THE NEW ARMENIAN MEDICAL JOURNAL
Volume18 (2024), Issue 2, p.67-75

DOI: https://doi.org/10.56936/18290825-2.v18.2024-67

INVESTIGATING THE RELATIONSHIP BETWEEN ORAL MANIFESTATIONS AND DEPRESSION, ANXIETY, AND STRESS IN COVID-19 PATIENTS

Qasem-zade-hosseini E. [1], Akbari H.[2], Rahmat-panah K.[3], Ghasvari Z.[3*], Akhbari P.[4], Ghotbi M.[5,] Omidi A.[6]

[1] Department of Oral and Maxillofacial Medicine, School of Dentistry, Kashan University of Medical Science, Kashan, Iran
[2] Social Determinants of Health Research Center, Kashan University of Medical Sciences, Kashan, Iran
[3] Dentistry school of Kashan University of Medical Sciences, Kashan, Iran
[4] Department of Oral and Maxillofacial Medicine, Tehran University of Medical Science, Tehran, Iran
[5] Medical school of Kashan University of Medical Sciences, Kashan, Iran
[6.] Department of Clinical Psychology, Faculty of Medicine, Kashan University of Medical Sciences, Kashan, Iran

Received 15.12.2023 Accepted for printing 30.04.2024

Abstract

Objectives*: *this study aimed to investigate the relationship between oral manifestations and depression, anxiety, and stress among covid-19 patients.

Methods: *This cohort study investigated 125 Covid-19 patients hospitalized at Covid-19 wards at Kashan Shahid Beheshti Hospital., After hospitalization, the patients were subjected to an oral examination and filled out the DASS-21 questionnaire to measure Psychological disorders at the beginning of hospitalization, one month and two months after discharge. Then we calculated the occurrence of oral manifestations and their relationship with depression, anxiety and, stress in the patients.*

***Results:** On the day of admission, 98.4% of patients had at least one type of oral manifestation. Coated tongue (75.2%), scallop tongue (67.2%) and xerostomia (66.4%) were the most common oral manifestations, respectively. As the severity of depression, anxiety and stress increased, the incidence of oral manifestations also did. However, we found no statistically significant relationship between these two factors (P<0.05); Temporomandibular disorders, xerostomia, changes in smell and taste were significantly related to Psychological disorders in some follow-ups (P<0.05).*

***Conclusion:** The study showed no statistically significant relationship between the severity of depression, anxiety and, stress with oral manifestations at any time, but with the increase in the severity of Psychological disorders, the incidence of oral manifestations also increased. A separate examination of the manifestations showed a statistically significant relationship between depression, anxiety and stress with xerostomia, temporomandibular disorders, changes in smell and taste at some follow-up times.*

***Keywords:** Covid-19, hospitalized patients, oral manifestations, depression, anxiety, stress*

Cite This Article as:
Qasem-zade-hosseini E., Akbari H., Rahmat-panah K., Ghasvari Z., Akhbari P., Ghotbi M. Omidi A. (2024). Investigating the Relationship Between Oral Manifestations and Depression, Anxiety, and Stress in Covid-19 Patients; The New Armenian Medical Journal, vol.18(2), p.67-75;
DOI: https://doi.org/ 10.56936/18290825-2.v18.2024-67

Address for Correspondence:
Zahra Ghasvari
Dentistry school of Kashan University of Medical Sciences
15th Khordad Square, Abazar Street, P.O.Box: 87137.81147, Kashan, Iran
Tel: +989130809176
E-mail: ghasvari77@yahoo.com

Introduction

The coronavirus pandemic outbroke in December 2019 and infected over 600 million people in the world and killed nearly 6.5 million people by September 2, 2022 [*WHO, 2021*]. Fever, sore throat, shortness of breath and dry cough are among the symptoms of Covid-19 [*Fini, M. B. 2020; Amorim Dos Santos, J. et al.,2021*]. Oral manifestations are also known as relatively common symptoms of this disease [*Binmadi N et al., 2022*]. Gustatory disorders, non-specific oral ulcers, desquamative gingivitis, petechiae and infections associated with candidiasis are among the oral manifestations related to Covid-19 [*Amorim Dos Santos J. et al.,2021*]; These manifestations can affect the patient's quality of life by causing dysphagia, multiple wounds, reducing the ability to speak and chew. And due to patient's difficulty to receive food and psychological issues, it can slow down their recovery and raise the mortality rate [*Nguyen P. et al., 2005*].

The sudden spread of Covid-19, has increased the prevalence of some psychological disorders as well as physical conditions [*Salari N. et al., 2020*]. Thus, sufferers experience a high level of depression, anxiety and stress [*Moayed M. et al., 2021*].

