

ORAL AND MAXILLOFACIAL MANIFESTATIONS OF COVID-19 – INTEGRATIVE LITERATURE REVIEW

MANIFESTAÇÕES ORAIS E MAXILOFACIAIS DA COVID-19 – REVISÃO INTEGRATIVA DA LITERATURA

Nathália Luise Severo Reis¹, Nathalia Rosa Nascimento Domingos¹, Marcus Antônio Brêda Júnior², Dayse Andrade Romão³

ABSTRACT

Scientific evidence suggests that SARS-CoV-2 is present in the oral tissues in the initial phase of contamination as the main viral reservoir. Besides the oral cavity being the main means of spread, it also becomes a common location of clinical manifestations during the onset and evolution of the disease. The objective was to evaluate the literature about the oral and maxillofacial clinical manifestations arising from Covid-19 contamination. This is an integrative literature review of the databases Latin American and Caribbean Literature on Health Sciences (Lilacs), Scientific Electronic Library Online (SciELO) and BBO Dentistry, of articles published between 2019 and 2022 that portrayed the theme of the study. Initially, the search for the descriptors was conducted individually, then, the crossings were performed using the Boolean operator “AND” and, subsequently, the three descriptors were crossed together. The inclusion criteria were articles published in Portuguese, English and Spanish, published and indexed in the databases, starting in 2019 - year of the emergence of Covid-19 and that portrayed the theme of the study. The exclusion criteria were articles published before 2019, articles outside the chosen databases, and articles that ran away from the theme of the study. During the study, 28 articles were selected from all the cited criteria. It was concluded that patients contaminated with Covid-19 had oral and maxillofacial clinical manifestations that may include ulcerations, inflammation in the oropharynx, retromandibular edema, fungal infections, xerostomia, anosmia, and ageusia.

Keywords: Oral manifestations; Covid-19; Signs and symptoms.

RESUMO

Evidências científicas sugerem que o SARS-CoV-2 está nos tecidos orais na fase inicial da contaminação como principal reservatório viral. Além da cavidade oral ser o principal meio de propagação, também se torna uma localização comum das manifestações clínicas durante o início e a evolução da doença. O objetivo foi avaliar na literatura as manifestações clínicas orais e maxilofaciais decorrentes da contaminação pela Covid-19. Trata-se de uma revisão integrativa da literatura das bases de dados Literatura Latino-Americana e do Caribe em Ciências da Saúde (Lilacs), Scientific Electronic Library Online (SciELO) e BBO Odontologia, de artigos publicados entre os anos de 2019 e 2022 que retratassem a temática do estudo. Inicialmente, realizou-se a busca pelos descritores individualmente, em seguida, foram realizados os cruzamentos utilizando o operador booleano “AND” e, posteriormente, os três descritores foram cruzados em conjunto. Os critérios de inclusão foram: artigos publicados em português, inglês e espanhol, publicados e indexados nas referidas bases de dados, a partir de 2019 – ano do surgimento da Covid-19 e que retratassem a temática em estudo. Os critérios de exclusão foram: artigos publicados antes de 2019, artigos fora das bases de dados escolhidas e que fugissem da temática do estudo. Durante o estudo, 28 artigos foram selecionados a partir de todos os critérios citados. Conclui-se que pacientes contaminados com a Covid-19 tiveram manifestações clínicas orais e maxilofaciais que podem incluir ulcerações, inflamações na orofaringe, edemas retromandibulares, infecções fúngicas, xerostomia, anosmia e ageusia.

Palavras-chave: Manifestações bucais; Covid-19; Sinais e sintomas.

¹Graduate student at the Tiradentes University Center, Maceió-AL, Brazil

²MSc and Professor, Tiradentes University Center, Maceió-AL, Brazil.

³MSc, PhD and Professor, Federal University of Alagoas, Maceió-AL, Brazil.

How to cite this article: Reis NLS, Domingos NRN, Brêda Junior MA, Romão DA. Oral and maxillofacial manifestations of Covid-19 - integrative literature review. Nav Dent J. 2023; 50(1): 34-40.

