Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.47750/jptcp.2023.1079

Oro-Facial manifestations of COVID-19 infection in a sample of Iraqi people

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Submitted: 17 November 2022; Accepted: 10 December 2022; Published: 14 January 2023

ABSTRACT

Public health officials are gravely concerned about the harm that viral illnesses continue to pose to humanity, various viral outbreaks, including the Middle East Respiratory Syndrome Corona-Virus (MERS-CoV), H1N1 influenza, the severe acute respiratory syndrome coronavirus (SARS-CoV-2) and SARS CoV-2 or COVID-19 that struck the globe in December 2019. A wide range of COVID-19 oral symptoms, such as ulceration, blisters, enanthems, hemorrhagic sores and cheilitis.

Aim: to investigate the prevalence of oral symptoms amongst COVID-19 patients due to the disease's aggressive nature and diverse symptomatology and to assess the impact of oral health conditions on COVID-19 disease severity in a sample of Iraqi people.

Materials & Methods: a cross-sectional study was conducted on (200) patients in total, (81) male and (119) female, who were identified as SARS-COV2 patients.

Results: COVID confirmed patients were involved in the present study with mean age (36.69±17.22) years & age range of (16-78) years. at least one of the oral manifestations was present in 72.5% of the patients, while about 27.5% did not experience any oro-facial symptoms. The oral symptom with the highest prevalence was dry mouth 50% followed by gustatory dysfunction 37% then burning mouth sensation 22.5% after that the oral pain 17%; myofacial pain 15.5 %; stomatitis\mucositis 14.5%; the prevalence of aphthous lesions, fissural cheilitis and tongue depapillation were at the same percentage which was 9.5%; then candidiasis 7.5%; the least prevalent oral symptoms was gingival bleeding at percentage of 2.5%.

Conclusions: COVID-19 has a noticeable effect on oral cavity, there was a correlations between some general and orofacial manifestations of COVID-19.

J Popul Ther Clin Pharmacol Vol 30(2):e131–e144; 14 January 2023.

Keywords: *COVID-19, Oral Symptoms, Dry Mouth, Gustatory Dysfunction.*

INTRODUCTION

Public health officials are gravely concerned about the harm that viral illnesses continue to pose to humanity, Various viral outbreaks, including the Middle East Respiratory Syndrome Corona-Virus (MERS-CoV), H1N1 influenza, the severe acute respiratory syndrome coronavirus (SARS-CoV-2) and SARS CoV-2 or COVID-19 that struck the globe in December 2019, Excitingly, the causative viruses in almost all of these pandemics are members of the same family, the Coronaviridae and they first infected mammals before spreading to humans, giving rise to spurious dynamics. [1]

The most popular deadly SARS-CoV-2 or COVID-19 is an extremely contagious illness that spread rapidly over the world. [2]

Fever, coughing, sore throat, muscle aches, arthralgia, headaches, dyspnea, and phlegm production are among the most often clinical symptoms. [3]

It has been suggested that COVID-19's involvement of the oral cavity has a multifaceted origin with many compounding processes, The oral cavity serves as a point of entry to the outside environment and is crucial to the propagation of SARS-CoV-2; Angiotensin-converting enzyme 2 (ACE-2) has been implicated in the involvement of a metallopeptidase enzyme as a functional receptor for SARS-CoV-2. [4]

A wide range of COVID-19 oral symptoms, such as ulceration, blisters, enanthems, hemorrhagic sores and cheilitis. [5, 6]

Numerous oral signs, including mucosal lesions, taste alterations, and gingivitis, have been recorded in the field; the oral lesions may be the first symptom of COVID-19 or a worrying sign of peripheral thromboembolism. [7, 8] Without concentrating on the direct consequences of viral infection, numerous papers have published on the impact of impaired health state on mucosal surface, such as the impacts of simultaneous infectious diseases and related illnesses. [6]

Since the dentists are in constant contact with patients and are susceptible to respiratory infections like COVID-19; they can be the first to diagnose the illness. [9]

Aim of study

The current study is aimed to investigate the prevalence of oral symptoms amongst COVID-19 patients due to the disease's aggressive nature and diverse symptomatology and to assess the impact of oral health conditions on COVID-19 disease severity in a sample of Iraqi people.