Various researches have focused on the relationship between psychological factors such as depression, anxiety and stress with some oral manifestations, including temporomandibular joint disorder (TMD) [*Sójka A. et al., 2019; Kmeid, E. et al., 2020*] - muscle-facial pain syndrome [*Bordoni B. et al., 2018; Mansourian A. et al., 2019; Chitnis A. et al., 2020*] – xerostomia [*Bergdahl M., Bergdahl J., 2000; Borahan, M. O. et al., 2012; Gholami, N. et al., 2017*] - BMS burning mouth syndrome [*Di Stasio, D. et al., 2018; Kim, M., Kho H, 2018; Abetz L, Savage N, 2009*] - Recurrent aphthous stomatitis [*Dhopte A et al., 2018; Bilodeau, E., Lalla R., 2019; Ekinci A. et al., 2020*] - Herpes simplex virus infection [*Yan C. et al., 2020*] - Lichen planus [*Cerqueira, J. et al., 2018; Manczyk B. et al., 2019*] – Morsicatio [*Kang H. et al., 2012*].

It's essential to know both physiological and psychological aspects of these disorders and benefit from collaboration among clinical specialists, such as dentists, oral disease specialists, psychologists etc., to properly handle the patients. Because it is still unclear whether the occurrence of oral symptoms is due to the Covid-19 infection alone or due to the systemic effects of simultaneous infections, stress and anxiety, weak immune system or the effects of drug treatment.

This study aimed to investigate oral manifestations related to depression, anxiety and stress in hospitalized Covid-19 patients. We hoped that by managing stress and anxiety, the creation and aggravation of patients' oral lesions can be prevented.

Materials and methods:

Research design and population: This cohort study investigated patients with Covid-19 hospitalized at Kashan Shahid Beheshti Hospital in in Iran in the age range of 18-60 in 2014-2015. Patients whose lung CT scan, PCR, or serum antibody test showed that they were infected with the virus were included in the study. Patients with a history of severe depression, high drug use, and autoimmune diseases were excluded from the study.

Out of 125 people participated in this study, 67 of them (53.6%) were women. The average age of the subjects was years old. The most frequent educational degree was associate degree. Two people deceased during the study. Cardiovascular diseases were the most common diseases among the participants (24 people) (19.2%) (data not shown) 60 people participated in the first follow-up and 69 people participated in the second follow-up (Figure).

Sample size: According to the study conducted by Neda Gholami et al.,, 31.7% (P1) of patients who had reduced saliva flow and xerostomia and 4.4% (P2) of healthy people had depression [*Gholami N. et al., 2017*]. Considering 95% confidence and 90% test power, the smallest sample required in this study was calculated as 48 people for each group. Considering that three factors of depression, anxiety and stress were measured in each patient, we tried to include at least 30 people in each group (including depressed/non-depressed, anxious/non-anxious, stressed/non-stressed).

Data collection method: To collect data, we visited newly hospitalized Covid-19 patients at the specialized wards on a daily basis after taking consents from them. Then we asked them about the history of oral manifestations, xerostomia, sense of smell and taste. We took photographs of 6 areas of the mouth, including left and right buccal, teeth