Received: 23/09/2022

Accepted: 03/03/2023

INTRODUCTION

On December 31st, 2019, in Wuhan - China, the Chinese government issued the first alert of global significance about the spread of the SARS-CoV-2, a virus that causes Covid-19 disease. For Capocasale et al, its high level of spread is due to the contact of droplets of body fluids of the contaminated person (mainly saliva), with the oral, nasal, and ocular mucous membranes of other individuals (1-3).

Studies have shown that this fluid pathway constitutes the major means of viral transmission due to the compatibility of the virus with the structures that are part of its production, in addition to the structures that secrete it serving as a means of viral storage and proliferation (4-5). It was emphasized that the angiotensin-converting enzyme 2 (ACE-2), present mainly in oral and maxillofacial tissues, facilitates the entry and installation of the virus in the cells. Because it stores such a large viral load, the oral cavity is the first structure to express some disorders, such as ageusia, anosmia, and inflammation of the oropharynx in the early stages of the disease (2,6). Initially, the patient may have mild, moderate, or severe symptoms depending on his/her immune response and the presence of comorbidities. The patient may be asymptomatic or have symptoms that can last for about 10 days. The most prevalent symptoms include cough, dyspnea, chills, oropharyngeal inflammation, glossitis, candidiasis, ageusia, anosmia, xerostomia, sialoadenitis, ulcerations and petechiae, which can evolve rapidly and with an unfavorable prognosis. Metallic taste and halitosis were also identified, but in an individualized way (7,8).

The consensus on the clinical manifestations has not yet been achieved due to the widely mutating nature of the virus, which produces diverse symptoms in each person. However, the accurate and complete clinical record of the various forms of manifestations caused by Covid-19 in the scientific community is essential to achieve a consensus that is efficient for the definition of strategies to combat the disease worldwide (9, 10).

Thus, this integrative review aims to evaluate in the literature the oral and maxillofacial clinical manifestations resulting from contamination by Covid-19, highlighting and unifying the current scientific information, since the virus is still circulating worldwide and the oral cavity is considered one of the main routes of infection.

LITERATURE REVIEW

This is an integrative literature review of the databases Latin American and Caribbean Literature on Health Sciences (Lilacs), Scientific Electronic Library Online (SciELO), BBO Dentistry and PUBMED,

of articles published between the years 2019 and 2022 that portrayed the theme of the study. For the survey of articles, the following descriptors were used: "Oral manifestations", "Covid-19" and "Signs and Symptoms".

Initially, the search for the descriptors was conducted individually. Next, two of these descriptors were crossed using the Boolean "AND" operator, and then the three descriptors were crossed together. The samples were selected at each step of the individual search and crossover process. The guiding question of this study was: What are the oral and maxillofacial clinical manifestations reported in patients affected by Covid-19?

The inclusion criteria for the selection of the sample were articles published in Portuguese, English and Spanish, published and indexed in the aforementioned databases, from 2019 - year of the appearance of Covid-19 – to 2022, that portrayed the studied theme. The exclusion criteria for the selection of the sample were articles published before 2019, articles outside the chosen databases and that ran away from the theme of the study. The research was conducted between September 2021 and April 2022. Figure 1 shows the flowchart evidencing the inclusion and exclusion steps by title, abstract, and full article.

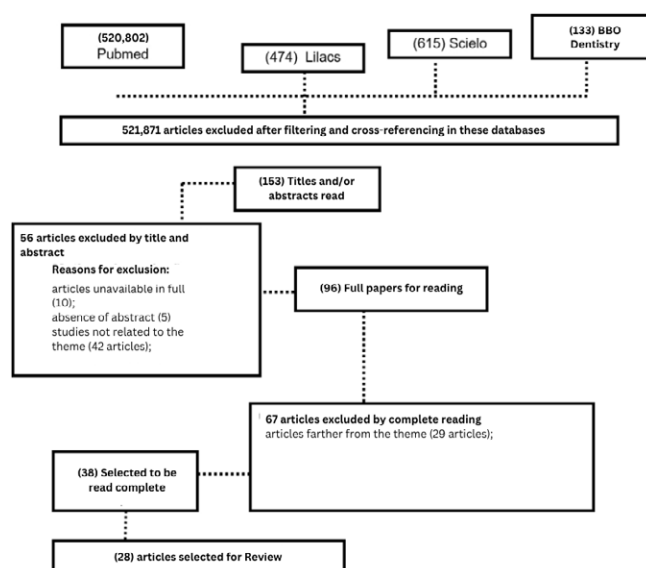


Figure 1 - Flowchart showing the inclusion and exclusion steps by title, abstract and full article