MATERIALS AND METHODS

Study design

An observational cross-sectional study was conducted on COVID-19 patients who were isolated in the Dar-AL Salaam Field Hospital in Iraq at the period of (September to December 2021).

This study included (200) patients in total, (81) male and (119) female, who were identified as SARS-COV2 patients and had their diagnosis and laboratory confirmation by PCR polymerase chain reaction.

Exclusion criteria

Patients older than 80 and younger than 16 years old were not included in this study because to the poorer patient compliance in these age groups.

Patients who refused to take part in any aspect of the investigation because they believed that being labeled as COVID positive was a stigma attached.

Additionally excluded patients with severe illnesses needing intensive care.

Patients who had oral lesions prior to COVID diagnosis.

All of the patients in this study answered a questionnaire that was written in both Arabic and English forms and included various manifestations that could be related to COVID-19 depending on the available data.

This questionnaire's list of symptoms was divided into three groups: the first group including the primary general symptoms of the disease like: cough, weakness, fever, myalgia, sore throat, runny nose, gastrointestinal symptoms.

The second group involving the intra oral manifestations of this disease which comprise: burning sensation, oral aphthous like lesions, taste alterations, salivary gland dysfunction (hyposalivation or dry mouth), tongue depapillation (redness), oral pain, cheilitis, candidiasis, gingival bleeding.

The third group consists of extra oral manifestations of the disease like: myofacial pain, temporomandibular joint dysfunction (limitation, clicking, subluxation).

RESULTS

A total of 200 [81 male (40.5%) and 119 female (59.5%)] COVID-confirmed patients were involved in the present study with mean age (36.69±17.22) years & age range of (16-78) years. (Table 1, 2).

The participants' ages or genders varied significantly from one another P-value (0.001). (Table 3)

According to the findings of the current study, at least one of the oral manifestations was present in 72.5% (n=145) of the patients, While about 27.5% (n = 55) did not experience any oro-facial symptoms. (Table 4).

The oral symptom with the highest prevalence was dry mouth 50% (n = 100) followed by gustatory dysfunction 37% (n=74) then burning mouth sensation 22.5% (n=45) after that the oral pain 17% (n=34); myofacial pain 15.5 %(n=31); stomatitis\mucositis 14.5% (n=29); the prevalence of aphthous lesions, fissural cheilitis and tongue depapillation were at the same percentage which was 9.5%(n=19) ;then candidiasis 7.5%(n=15) ; the least prevalent oral symptoms was gingival bleeding at percentage of 2.5%(n=5) . (Figure 1).

Regarding the general symptoms, the most prevalent symptoms was fever (83.5%) followed by weakness (80%) then myalgia (73%), head ache (70%), cough (65%), loss of smell sensation (54%), loss of taste sensation (48.5%), sore throat(38.5%), nasal congestion(26.5%), runny nose(25%) and the least prevalent symptom was gastrointestinal symptom(24.5%). (Figure 2).

There were no significant correlations between the occurrence of some of the oral manifestations and demographic factors (gender, age group) except for burning mouth and oral pain in which there was a high significant difference in relation to age group categories (p=0.000), (p=0.004) respectively; in addition to a significant variations among dry mouth, candidiasis and myofacial pain in relevance to age group (p=0.034) (p=0.029), (p=0.049) respectively. (Table 4)

Concerning the association between the general and oro-facial symptoms of COVID-19 patients (Table 5); there was no relation between cough and oro-facial symptoms; while the weakness was significantly related to dry mouth, tongue depapillation(p=0.039, 0.046) respectively and strongly related with the absence of any oral symptoms (p=0.009); myalgia was considerably related to gustatory dysfunction and tongue depapillation (p=0.024,0.012) respectively; fever was at a significant relation with aphthous lesion

(p=0.021);headache was significantly related with dry mouth and oral pain (p=0.015,0.043) and highly linked with myofacial pain(p=0.004); loss of smell sensation was strongly correlated with gustatory dysfunction & absence of oral symptoms (p=0.000, 0.007)respectively.