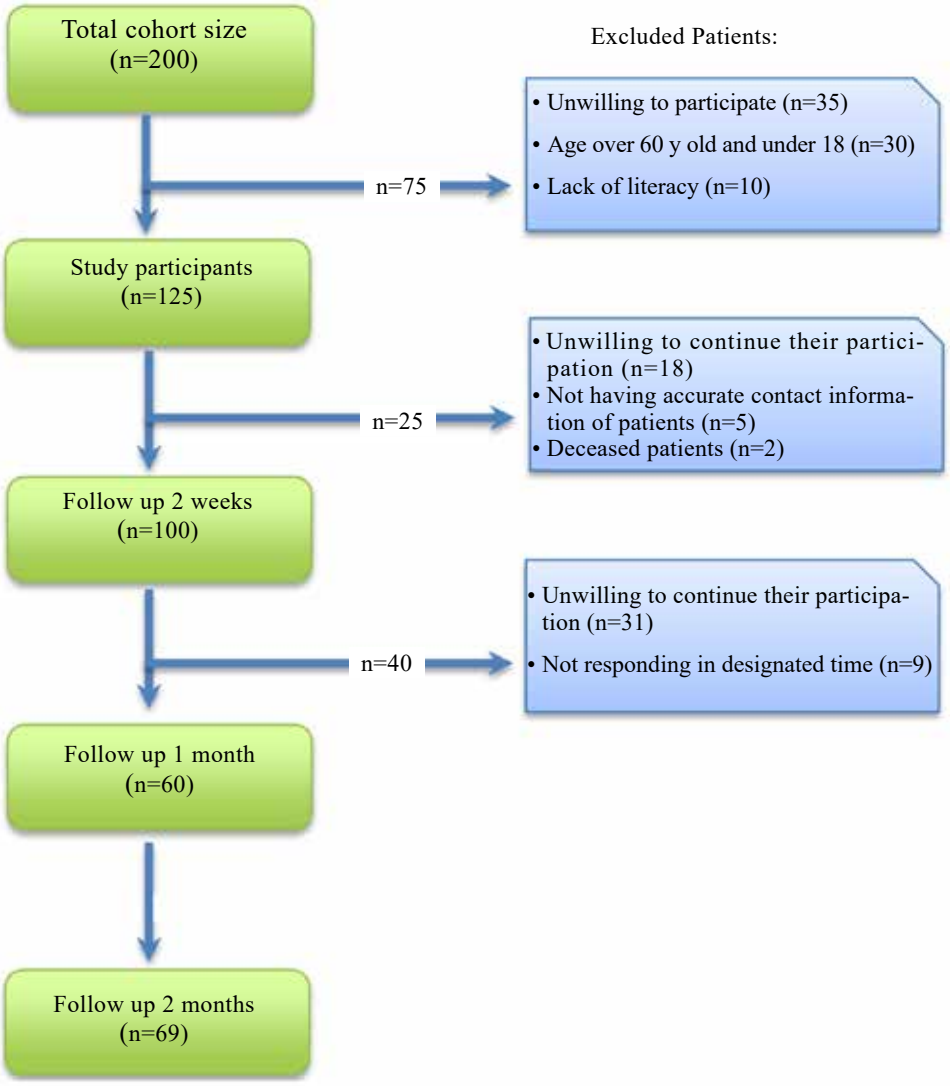

Figure. *Study flow diagram*

from front view, palate and ventral and dorsal tongue. The photos were checked by a specialist at oral and maxillofacial diseases. Also, the patient was asked to complete the DASS-21 questionnaire to check the state of depression, anxiety and stress. Of course, the test was completed when the general condition of the patient was improving, so that the person himself could read the questionnaire and answer the questions with his own interpretation. Also, the information of the patient's file including age, underlying diseases, drugs, history of addiction and paraclinical tests of the patient during hospitalization were recorded. The next follow-ups took place one and two months after discharge, in which, in addition to examining the oral condition, the 21-DASS test was taken from the patients in person using the pressline system. The patients took photos of the previous areas in their mouths and sent them to the plan administrator. In case of oral lesions, they were referred to a specialist clinic for clinical examination. The photos were compared and their changes were checked.

This study, classified the condition of oral manifestations of patients into four levels. The patients with no oral manifestations were considered at None level, and ones with only oral manifestations including xerostomia, coated tongue, furrowed tongue, depapier tongue, scalloped tongue, geographic tongue, and frictional hyperkeratosis at low level. Patients with an oral manifestation of important diseases including external and internal herpes, fungal infections, joint disorders, olfactory and gustatory disorders, pigmentations, lichen planus, blight, pemphigus, wounds caused by xerostomia or trauma are placed at moderate level. Finally, patients with two or more manifestations of the group

of important diseases were placed at high level.

Data analysis: We calculated the frequency of oral manifestations and depression, anxiety and stress. Chi-square and Fisher's exact statistical tests were used to analyze the results. Also, for quantitative variables, firstly the mean and standard deviation were calculated and the Kolmogorov Smirnov test was used to measure the normality of the data. T-test and ANOVA were used to compare groups.

Results:

98.4% of the participants had oral manifestations during hospitalization. 56.8% of subjects had oral manifestations at high level, which decreased to 14.9% after two months. The most common oral manifestations on the day of admission were coated tongue (75.2%), scalloped tongue (67.2%) and xerostomia (66.4%), respectively (Table 1).

The average score of depression among the patients with oral manifestations found to be 8.4 for low level, 10.6 for moderate level, and 18.3 for high level, two months after discharge. A statistically significant difference was observed between the average score of depression and the level of oral manifestations within the two-month follow-up ($p=0.05$), but this difference was not significant at other times ($p<0.05$). No statistically significant difference between the score of anxiety and stress and the level of oral manifestations was found at any time ($p<0.05$). Of course, at all times and for all three factors, the average score of people with high level of oral presentation was higher than the average score of people with low level. With the increase in the severity of depression, anxiety and

Table 1.

Frequency distribution of levels of oral manifestations in patients with Covid-19

Time of examination	n	Oral manifestations count (%)			
		None	Lowe	Moderate	High
Hospitalization	125	2 (1.6)	10 (8.0)	42 (33.6)	71 (56.8)
Two weeks after discharge	100	2 (2.0)	18 (18.0)	32 (32.0)	48 (48.0)
One month after discharge	92	4 (4.3)	32 (34.8)	32 (34.8)	24 (26.1)
Two months after discharge	74	4 (5.4)	30 (40.5)	29 (39.2)	11 (14.9)

Table 2.

Mean and standard deviation of depression, anxiety and stress scores according to the severity of oral manifestations during hospitalization, one and two months after discharge

Psychological disorder type	Level of oral manifestation	Time of oral manifestation					
		Hospital		One month		Two months	
		$\overline{X} \pm SD$	P.value	$\overline{X} \pm SD$	P.value	$\overline{X} \pm SD$	P.value
Depression	Low	8.5±8.62	0.714	10.35±9.39	0.104	8.40±8.55	0.050
	Moderate	9.76±7.14		9.26±7.46		10.61±9.10	
	High	10.49±8.71		16.00±10.42		18.29±9.83	
Anxiety	Low	11.83±10.60	0.122	9.57±8.29	0.163	8.60±7.71	0.560
	Moderate	10.54±7.01		8.32±7.52		9.91±8.15	
	High	13.83±8.38		13.85±8.77		12.57±11.0	
Stress	Low	15.50±11.32	0.570	13.22±9.36	0.087	13.00±12.5	0.248
	Moderate	14.15±8.19		12.42±9.25		14.26±8.34	
	High	16.20±10.41		19.54±9.56		20.29±5.82	

Table 3.