During the study, 28 articles were selected from all the cited inclusion and exclusion criteria (Table 1). Ageusia, anosmia, oropharyngeal inflammation, oral candidiasis (due to the lowered immunity of the affected individual), oral ulcerations, retromandibular edema and xerostomia were the most frequently reported manifestations in the

presented studies. In contrast, halitosis and metallic taste sensation were reported in a more individualized way. The manifestations found were limited to the oral cavity, oropharynx and retromandibular region. Ageusia is an unequivocal symptom in the papers. The most discussed hypothesis is about the loss of taste and smell.

TABLE 1 - WORKS INCLUDED IN THE INTEGRATIVE REVIEW

Title	Author	Year/Country	Study Design	Outcomes
Oral Manifestations Associated With Covid-19 disease: an observational cross sectional study.	CHAWLA, Jitendra. et al.	2022/India	Cross-sectional observational	Xerostomia and ageusia can be used as indicators to identify suspected Covid-19 disease while intraoral signs such as ulcers need further evaluation.
Orofacial mycoses in coronavirus disease-2019 (Covid-19): A systematic review	SAMARANAYAKE LP, et al.	2022/China	Systematic review	Patients with SARS-CoV-2 are more susceptible to fungal infections.
The impact of Covid-19 on the oral health of patients with special needs	ETTINGER R., et al.	2022/USA	Systematic review	The burden of oral health problems during the Covid-19 crisis was most intense for people with special needs or residents of long-stay institutions.
An integrative review of oral manifestations in patients with Covid-19: signs directly related to SARS-CoV-2 infection or secondary findings?	REIS VP., et al.	2022/Brazil	Integrative review	Healthcare professionals should be aware of care related to oral symptoms and, whenever possible, patients with Covid-19 should undergo an intraoral examination
Oral manifestations of Covid-19: a brief review of the literature	SANTOS, Serenna Viana dos et al.	2021/Brazil	Literature review	Traumatic ulcers, taste changes, periodontitis, reduced salivary flow, are common in patients with Covid-19.
Oral and cutaneous manifestations of Covid-19 in pediatric patients.	MORAIS, Mayara Faria de et al.	2021/Brazil	Literature review	Taste dysfunction is what stands out the most.
Role of oral tissues during SARS-CoV-2 infection.	LÓPEZ, Luis Ángel Ortiz et al.	2021/Mexico	Literature review	Ageusia is the most present symptom.
Prevalence of oral lesions in Covid-19 Egyptian patients	ELAMROUSY W, et al.	2021/Egypt	Observational Cross-Sectional	Systemic health and disease severity were not related to the spread of oral lesions
A german awmf's s2e/realist synthesis and meta-narrative snapshot of craniomaxillofacial manifestations in Covid-19 patients: rapid living update on 1 january 2021	PITAK-ARNNOP, Poramate et al.	2021/Germany	Metanarrative	Some complications, such as extensive infections during corticosteroid therapy, have a prolonged reprieve due to long-term ventilator dependence.
Tongue ulcer in a patient with Covid-19: a case presentation.	NEJABI, Bashir M et al.	2021/China	Literature review	To avoid positive Covid-19 results, awareness programs for diagnosis and management of clinical symptoms should be implemented among patients.
Is SARS-CoV-2 an etiologic agent or predisposing factor for oral lesions in Covid-19 patients? A concise review of reported cases in the literature.	ETEMAD-MOGHADAM S, et al.	2021/Iran	Literature review	Observing oral lesions similar to those reported in Covid-19 patients can neither confirm nor rule out the disease without additional testing.