Loss of taste sensation was highly associated with gustatory dysfunction (p=0.000) and significantly associated with absence of oral symptoms (p=0.017).

Sore throat was significantly related with aphthous lesion, stomatitis\mucositis. (p=0.034, 0.023) respectively and highly associated with burning mouth, gustatory dysfunction, oral pain, myofacial pain and absence of oral symptoms. (p=0.010, 0.005, 0.001, 0.007, 0.010) respectively.

Runny nose was significantly related with stomatitis\mucositits. (p=0.041); while nasal congestion was significantly associated with aphthous lesion, oral pain and myofacial pain. (p=0.015, 0.045, 0.047) respectively and strongly associated with dry mouth, stomatitis\mucositis and gingival bleeding. (p=0.001, 0.000, 0.003) respectively.

Gastrointestinal symptoms were at a significant relation with aphthous lesion, fissural cheilitis and gingival bleeding. (p=0.031) and with stomatitis\mucositis (p=0.011) and had a high significant relation with gustatory dysfunction (p=0.001).

TABLE 1: Demographic characteristics of COVID 19 patients

Gender distribution (Male& Female)	N	Percent %	Age group	N	Percent %
Male	81	40.5%	under 30 years	100	50.0%
Female	119	59.5%	30 years & older	100	50.0%
Total	200	100.0%	Total	200	100.0%

TABLE 2: Age distribution in Years

N					
200	Mean	Std. Error of Mean	Std. Deviation	Minimum	Maximum
	36.69	1.218	17.228	16	78

TABLE 3: Correlations between gender and age groups

			Gender distribution (Male& Female)	Age Groups
Spearman's rho	Gender distribution (Male& Female)	Correlation Coefficient	1.000	-.214**
		Sig. (1-tailed)	.	.001
		N	200	200
	Age Groups	Correlation Coefficient	-.214**	1.000
		Sig. (1-tailed)	.001	.
		N	200	200
**. Correlation is significant at the 0.01 level (1-tailed).				