Mean and standard deviation of depression, anxiety and stress scores according to the presence of xerostomia during hospitalization, one and two months after discharge of patients with Covid-19

DPT	Xeros	Time of oral lesion examination					
		Hospital		One month after discharge		Two months after discharge	
		$\overline{X} \pm SD$	P.value	$\overline{X} \pm SD$	P.value	$\overline{X} \pm SD$	P.value
Depression	Yes	9.73±8.08	0.545	10.06±21.20	0.011	6.00	0.610
	No	10.68±8.41		10.32±8.68		10.90±9.43	
Anxiety	Yes	12.61±7.66	0.890	19.20±11.45	0.009	4.00	0.490
	No	12.40±9.47		9.24±7.46		9.88±8.37	
Stress	Yes	15.22±9.53	0.717	22.00±8.83	0.065	4.00	0.287
	No	15.90±10.39		13.68±9.46		14.82±9.95	

Notes: TPD - *type of psychological disorders, Xeros - Xerostomia, * - Xerostomia was measured according to the VAS score from 0 to 10 (0 without xerostomia and 10 with severe xerostomia). A score of 6 and above was assumed to be pathological xerostomia.*

Table 4.

Mean and standard deviation of depression, anxiety and stress scores according to the presence of temporomandibular joint disorder during hospitalization, one and two months after discharge in patients with Covid-19

TPD	TJD	Time of oral lesion examination					
		Hospital		One month after discharge		Two months after discharge	
		$\overline{X}$ ± SD	P.value	$\overline{X}$ ± SD	P.value	$\overline{X}$ ± SD	P.value
Depression	Yes	11.09±8.75	0.394	14.93±10.11	0.075	12.83±9.85	0.394
	No	9.67±7.96		9.95±8.67		10.16±9.25	
Anxiety	Yes	13.94±8.45	0.256	14.27±9.44	0.022	10.67±7.88	0.670
	No	12.02±8.19		8.60±7.35		9.47±8.54	
Stress	Yes	16.36±10.9	0.532	18.53±9.18	0.050	16.33±9.97	0.495
	No	15.11±9.39		12.90±9.46		14.05±10.76	

Notes: TPD - *type of psychological disorders,* **TJD -** *temporomandibular joint disorders*

Table5.

Mean and standard deviation of depression, anxiety and stress scores according to the presence of gustatory disorders during hospitalization, one and two months after discharge of patients with Covid-19

TPD	GD	Time of oral lesion examination					
		Hospital		One month after discharge		Two months after discharge	
		$\overline{X}$ ± SD	P.value	$\overline{X}$ ± SD	P.value	$\overline{X}$ ± SD	P.value
Depression	Yes	10.59±7.96	0.468	19.75±9.22	0.004	16.40±5.55	0.161
	No	9.5±7.96		9.87±8.56		10.18±9.53	
Anxiety	Yes	14.69±8.80	0.004	16.00±9.80	0.029	10.00±8.12	0.947
	No	10.42±7.16		9.15±7.68		9.73±8.44	
Stress	Yes	16.66±8.78	0.176	22.75±7.70	0.007	16.80±4.15	0.608
	No	14.26±8.78		13.02±9.27		14.36±10.41	

Notes: TPD - *type of psychological disorders,* **GD -** *Gustatory disorders*

Table6.

Mean and standard deviation of depression, anxiety and stress scores according to the presence of olfactory changes during hospitalization, one and two months after discharge of patients with Covid-19

TPD	GD	Time of oral lesion examination					
		Hospital		One month after discharge		Two months after discharge	
		$\overline{X}$ ± SD	P.value	$\overline{X}$ ± SD	P.value	$\overline{X}$ ± SD	P.value
Depression	Yes	10.37±8.77	0.701	15.56±7.92	0.134	19.43±9.14	0.007
	No	9.80±7.72		10.48±9.35		9.40±8.71	
Anxiety	Yes	13.70±8.29	0.167	14.44±8.11	0.089	13.14±10.70	0.250
	No	11.62±8.19		9.30±8.13		9.21±8.89	
Stress	Yes	16.22±10.79	450/0	21.56±7.67	0.014	21.43±5.13	0.050
	No	14.84±8.95		13.04±9.43		13.49±10.15	

Notes: TPD - *type of psychological disorders,* **OD -** *Olfactory disorders*

stress, the incidence of oral manifestations also increased proportionally, but we found no statistically significant relationship between the severity of depression, anxiety and stress with oral manifestations at any time (Table 2).