Characteristics of oral manifestations in symptomatic non-hospitalized Covid-19 patients: a cross-sectional study on a sample of the Saudi population.	NATTO, Zuhair S et al.	2021/Saudi Arabia	Cross-sectional Study	Taste loss was the most prevalent specific oral manifestation. It was suggested that oral examinations of patients with Covid-19 should be performed as part of routine examinations to discover any correlation between the disease and the oral cavity.
Oral and maxillofacial implications of Covid-19: an integrative review.	AMANCIO, A DE M et al.	2021/Brazil	Integrative Review	Clinical orofacial signs and symptoms may be the first to appear in patients contaminated with Covid-19 and may be important in diagnosing the infection. In addition to oral and maxillofacial clinical manifestations, however, the disease also presents systemic manifestations
Oral health conditions in people with Covid-19.	BRAGA, Débora R Alves et al.	2021/Brazil	Cross-Sectional Study	Usually, people who have a severe degree of the disease are more likely to trigger oral changes.
An s2e/realistic synthesis from the German AWMF and a metanarrative snapshot of a skull-maxillofacial manifestations in patients with Covid-19: rapid life update on 1 January 2021.	PITAK-ARNNOP P. et al.	2021/Germany	Metanarrative	In addition to taste and smell dysfunctions, some nonspecific lesions such as aphthae, erythema/petechiae, fungal superinfections, conjunctivitis, necrosis, can be seen, but often treated conservatively.
Halitosis in Covid-19 patients.	RIAD A, et al.	2021/Czech Republic	Cross-Sectional Observational	The prevalence of halitosis among patients with Covid-19 and possible etiologies that can be linked directly or indirectly to SARS-CoV-2 indirectly, to SARS-CoV-2 infection.
Oral manifestations in patients with Covid-19: a 6-month update.	SANTOS, J. Amorim et al.	2021/Brazil	Systematic Review	Xerostomia is the most frequent oral symptom, with a prevalence of 43%, followed by taste disturbances (38%).
Oral ulceration and blistering in patients with Covid-19.	SINADINOS A, et al.	2021/England	Case Report	The authors suggest a link between Covid-19 and oral ulceration and blisters, but acknowledge that these signs can often go unnoticed due to lack of intraoral examination during hospital admission.
Signs and symptoms of oral and cutaneous manifestations in children with Covid-19: a narrative review.	TAVARES, Nathália Cristina dos Santos Araujo, et al.	2021/Brazil	Narrative Review	The signs and symptoms in children with Covid-19 have some peculiarities when compared to adults.
Oral and maxillofacial manifestations associated with Covid-19. Literature review.	PARRA-SANABRIA, Erika Alexandra et al.	2020/Argentina	Literature Review	The most frequent oral and maxillofacial manifestations in Covid-19 patients are retromandibular edema and ulcers.
Aphthous-like stomatitis of Covid-19 patients: case report and review of evidence.	AL-KHANATI, Nuraldeen Maher et al.	2020/Brazil	Case Report And Systematic Review	Aphthous stomatitis is a predictable and clinically relevant oral complication in patients with Covid-19.
General information, management, care and clinical manifestations of SARS-CoV-2.	ORELLANA-CENTENO, José Eduardo et al.	2020/Mexico	Literature Review	Clinical manifestations General: fever, dry cough, feeling short of breath and breathlessness, fatigue, muscle pain, headache, sore throat, confusion, diarrhea, vomiting. Oral: ageusia, shortness of breath, and dry mouth.
Pandemic: oral repercussions and its possible impact on oral health.	MACIEL, Panmella Pereira et al.	2020/Brazil	Literature Review	Oral manifestations including dental anomalies, can occur as a direct result of SARS-CoV-2 infection.
Orofacial manifestations of Covid-19: a brief review of the published literature.	HALBOUB, Esam et al.	2020/Brazil	Literature Review	Oral and maxillofacial surgeons are one of the groups of healthcare professionals with a high risk of nosocomial infection.