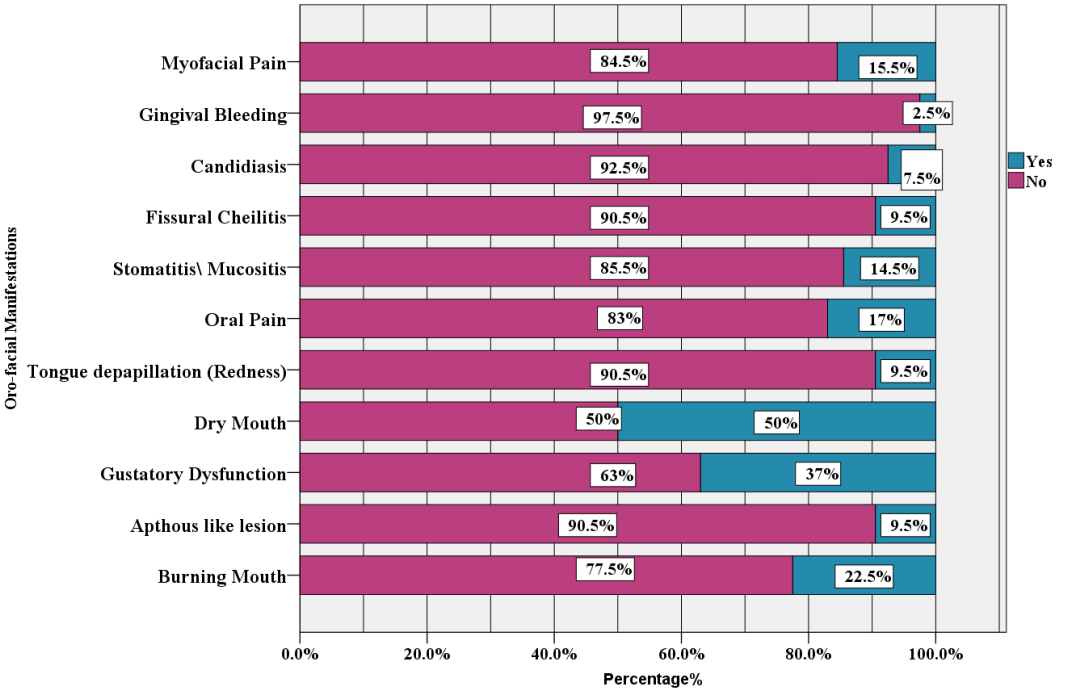

FIGURE 1: Prevalence of Oro-facial manifestation of COVID 19 patients

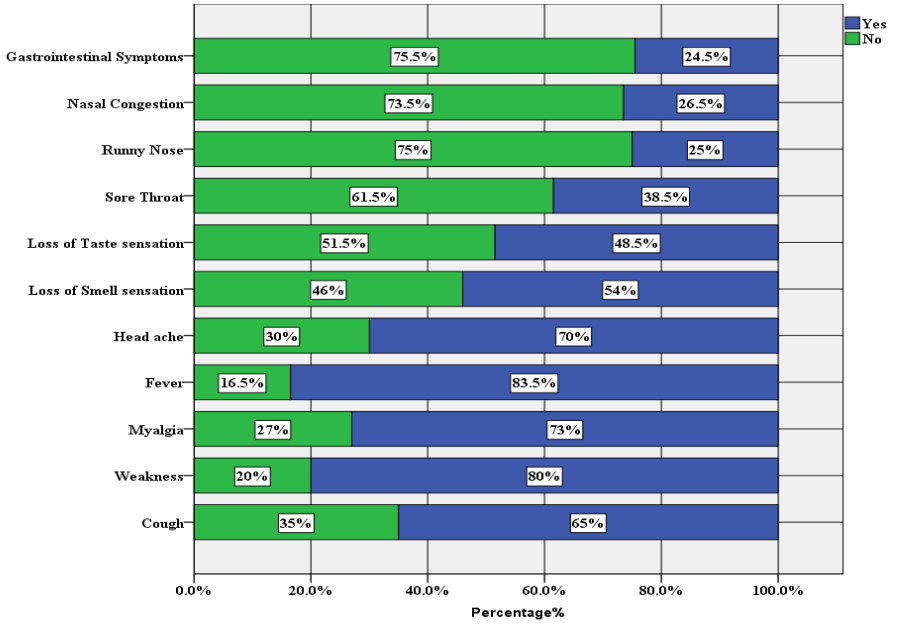

FIGURE 2: Prevalence of general manifestations of COVID-19 patients

TABLE 4: Association between oro-facial symptoms of COVID-19 and demographic data

Oro-facial manifestations	Parameter	Yes N	Yes %	No N	No %	P Value Exact Sig- (2 sided)
Burning Mouth	Gender : Male	19	23.5%	62	67.5%	0.863
	Female	26	21.8%	93	78.2%	
	Age Group: <30 years	11	11.0%	89	89.0%	.000**
	≥30 years	34	34.0%	66	66.0%	
Aphthous Lesion	Gender : Male	9	11.1%	72	88.9%	0.625
	Female	10	8.4%	109	91.6%	
	Age Group: <30 years	10	10.0%	90	90.0%	1.000
	≥30 years	9	9.0%	91	91.0%	
Gustatory Dysfunction	Gender : Male	28	34.6%	53	65.4%	0.655
	Female	46	38.7%	73	61.3%	
	Age Group: <30 years	41	41.0%	59	59.0%	0.305
	≥30 years	33	33.0%	67	67.0%	
Dry Mouth	Gender : Male	38	46.9%	43	53.1%	0.565
	Female	62	52.1%	57	47.9%	
	Age Group: <30 years	42	42.0%	58	58.0%	0.034*
	≥30 years	58	58.0%	42	42.0%	
Tongue Depapillation	Gender : Male	9	11.1%	72	88.9%	0.625
	Female	10	8.4%	109	91.6%	
	Age Group: <30 years	7	7.0%	93	93.0%	.335
	≥30 years	12	12.0%	88	88.0%	
Oral Pain	Gender : Male	15	18.5%	66	81.5%	0.703
	Female	19	16.0%	100	84.0%	
	Age Group: <30 years	9	9.0%	91	91.0%	0.004**
	≥30 years	25	25.0%	75	75.0%	
Stomatitis& Mucositis	Gender : Male	12	14.8%	69	85.2%	1.000
	Female	17	14.3%	102	85.7%	
	Age Group: <30 years	12	12.0%	88	88.0%	.422
	≥30 years	17	17.0%	83	83.0%	