The average anxiety score within one-month follow-up among patients with and without xerostomia was 19.2 and 9.2, respectively. A significant difference was observed between the average score of anxiety and the manifestation of pathological xerostomia in the 1-month follow-up (P=0.009). Also, we observed a statistically significant relationship between the mean score of depression and xerostomia at the same time (P=0.011). But at other times, this relationship was not significant (P>0.05) (Table 3).

The average anxiety score in patients with and without temporomandibular joint disorder within the one-month follow-up was 14.3 and 8.6, respectively. There was a significant difference between the average score of anxiety according to the presence of temporomandibular joint disorder within the one-month follow-up (P=0.022). Also, we found a statistically significant relationship between the mean score of stress and this disorder. But at other times, this relationship was insignificant (p<0.05) (Table 4).

The average anxiety score in patients with and without gustatory disorders during hospitalization was 14.69 and 10.42, respectively. A significant difference was observed between the average anxiety score according to the presence of gustatory disorders during hospitalization (P=0.004). Also, the statistical difference between the average score of depression, anxiety and stress according to the presence of gustatory disorders

in the one-month follow-up was significant ($p<0.05$). But at other times, this difference was insignificant ($p<0.05$) (Table 5).

The average score of depression in patients with and without olfactory changes within the two-month follow-up was 19.43 and 9.40, respectively. A significant difference was observed between the average score of depression according to the presence of olfactory changes within the two-month follow-up ($P=0.007$). Also, we observed a statistically significant difference between the average stress score despite changes in smell first and second months after discharge ($p<0.05$). But at other times, this difference was insignificant ($p<0.05$) (Table 6).

Discussion:

One of the relatively common symptoms of Covid-19 patients are oral manifestations. The affinity of this virus for ACE2 receptors, which are found in the respiratory epithelium, salivary glands, and oral mucosa, can be one of the causes of these manifestations [*Binmadi N. et al., 2022*]. Covid-19 pandemic caused physical conditions as well as psychological disorders such as anxiety, depression and post-traumatic stress in the general population [*Salari N. et al., 2020*]. Studies have shown that patients who have suffered from Covid-19 experience a high level of depression, anxiety and stress [*Moayed M. et al., 2021*]. Also, reports indicate that the psychological state of patients can affect the mouth and its surrounding structure and cause manifestations; These manifestations are classified as psychosomatic [*Trjpathi R. et al., 2018*].

This study aimed to investigate the relationship between psychological factors such as depression, anxiety and stress with oral manifestations in hospitalized patients with Covid-19. In the present study, on the day of admission, 98.4% of the patients had oral manifestations, of which 56.8% were at a high level. The prevalence of oral manifestations was reported from 25.6% in the study of Nuno Gonzalez A to 88.8% is variable in Jerome R. Lechien's study [*Lechien J. et al., 2020; Nuno-Gonzalez A. et al., 2021*]. The reason for this difference in the results can be seen as the broader types of manifestations that were discussed in our study. Grooved tongue, scallop and coated are among the manifestations that were not considered in the above studies.

The most common oral manifestations on the day of admission were reported as coated tongue (75.2%), scalloped tongue (67.2%) and xerostomia (66.4%), which was contrary to the results of Binmadi et al.,'s study; They reported taste disturbance (60%) and xerostomia (42%) as the most common manifestations (100% hospitalized versus 7% hospitalized - average age 41 years versus 33 years) [*Binmadi N. et al., 2022*]; Studies have shown that xerostomia and gustatory disorders increase and decrease with age, respectively [*Amorim Dos Santos J. et al., 2021; Sehanobish E. et al., 2021; Stankeviciene I. et al., 2021*].

In the present study, no significant statistical relationship was observed between the severity of depression, anxiety and stress at the time of admission, first and second months after discharge with the occurrence of oral manifestations ($p<0.05$), but in general, the average score of depression, anxiety and Stress was higher in patients with high-level oral manifestations, compared to those with low-level oral manifestations.

To the best of our knowledge, no study has investigated the relationship between oral manifestations in Covid-19 patients and psychiatric parameters such as depression, anxiety and stress. We found a significant relationship between the anxiety and depression of patients (one month after discharge) with the feeling of xerostomia ($p<0.011$), which was in line with the study of Nadaghlami et al., and Borahan et al., [*Borahan M. et al., 2012; Gholami N. et al., 2017*]. Previous studies have shown that autonomic nervous system regulate saliva secretion, which is affectable by physical and psychological stimuli such as emotions, fear, stress, and depression [*Trjpathi R. et al., 2018*].

In patients with temporomandibular disorders, the results of anxiety and stress had a statistically significant relationship with this disorder one month after discharge ($p<0.05$). Of course, a higher average score of depression, anxiety and stress was evident in all follow-ups in patients with TMD. In this regard, Mahsa Alavi Namour and his colleagues stated that stress, depression and anxiety are significantly related to TMD symptoms and introduced stress alone as the most effective factor in causing TMD . Elio Kmeid and colleagues also stated that temporomandibular disorders are significantly related to depression, anxiety and stress [*Kmeid E. et al., 2020*].