Management of patients in oral and maxillofacial surgery during the crisis and post-pandemic control period of the Covid-19 pandemic.	GIL, Monje Florencio et al.	2020/Spain	Literature Review	Oral and maxillofacial surgeons are one of the groups of healthcare professionals with a high risk of nosocomial infection.
Oral manifestations in patients with Covid-19: a living systematic review.	SANTOS, J. Amorim et al.	2020/Brazil	Literature Review	Taste disorders are associated with Covid-19 positivity, mild/moderate severity, and female gender.
Oral manifestations of Covid-19 patients: an online survey of the egyptian population.	KADY, Dina M. El et al.	2020/Egypt	Literature Review	Covid-19 has significant consequences for the oral cavity and salivary glands, such as gland-related salivary symptoms and taste disturbances.
How to deal with coronavirus disease 2019: a comprehensive narrative review about oral involvement of the disease.	CAPOCASALE, Giorgia et al.	2020/Italy	Literature Review	Recognizing and detecting some oral signs and symptoms of Covid-19 can make it easier to perform better screening and follow up with early treatment to the manifestations of the disease.

DISCUSSION

The results show that SARS-CoV-2 is stored mainly in oral tissues in the initial phase of contamination. Some structures, such as the tongue, salivary glands and gingival epithelium, become means of propagation of high viral load by the distribution of salivary flow. Thus, besides the oral cavity being the main means of propagation, it also becomes one of the foci of clinical manifestations during the evolution of the disease. Studies confirm the presence of SARS-CoV-2 in saliva, in the ducts of the glands that produce it, in the fluid of the gingival crevices, and in secretions of the upper and lower respiratory tract. The oral and oropharyngeal microbiota are similar to those of the respiratory tract, which facilitates virus adhesion in these regions specifically (6, 11).

The high viral load in saliva is detected early in the infection, this may account for the presence of anosmia and ageusia reported as early symptoms in most studies. The rate decreases along with the disease over time, suggesting that salivary clearance of the virus correlates with disease manifestation. SARS-CoV-2 is predominantly lodged in the nasal, buccal, and pharyngeal mucosa during the first 10 days of infection, evolving later to the lungs. The peripheral nervous system is affected by the virus, and since taste buds are innervated by cranial nerves, related functions can be impaired, resulting in taste disturbances that can last for about 10 days (2, 12).

The scientific evidence shows that the manifestations frequently found among symptomatic patients are cough, dyspnea, vomiting, pharyngeal pain, chills, glossitis, candidiasis, ageusia, anosmia, xerostomia, salivary gland infections, changes in the oral mucosa with presentation of erythematous

lesions, ulcers and enanthema buccalis which are small eruptions on the oral mucosa, mainly on the palate - numerous petechiae (13, 14). Moreover, the literature shows cases of gingivitis, halitosis, hairy tongue, lingual ulceration, dry lips, and dental anomalies (4, 15,16), aphtous lesions, papillar areas of the tongue with abnormal papillary growth - accompanied by pain and a burning sensation - and absence of smell and taste (1,17). Most oral lesions were on the palate, followed by gingival, labial, jugal and specialized mucosa and facial region. Due to salivary gland infections, the appearance of retromandibular edema usually caused by acute periodontal lesions has also been reported (1,17).

The symptoms sporadically found are maxillofacial manifestations such as: facial weakness, retroauricular pain and sialoadenitis. Increase in retromandibular volume, pain when eating and erythema (15,18). Among the relevant oral symptoms related to Covid-19, ageusia is an unequivocal symptom in the papers, resulting from the mentioned pathology. The most discussed hypothesis in the literature about taste loss is about the ACE2 receptors, which are in great quantity on the lingual surface. It was evidenced by Santos *et al.* that the virus interacts directly with these receptors and taste components by interfering with the sialic acid that is responsible for protecting the glycoproteins that carry the taste molecules to the taste bud, causing the disorder (19-20).

It had been quoted that a 42-year-old man reported feeling metallic taste. Recovery of taste after illness may be associated with regeneration of the cells or reversal of the effects on them (2, 17). Other reactions, such as gingivitis, halitosis, hairy tongue, lingual ulceration, and dry lips, have also been cited, but may be associated with the side effects of the Covid-19 treatment itself and the

difficulty of oral hygiene in more advanced cases, which highlights the need for expanded application of hospital dentistry during treatment. Braga *et al.* stated in a cross-sectional study that there are some exceptions, since some patients contaminated with Covid-19 considered severe did not trigger any oral signs and symptoms though (4, 15, 21).

