relationship between age and sex to the oral manifestations that occur.<sup>20,21</sup> However, the incidence of oral/inflammatory lesions in the oral cavity accompanied by xerostomia is more common in men and pain in the jaw or temporomandibular joints, xerostomia, and taste disturbances are more common in women.<sup>15</sup> In addition, the incidence of enanthem is also more commonly found in men.<sup>25</sup>

The relationship between oral hygiene and the manifestations that arise cannot be determined with certainty. Some patients who experienced ulceration and oral pain were found to have decreased oral hygiene, whereas patients who experienced improved oral hygiene had a low percentage of ulceration and oral pain.<sup>15</sup> Meanwhile, a study by Biadsee et al.<sup>23</sup> found that oral hygiene was not related to the oral manifestations that occurred. Therefore, further attention is needed from dentists to help overcome oral manifestations that arise in patients and improve patient's oral and dental health.<sup>23</sup>

## Conclusion

COVID-19 can cause manifestations in the oral environment which generally occur as early symptoms or in the acute phase of COVID-19.

## Acknowledgment

None.

## Conflict of Interest

The authors report no conflict of interest.

## References

1. Fini MB. What dentists need to know about COVID-19. *Oral Oncol* 2020;105: 1-2.
2. Macchi J, Herskovitz J, Senan AM, et al. The natural history, pathobiology and clinical manifestations of SARS-CoV-2 infections. *J Neuroimmune Pharmacol* 2020;15: 359-386.
3. Yang Y, Xiao Z, Ye K, et al. SARS-CoV-2: Characteristics and current advances in research. *Virology J* 2020;17: 1.
4. Astuti I, Ysrafil. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): An overview of viral structure and host response. *Diabetes Metab Syndr* 2020;14: 407-412.
5. Khan M, Adil SF, Alkathlan HZ, et al. COVID-19: A global challenge with old history epidemiology and progress so far. *Molecules* 2021;26: 39.
6. Andersen KG, Rambaut A, Lipkin WI, et al. The proximal origin of SARS-CoV-2. *Nature Med* 2020;26: 450.
7. Liu YC, Kuo RL, Shih SR. COVID-19: The first documented coronavirus pandemic in history. *Biomed J* 2020;43: 328-331.
8. Tang X, Wu C, Li X, et al. On the origin and the continuing evolution of SARS-CoV-2. *Natl Sci Rev* 2020;7: 1012-1023.

9. Sampson V, Kamona N, Sampson A. Could there be a link between oral hygiene and the severity of SARS-CoV-2 infections?. *Br Dent J* 2020;228: 971-975.
10. Zhong M, Lin B, Pathak JL, et al. Ace2 and furin expressions in oral epithelial cells possibly facilitate covid-19 infection via respiratory and fecal-oral routes. *Front Med* 2020;7: 2.
11. Xiang Z, Koo H, Chen Q, et al. Potential implications of SARS-CoV-2 oral infection in the host microbiota. *J Oral Micro* 2020;13: 1-2.
12. Soffritti I, D'Accolti M, Fabbri C, et al. Oral microbiome dysbiosis is associated with symptoms severity and local immune/inflammatory response in covid-19 patients: A cross-sectional study. *Front Microbiol* 2021;12: 2, 5-7.
13. Patel KP, Vunnam SR, Patel PA, et al. Transmission of SARS-CoV-2: An update of current literature. *Eur J Clin Microbiol Infect Dis* 2020;39: 2005-2011.
14. Iranmanesh B, Khalili M, Amiri R, et al. Oral manifestations of covid-19 disease: A review article. *Derma Ther* 2020;1: e14587.
15. AbuBakr N, Salem ZA, Kamel AHM. Oral manifestations in mild-to-moderate cases of COVID-19 viral infection in the adult population. *Dent Med Probl* 2021;58: 7, 10-11.
16. Freni F, Medurib A, Gaziaa F, et al. Symptomatology in head and neck district in coronavirus disease (COVID19): A possible neuroinvasive action of SARS-CoV-2. *Am J Otolaryngol* 2020;41: 1, 3-5.
17. Fantozzi PJ, Pampena E, Vannab DD, et al. Xerostomia, gustatory and olfactory dysfunctions in patients with COVID-19. *Am J Otolaryngol* 2020;41: 1-3.
18. Chen L, Zhao J, Peng J, et al. Detection of SARS-CoV-2 in saliva and characterization of oral symptoms in COVID-19 patients. *Cell Proliferation*. 2020;53: 1-3.
19. Machado AS, Castelo PM, Silva FC, et al. Covid-19: Signs and symptoms related to the feeding behaviour. *Physiol Behav* 2021;242: 1-3.
20. Kady DME, Gomaa EA, Abdella WS, et al. Oral manifestations of COVID-19 patients: An online survei of the egyptian population. *Clin Exp Dent Res* 2021;7: 852-860.
21. Sinjari B, D'Ardes D, Santilli M, et al. SARS-CoV-2 and oral manifestation: An observational, human study. *J Clin Med* 2020;9: 1-4.
22. Dorrego MV, Chacon L, Rosas R, et al. Oral findings in patients with COVID-19. *ACTAS Dermosifiliogr* 2022;113: 183-186.
23. Biadsee A, Kassem F, Dagan O, et al. Olfactory and oral manifestations of COVID-19: sex-related symptoms-a potential pathway to early diagnosis. *Otolaryngol Head Neck Surg* 2020;163: 722, 724, 726.
24. Favia G, Tempesta A, Barile G, et al. *J Clin Med* 2021;10: 1, 3, 5, 6.
25. Fidan V, Koyuncu H, Akin O. Oral lesions in Covid 19 positive patients. *American J Otolaryngol Head Neck Med Surg* 2021;42: 1-2
26. Cauhe JJ, Quijano DO, Lobo DP, et al. Enanthen in patients with COVID-19 and skin rash. *JAMA Dermatol* 2020;156: 1134-1136.
27. Gonzalez AN, Magaletskyy K, Carrillo PM, et al. Are oral mucosal changes a sign of COVID-19? A cross-sectional study at a field hospital. *ACTAS DermoSifiliogr* 2021;112: 640-644.



This work is licensed under a Creative Commons Attribution