Changes in the sense of smell and taste are other manifestations known among Covid-19 patients. Reports have shown that 95% of gustatory disorders are secondary to olfactory disorders. Indeed, most of the patients have difficulty differentiating between taste and olfactory disorders [*Farid H. et al., 2022*].

In the present study, on the day of admission, 48.8% of the patients with Covid-19 suffered from gustatory disorders; The relationship of this disorder with depression and stress one month after discharge and with anxiety at the same time of hospitalization and one month follow-up was statistically significant. olfactory disorders was reported in this study with a frequency of 44% on the day of admission. Also, a statistically significant correlation was observed between the average score of depression and stress with changes in smell at some times ($p<0.05$).

Hur K and colleagues examined the relationship between olfactory and gustatory disorders and depression in the elderly population of the United States of America; In line with our findings, they reported a significant relationship between depression and olfactory and gustatory disorders [*Hur C et al., 2018*]. In a study by Kim M and Kho H (2018), the decrease in the expression of 5-HT1A serotonin receptors in the taste cells of mice suffering from anhedonia (one of the symptoms of acute depression) was considered as a cause of gustatory disorders. On the other hand, the study of Nabi-Afjadi M and colleagues showed that direct damage to the epithelium of the mouth and nose and the nature of the invasion of the nerve by the coronavirus can lead to olfactory and gustatory disorders [*Najafloo R. et al., 2021; Neta, F. I. et al., 2021*]; However, the higher average score of depression in patients with gustatory disorders can be justified, but the cause is not clear.

Özsoy-Ünübol et al., investigated the relationship between anxiety and depression with changes in smell and taste in patients with fibromyalgia, and concluded that changes in smell and taste have a negative correlation with depression and anxiety; Although this relationship was not statistically significant [*Özsoy-Ünübol T. et al., 2020*].

In previous studies, the relationship between psychological factors and lesions such as plague[*Huling L. et al., 2012; Gavic L. et al.,, 2014*], herpes simplex virus [*Wang X et al., 2014, Yu W. et al., 2018*] and lichen planus [*Gavic L. et al., 2014; Cerqueira J. D. et al., 2018; Manczyk B. et al., 2019*] has been investigated and reported to be significant, but in the present study, due to the small number of people with these manifestations, it was not possible to investigate the relationship and the results cannot be trusted (4 people with plague, 6 people with oral herpes, 2 people with lichen planus).

Conclusion:

Oral manifestations were common among hospitalized Covid-19 patients. No statistically significant relationship was observed between the severity of depression, anxiety and stress with oral manifestations at any time. But in general, the average score of depression, anxiety and stress in all follow-ups, in people with oral manifestations at a high level were more than those who had low level demonstrations. A statistically significant relationship between depression, anxiety and stress with xerostomia, temporomandibular disorders, changes in smell and taste in some follow-ups was found; However, it was unclear whether the exact cause of this manifestation is the virus, psychological factors, drugs or weakening of the immune system.

REFERENCES

1. *Abetz, L. M. and N. W. Savage (2009)*. Burning mouth syndrome and psychological disorders. Australian dental journal **54**(2): 84-93. https://doi.org/10.1111/j.1834-7819.2009.01099.x
2. *Amorim dos Santos J.; Normando A.G.C.; Carvalho da Silva R.L.; Acevedo A.C.; De Luca Canto G.; Sugaya N. et al., (2021)*. Oral Manifestations in Patients with COVID-19: A 6-Month Update . Journal of Dental Research, **100**(12): 1321-1329. doi:10.1177/00220345211029637
3. *Bergdahl, M., Bergdahl J (2000)*. Low unstimulated salivary flow and subjective oral dryness: association with medication, anxiety, depression, and stress. Journal of dental research **79**(9): 1652-1658. https://doi.org/10.1177/00220345000790090301