Oral candidiasis was one of the most frequently detected oral manifestations in several reported cases. This can be attributed to the drop in immunity, opportunistic fungal and bacterial infections, antibiotic therapy, and long-term deterioration of oral hygiene. This can be explained by the misused antibiotics during Covid-19 contamination significantly affecting the microbial balance and also be related to candida infection (22, 23).

Among the maxillofacial manifestations, facial weakness, retroauricular pain, and sialoadenitis can be cited. Sialoadenitis is an inflammation in the salivary glands of infectious or non-infectious origin and may be caused by SARS-CoV-2 due to the superficial composition of the glandular cells (they have ECA2: transmembrane protein that may suffer inflammation and, later, repair by fibrosis) with direct impact on the salivary flow. Increased retromandibular volume, pain when eating, erythema, fever and dry mouth are some of the signs and symptoms of this pathology. In case of hyposalivation, there may be an increased risk of salt deposition on the ductal wall that induces sialolithiasis and contributes to duct stenosis and dilatation (17, 19).

Acute periodontal lesions were also found in abnormally high numbers in patients diagnosed with SARS-CoV-2, the main cause of retromandibular edema. This is mainly due to the biological storage potential of the periodontal pocket and the side effects of the medications used to treat the disease. The periodontal pocket is a reservoir for viruses because it provides a suitable environment for their multiplication, since the cells have receptors compatible with these viruses in their membrane, so it may also be related to the deposition of SARS-CoV-2. Many lesions started as simple gingivitis and evolved into necrotizing ulcerative gingivitis (24,25).

There is the possibility of worsening the symptoms of the disease by the presence of previously installed periodontitis, which can exacerbate the inflammatory reaction in the bloodstream, and may exert negative effects on other parts of the body. In constant metagenomic analyses of infected patients, there is detection of a high number of anaerobic bacteria such as *Prevotella intermedia*, *Streptococci*, *Fusobacterium*, *Treponema*, and *Veillonella*, which precipitate the appearance of necrotizing periodontitis. Another

important factor is the ability of periodontal bacteria to increase the virulence of the virus by cleavage of S-glycoproteins, since the pocket is a viral reservoir and shows greater potential for contamination during subgingival scaling. In addition, periodontitis is a risk factor for patients affected by Covid-19 by increasing the risk of mortality (26).

The oral microbiota plays a key role in the development of co-infections following infection with this virus, as well as in the immune response that is triggered by viral contamination. In this sense, the oral and maxillofacial clinical signs in patients with Covid-19, as discussed here, provide a significant picture of the impact that SARS-CoV-2 can have on an individual's oral and systemic health. It is possible to verify the essential role of the diagnosis of the oral cavity in all stages of the virus adhesion to the human body, evidencing that both primary care and attention to the central gateway of contamination is essential in the evolution of the control and eradication of the disease (3, 27, 28). Furthermore, it was observed that the intensity of oral health problems during the Covid-19 crisis was greater in people with special needs or residents of long-stay institutions (29).

It is recommended that health professionals perform a detailed oral examination and pay attention to oral manifestations to ensure better patient support and control of manifested symptoms. In oral and maxillofacial surgeries, for example, there is a great exposure and release of oral and body fluids and aerosols. There must be a selection and prioritization of indispensable procedures to be performed and with operative techniques to avoid contagiousness in advanced levels (12, 30).

This integrative literature review integrates four databases (Lilacs, Scielo, BBO Dentistry and PUBMED), with articles published from 2019 - year of the emergence of Covid-19 - until April 2022. The consensus on clinical manifestations has not yet been done due to the widely mutating nature of the virus and, because of its uniqueness, this study presented limitations in the number of samples available during the search. The perspective is that with the detailed, unified, and complete evidence of all the oral and maxillofacial clinical manifestations resulting from contamination by Covid-19, the scientific community will be able to reach a consensus that will be efficient in defining strategies to fight the disease worldwide.

CONCLUSION

Patients contaminated with Covid-19 reported cough, oropharyngeal pain, ageusia, anosmia, xerostomia, salivary gland infections, erythematous lesions, ulcers, blisters, metallic taste, halitosis, glossitis, facial weakness, and oral candidiasis. Ageusia and anosmia were the oral

and maxillofacial clinical manifestations most often cited in this integrative literature review and may be important symptoms for screening and early diagnosis of patients with Covid-19.