Fissural Cheilitis	Gender : Male	7	8.6%	74	91.4%	0.810
	Female	12	10.1%	107	89.9%	
	Age Group: <30 years	5	5.0%	95	95.0%	.051
	≥30 years	14	14.0%	86	86.0%	
Candidiasis	Gender : Male	8	9.9%	73	90.1%	0.413
	Female	7	5.9%	112	94.1%	
	Age Group: <30 years	3	3.0%	97	97.0%	
	≥30 years	12	12.0%	88	88.0%	0.029*
Gingival Bleeding	Gender : Male	1	1.2%	80	98.8%	0.650
	Female	4	3.4%	115	96.6%	
	Age Group: <30 years	3	3.0%	97	97.0%	1.000
	≥30 years	2	2.0%	98	98.0%	
Myofacial Pain	Gender : Male	14	17.3%	67	82.7%	0.559
	Female	17	14.3%	102	85.7%	
	Age Group: <30 years	10	10.0%	90	90.0%	
	≥30 years	21	21.0%	79	79.0%	.049*
Absence of oral Manifestations	Gender : Male	25	30.9%	56	69.1%	0.421
	Female	30	25.2%	89	74.8%	
	Age Group: <30 years	32	32.0%	68	68.0%	
	≥30 years	23	23.0%	77	77.0%	.205

***** Correlation is significant at the 0.05 level (2-tailed)
**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 5: Correlations between general and Oro-Facial manifestations of COVID-19 patients

Spearman's rho Correlations sig.(1-sided) P value						
Inter relation statistics	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
Cough	0.166	0.430	0.281	0.278	0.118	0.127
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.315	0.249	0.242	0.239	0.123	0.108
Weakness	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.500	0.452	0.083	0.039*	0.046*	0.463
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.345	0.236	0.252	0.130	0.280	0.009**
Myalgia	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.477	0.271	0.024*	0.500	0.012*	0.309
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.470	0.472	0.284	0.085	0.274	0.070
Fever	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.121	0.021*	0.104	0.285	0.465	0.208
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.168	0.232	0.353	0.158	0.051	0.347
Head ache	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.427	0.187	0.400	0.015*	0.357	0.043*
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.448	0.357	0.385	0.070	0.004**	0.432
Loss of Smell sensation	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.073	0.361	0.000**	0.286	0.138	0.446
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.296	0.138	0.278	0.264	0.249	0.007**
Loss of Taste sensation	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.098	0.353	0.000**	0337	0.144	0.286
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.057	0.280	0.112	0.302	0.495	0.017*
	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.010**	0.034*	0.005**	0.235	0.093	0.001**

Sore Throat	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.023*	0.438	0.251	0.472	0.007**	0.010**
Runny Nose	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.314	0.244	0.433	0.052	0.166	0.140
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.041*	0.106	0.439	0.218	0.028	0.393
Nasal Congestion	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.214	0.015*	0.131	0.001**	0.143	0.045*
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.000**	0.492	0.268	0.003**	0.047*	0.051
Gastrointestinal Symptoms	Burning mouth	Apthous lesion	Gustatory dysfunction	Dry Mouth	Tongue Depapillation	Oral Pain
	0.214	0.031*	0.001**	0.435	0.227	0.234
	Stomatitis\ Mucositis	Fissural Cheilitis	Candidiasis	Gingival bleeding	Myofacial Pain	Absence of Oral symptoms
	0.011*	0.031*	0.420	0.031*	0.052	0.101

* Correlation is significant at the 0.05 level (1-tailed).
**. Correlation is significant at the 0.01 level (1-tailed).