4. *Bilodeau, E. A., Lalla R. (2019).* Recurrent oral ulceration: Etiology, classification, management, and diagnostic algorithm. Periodontology 2000 **80**(1): 49-60. https://doi.org/10.1111/prd.12262
5. *Binmadi NO, Aljohani S, Alsharif MT, Almazrooa SA, Sindi AM (2022).* Oral Manifestations of COVID-19: A Cross-Sectional Study of Their Prevalence and Association with Disease Severity. Journal of clinical medicine **11**(15): 4461. https://doi.org/10.3390/jcm11154461
6. *Borahan MO, Pekiner FN, Atalay T (2012).* Evaluation of effects of the psychological factors on saliva. Journal of Marmara University Institute of Health Sciences **2**(Suppl 1): S8-S14. - http://musbed.marmara.edu.tr
7. *Bordoni B, Sugumar K, Varacallo M, (2018).* Myofascial pain. In: StatPearls. StatPearls Publishing, Treasure Island (FL); 2023. PMID: 30570965.
8. *Cerqueira JDM, Moura JR, Arsati F, Lima-Arsati YBO, Bittencourt RA, Freitas VS, (2018).* Psychological disorders and oral lichen planus: A systematic review. Journal of investigative and clinical dentistry **9**(4): e12363. https://doi.org/10.1111/jicd.12363
9. *Chitnis AVi, Mistry GS, Puppala P., Swarup N.A. (2020).* Laser therapy for myofascial pain dysfunction syndrome. Journal of Interdisciplinary Dentistry **10**(1): 35-38. DOI: 10.4103/jid.jid_39_19
10. *Dhopte A, Naidu G, Singh-Makkad R, Nagi R, Bagde H, Jain S* (2018). Psychometric analysis of stress, anxiety and depression in patients with recurrent aphthous Stomatitis-A cross-sectional survey based study. Journal of clinical and experimental dentistry **10**(11): e1109. doi: 10.4317/jced.55012
11. *Di Stasio D, Candotto V, Serpico R, Migliozzi R, Petruzzi M, Tammaro M, Maio C, Gritti P et al., (2018).* Depression and distress in burning mouth syndrome: a case control study. J Biol Regul Homeost Agents **32**(2 Suppl 1): 91-95.
12. *Ekinci A, Demir E, Ekinci H, (2020).* Serum prolidase and oxidative stress levels in patients with recurrent aphthous stomatitis: a prospective, controlled study. https://doi.org/10.4103/ijdvl.IJDVL_20_18
13. *Farid H, Khan M, Jamal S, Ghafoor R, (2022).* Oral manifestations of Covid-19-A literature review. Reviews in medical virology **32**(1): e2248. https://doi.org/10.1002/rmv.2248
14. *Fini M. B. (2020).* What dentists need to know about COVID-19. Oral oncology **105**: 104741. https://doi.org/10.1016/j.oraloncology.2020.104741
15. *Gavic L, Cigic L, Lukenda DB, Gruden V, Gruden Pokupec JS, (2014).* The role of anxiety, depression, and psychological stress on the clinical status of recurrent aphthous stomatitis and oral lichen planus. Journal of oral pathology & medicine **43**(6): 410-417. https://doi.org/10.1111/jop.12148
16. *Gholami N, Sabzvari BH, Razzaghi A, Salah S, (2017).* Effect of stress, anxiety and depression on unstimulated salivary flow rate and xerostomia. Journal of dental research, dental clinics, dental prospects **11**(4): 247. doi: 10.15171/joddd.2017.043
17. *Huling, L. B., Baccaglini L, Choquette L, Feinn RS, Lalla RV (2012).* "Effect of stressful life events on the onset and duration of recurrent aphthous stomatitis.. Journal of oral pathology & medicine **41**(2): 149-152.
18. *Hur K. Choi JS, Zheng M, Shen J, Wrobel B (2018).* Association of alterations in smell and taste with depression in older adults. Laryngoscope investigative otolaryngology **3**(2): 94-99. https://doi.org/10.1002/lio2.142
19. *KangHS, Lee HE, Ro YS, Lee CW, (2012).* Three cases of'morsicatio labiorum'. Annals of dermatology **24**(4): 455-458. DOI10.5021/ad.2012.24.4.455
20. *Kim, M.-J., Kho H.-S. (2018).* Understanding of burning mouth syndrome based on psychological aspects. Chin J Dent Res **21**(1): 9-19.
21. *Kmeid, E., Nacouzi M, Hallit S, Rohayem Z (2020).* Prevalence of temporomandibular joint disorder in the Lebanese population, and its association with depression, anxiety, and stress. Head & face medicine **16**: 1-11. DOI https://doi.org/10.1186/s13005-020-00234-2
22. *Lechien J.R., Chiesa-Estomba C.M., De Siati D.R., Horoi M., Le Bon S.D., Rodriguez A. et al., (2020).* Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study. European Archives of Oto-rhino-laryngology **277**(8): 2251-2261. DOI https://doi.org/10.1007/s00405-020-05965-1
23. *Manczyk B, Gołda J, Biniak A, Reszelewska K, Mazur B, Zając K, et al., (2019).* Evaluation of depression, anxiety and stress levels in patients with oral lichen planus. Journal of

oral science **61**(3): 391-397. DOI https://doi.org/10.2334/josnusd.18-0113

24. *Mansourian A, Pourshahidi S, Sadrzadeh-Afshar M-S, Ebrahimi H (2019).* A comparative study of low-level laser therapy and transcutaneous electrical nerve stimulation as an adjunct to pharmaceutical therapy for myofascial pain dysfunction syndrome :a randomized clinical trial., Frontiers in dentistry **16**(4): 256. doi: 10.18502/fid.v16i4.2084

25. *Moayed MS, Vahedian-Azimi A, Mirmomeni G, Rahimi-Bashar F, Goharimoghadam K, Pourhoseingholi MA et al., (2021).*Depression, anxiety, and stress among patients with COVID-19: a cross-sectional study. Clinical, Biological and Molecular Aspects of COVID-19: 229-236. https://doi.org/10.1007/978-3-030-59261-5_19

26. *Najafloo R, Majidi J, Asghari A, Aleemardani M, Kamrava SK, Simorgh S et al., (2021).* Mechanism of anosmia caused by symptoms of COVID-19 and emerging treatments. ACS chemical neuroscience **12**(20): 3795-3805. https://doi.org/10.1021/acschemneuro.1c00477