The authors declare that there are no conflicts of interest.

Corresponding author:

Dayse Andrade Romão

Address: Av. Lourival Melo Mota, S/N Tabuleiro do Martins
Maceió – AL, Brazil. Post Code 57072-900.

Email: dayseromao@gmail.com.

REFERENCES

1. Al-Khanati NM, Riad A, Sahloul ME, Klugar M. Aphthous-like stomatitis of Covid-19 patients: case report and review of evidence. *Braz. J. Oral Sci.* 2020 Nov. 4;19:e201354.
2. Capocasale G, Nocini R, Faccioni P, Donadello D, Bertossi D, Albanese M, et al. How to deal with coronavirus disease 2019: A comprehensive narrative review about oral involvement of the disease. *Clin Exp Dent Res.* 2021 Feb;7(1):101-108
3. Penoni DC. O novo coronavirus e a viralização da prevenção. *Rev Nav Odontol.* 2020; 47(1): 5-6
4. Braga DRA, Saintrain MVL, Rodrigues DM, Bezerra CB, Martins MGA. Condições de saúde bucal em pessoas acometidas por Covid-19. *J. Health Biol Sci.* 2021;9(1):1-8.
5. Etemad-Moghadam S, Alaeddini M. Is SARS-CoV-2 an Etiologic Agent or Predisposing Factor for Oral Lesions in Covid-19 Patients? A Concise Review of Reported Cases in the Literature. *Int J Dent.* 2021 May 18;2021:6648082
6. López LAO, Leon LAM, Ramirez DFP, Rascón JFL, Díaz LAC. Papel de los tejidos orales durante la infección por SARS-CoV-2. *Revista ADM. México.* 78 (3): 167-175. 2021.
7. Chawla J. Oral manifestations associated with Covid-19 disease: An observational cross-sectional study. *Journal of Oral Biology and Craniofacial Research.* 2022;12 (2): 279–283.
8. Parra–Sanabria EA, Bermúdez MB, Vega CPP, Jiménez AR. Manifestaciones orales y maxilofaciales asociadas a la Covid-19. Revisión de la literatura. *Acta Odont Col.* 2020; 10:60-80.
9. Moraes MF, Natalino YR, Holanda AF, Souza Sobrinho HF, Sarmiento LC, Gomes APM, et al. Oral and cutaneous manifestations of Covid-19 in pediatric patients. *RGO, Rev Gaúch Odontol.* 2021;69:e2021005
10. Amorim Dos Santos J, Normando AGC, Carvalho da Silva RL, Acevedo AC, De Luca Canto G, Sugaya N, Santos-Silva AR, Guerra ENS. Oral Manifestations in Patients with Covid-19: A 6-Month Update. *J Dent Res.* 2021 Nov;100(12):1321-1329
11. Brandini DA, Takamiya AS, Thakkar P, Schaller S, Rahat R, Naqvi AR. Covid-19 and oral diseases: Crosstalk, synergy or association? *Rev Med Virol.* 2021 Nov;31(6):e2226
12. Monje Gil Florencio, Cebrián Carretero José Luis, López-Cedrún Cembranos José Luis, Redondo Alamillos Marta, Valdés Beltrán Andrés, Almeida Parra Fernando et al . Manejo de pacientes en cirugía oral y maxilofacial durante el periodo de crisis y de control posterior de la pandemia de Covid-19. *Rev. Esp. Cirug. Oral y Maxilofac.,* 2020; 42 (2): 51-59.
13. Iranmanesh B, Khalili M, Amiri R, Zartab H, Aflatoonian M. Oral manifestations of Covid-19 disease: A review article. *Dermatol Ther.* 2021 Jan;34(1):e14578
14. Orellana-Centeno JE, Castillo VM, Sotelo RNG. Generalidades, manejos, cuidados y manifestaciones clínicas del SARS-CoV-2. *Revista ADM.* 2020; 77 (3): 153-155.
15. El Kady DM, Gomaa EA, Abdella WS, Ashraf Hussien R, Abd ElAziz RH, Khater AGA. Oral manifestations of Covid-19 patients: An online survey of the Egyptian population. *Clin Exp Dent Res.* 2021 Oct;7(5):852-860.