27. *Neta FI, Fernandes ACL, Vale AJM, Pinheiro FI, Cobucci RN, de Azevedo EP, Guzen FP (2021).* Pathophysiology and possible treatments for olfactory-gustatory disorders in patients affected by COVID-19. Current research in pharmacology and drug discovery **2**: 100035. https://doi.org/10.1016/j.crphar.2021.100035

28. *Nuno-Gonzalez A., Martin-Carrillo P., Magaletsky K., Martin Rios M.D., Herranz Mañas C., Artigas Almazan J, et al., (2021).*Prevalence of mucocutaneous manifestations in 666 patients with COVID-19 in a field hospital in Spain: oral and palmoplantar findings. British journal of dermatology **184**(1): 184-185. https://doi.org/10.1111/bjd.19564

29. *WHO (2021).* COVID-19 weekly epidemiological update, edition 58, 21 September 2021. https://www.epid.gov.lk/storage/post/pdfs/en_6400a586dbe6f_sitrep-gl-en-22-09_10_21.pdf

30. *Özsoy-Ünübol T, Kullakçi H, İlhan İ, Yilmaz F. (2020).* Evaluation of olfactory and gustatory functions in patients with fibromyalgia syndrome: Its relationship with anxiety, depression, and alexithymia. Archives of Rheumatology **35**(4): 584. doi: 10.46497/ArchRheumatol.2020.7833

31. *Nguyen NP; Frank C, Moltz CC, VosP, Smith HJ, Karlsson U, et al., (2005).* Impact of dysphagia on quality of life after treatment of head-and-neck cancer. International Journal of Radiation Oncology*Biology*Physics **61**(3): 772-778. https://doi.org/10.1016/j.ijrobp.2004.06.017

32. *Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M et al.,* (2020). Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. Globalization and health **16**: 1-11.

33. Sehanobish E, *Barbi M, Fong V, Kravitz M, Tejera DS, Asad M (2021).* COVID-19-induced anosmia and ageusia are associated with younger age and lower blood eosinophil counts. American Journal of Rhinology & Allergy **35**(6): 830-839. https://doi.org/10.1177/194589242110048

34. *Sójka, A. Stelcer B, Roy M, Mojs M, Pryliński M (2019).* Is there a relationship between psychological factors and TMD? Brain and behavior **9**(9): e01360. https://doi.org/10.1002/brb3.1360

35. *Stankeviciene I., Puriene A., Mieliauskaite D., Stangvaltaite-Mouhat L., Aleksejuniene J.et al. (2021).* Detection of xerostomia, Sicca, and Sjogren's syndromes in a national sample of adults. BMC Oral Health 21, 552 (2021). https://doi.org/10.1186/s12903-021-01917-1

36. *Tripathi RM, Seth P, Awasthi P, Bhattacharya A, Bajpai AK, Thahriani A (2018).* Psychosomatic disorders affecting the oral cavity: A. Pharma Innov **7**(8): 327-332.

37. *Wang X., Zhang L., Lei Y., Xia L, Xinyu Z, Yiyun L, et al. (2014).* Meta-Analysis of Infectious Agents and Depression. Sci Rep 4, 4530 (2014). https://doi.org/10.1038/srep04530

38. *Yan C, Luo Z, Li W, Li X, Dallmann R, Kurihara H et al., (2019).* Disturbed Yin-Yang balance: stress increases the susceptibility to herpes simplex virus type 1 primary and recurrent infections. Acta Pharmaceutica Sinica B, **10**(3): 383-398. doi:10.1016/j.apsb.2019.06.005

39. *Yu W., Geng S., Suo Y., Wei X., Cai Q., Wu B. et al.,* (2018). Critical Role of Regulatory T Cells in the Latency and Stress-Induced Reactivation of HSV-1. Cell Reports, 25(9), 2379–2389.e3. doi:10.1016/j.celrep.2018.10.105

THE NEW ARMENIAN MEDICAL JOURNAL

Volume18 (2024). Issue 2

The Journal is founded by
Yerevan State Medical
University after M. Heratsi.

Rector of YSMU

Armen A. Muradyan

Address for correspondence:

Yerevan State Medical University
2 Koryun Street, Yerevan 0025,
Republic of Armenia

Phones:

(+37410) 582532 YSMU
(+37493 588697 Editor-in-Chief
Fax: (+37410) 582532
E-mail:namj.ysmu@gmail.com, ysmiu@mail.ru
URL:http//www.ysmu.am

Our journal is registered in the databases of Scopus, EBSCO and Thomson Reuters (in the registration process)

SCOPUS EBSCO REUTERS

Copy editor: Tatevik R. Movsisyan

Printed in "LAS Print" LLC
Director: Suren A. Simonyan
Armenia, 0023,Yerevan,
Acharyan St. 44 Bulding,
Phone: (+374 10) 62 76 12,
E-mail: las.print@yahoo.com

THE NEW ARMENIAN MEDICAL JOURNAL
Volume18 (2024). Issue 2

CONTENTS