16. Maciel PP, Martelli Júnior H, Martelli DRB, Machado RA, Andrade PV, Perez DEC, et al. Covid-19 pandemic: oral repercussions and its possible impact on oral health. *Pesqui Bras Odontopediatria Clín Integr.* 2020; 20(suppl1):e0138
17. Tavares NCSA, Santos EM, Bussadori SK, Imparato JCP, Rezende KM. Sinais e Sintomas de Manifestações Orais e Cutâneas em Crianças Com Covid-19: Revisão Narrativa. *Research, Society and Development.* 2021; 10 (10): e258101018515.
18. Halboub E, Al-Maweri SA, Alanazi RH, Qaid NM, Abdulrab S. Orofacial manifestations of Covid-19: a brief review of the published literature. *Braz Oral Res.* 2020 Oct 30;34:e124.
19. Pitak-Arnnop P, Meningaud JP, Sirintawat N, Subbalekha K, Auychai P, Iamaroon A, O-Charoenrat P, Suntorntham S, Messer-Peti R, Neff A. A German AWMF's S2e/realist synthesis and meta-narrative snapshot of craniomaxillofacial manifestations in Covid-19 patients: Rapid living update on 1 January 2021. *J Stomatol Oral Maxillofac Surg.* 2022 Feb;123(1):64-73.
20. Santos SV, Freitas IDP, Senna SFM, Rocha LPC, Armomino SAF. Manifestações orais do Covid-19: uma breve revisão de literatura. *Rev. Odontol. Araçatuba.* 2021; 42(3): 50-55.
21. Elamrousy WAH, Nassar M, Issa DR. Prevalence of Oral Lesions in Covid-19 Egyptian Patients. *J Int Soc Prev Community Dent.* 2021 Nov 30;11(6):712-720
22. Amacio AM, Souza LC, Silva EGC, Lima KC, Silveira EJD. Implicações orais e maxilofaciais da Covid-19: uma revisão integrativa. *HOLOS.* 2021; 3: 1–19
23. Nejabi MB, Noor NAS, Raufi N, Essar MY, Ehsan E, Shah J, Shah A, Nemat A. Tongue ulcer in a patient with Covid-19: a case presentation. *BMC Oral Health.* 2021 May 20;21(1):273
24. Natto ZS, Afeef M, Khalil D, Kutubaldin D, Dehathem M, Alzahrani A, Ashi H. Characteristics of Oral Manifestations in Symptomatic Non-Hospitalized Covid-19 Patients: A Cross-Sectional Study on a Sample of the Saudi Population. *Int J Gen Med.* 2021 Dec 10;14:9547-9553.
25. Reis VP, Bezerra AR, Maia ABP, Marques LC, Conde DC. An integrative review of oral manifestations in patients with Covid-19: signs directly related to SARS-CoV-2 infection or secondary findings? *Int J Dermatol.* 2022 Mar;61(3):278-290.
26. Amorim dos Santos J, Normando AGC, Carvalho da Silva, RL, Acevedo AC, De Luca Canto G, Sugaya N, et al. Oral manifestations in patients with Covid-19: a living systematic review." *Journal of dental research.* 2021; 100 (2): 141-154.
27. Riad A, Kassem I, Hockova B, Badrah M, Klugar M. Halitosis in Covid-19 patients. *Spec Care Dentist.* 2020; 41(2):282-285.
28. Sinadinos A, Shelswell J. Oral ulceration and blistering in patients with Covid-19. *Evid Based Dent.* 2020; 21(2):49
29. Ettinger R, Marchini L, Zwetchkenbaum S. The Impact of Covid-19 on the Oral Health of Patients with Special Needs. *Dent Clin North Am.* 2022 Apr;66(2):181-194
30. Samaranayake LP, Fakhruddin KS, Ngo HC, Bandara HMNM, Leung YY. Orofacial Mycoses in Coronavirus Disease-2019 (Covid-19): A Systematic Review. *Int Dent J.* 2022 Oct;72(5):607-620