DISCUSSION

In the current research, regarding gender distribution, the percentage of female (59.5%) exceeds that of male patients (40.5%) this was in agreement with Sylvester et al [10] who found that female patients were more likely to have long COVID-19 syndrome than male due to variations in immune response function; while the study of Tomo et al [11] reported that Male: female proportion was 1:1.

Our study found that the mean age of patients was (36.69 ±17.228) years, also Hassan et al [12] reported that the mean age of COVID patients was (37.67±14) years.

In the existing study, the relation between gender and age group was highly significant (p=0.001), this was in agreement with Kushwaha et al [13] who found that the gender difference across age groups was statistically significant (p<0.001).

In our study the most common oral symptom was dry mouth 50%, some studies had demonstrated dry mouth as a COVID-19 complaints. [14, 15, 16], Hyposalivation could be a complication of COVID-19-induced chronic sialadenitis, following the inflammatory destruction of the salivary glands, this destruction could be repaired by fibrosis affecting both the acini and the duct, resulting in hyposecretion.[17]

Investigations had reported gustatory and olfactory dysfunction in COVID-19 patients with comparatively high proportions everywhere on the world [18, 19] and this was in accordance with our results that show (37%) prevalence rate of gustatory dysfunction and (54%) loss of smell sensation; the pathogenic factors through which SARS infection results in olfactory or gustatory dysfunction remain unknown. [20].

Burning mouth sensation was prevalent of (22.5%) in the current research and according to a few studies [8, 21], COVID patients with moderate to severe symptoms had burning mouth symptoms that were linked to a possible candidal pathogen.

Some studies [22, 23] documented the prevalence of orofacial pain including (dental\oral, jaw bone, trigeminal neuralgia) among COVID-19 participants at 18.3% and this was in agreement with our results that reported prevalence rate of oral pain 17% and myofacial pain 15.5 %, Possible pathophysiological mechanisms include the dysfunction of hypoxic muscles brought on by coronaviruses as well as the activation of pain receptors by stressful events, which results in facial pain.

Lots of studies that have been published claim that oral lesions appear in COVID-19 patients as a result of debilitated immunity or as a side effect of COVID-19 treatment, these lesions including aphthous ulcers, erosions, mucocutaneous insults, geographic tongue, plaque-like lesions, candidiasis, mucormycosis, and Herpes Simplex Virus-1-associated ulcers. [8, 24, 25] this was in agreement with the current study that documented stomatitis\mucositis 14.5% then the aphthous lesions, fissural cheilitis and tongue depapillation 9.5% then candidiasis 7.5%.

Our results show that the gingival bleeding was the least prevalent oral symptom at percentage of (2.5%) in harmony with pilot study of ElKady et al [26] that established gingival bleeding as less prevalent symptom related with COVID 19; other case report study documented three COVID 19 cases with gingival bleeding. [27], this could be attributed to that the periodontal and gingival diseases are multi - faceted, with the main cause being the response to dental biofilm.

Furthermore our study revealed that (27.5%) had no oral symptoms related to corona virus, this is in alignment with the estimated number of symptomless COVID-19 patients, according to the suggested studies [28, 29].

Patients with COVID-19 may present with a variety of clinical symptoms, these symptoms, such as cough, fever, headache and dyspnea, are usually nonspecific [30], in the present study, fever was the most common symptoms (83.5%) also Hui and Zumla [31] estimated that prevalence of fever in adults COVID 19 patients was (79.43 %), which indicates how an organism reacts to toxins that affect its thermal- regulating processes.

A systematic review study [32] show proportions of general COVID symptoms as follow: cough 54.52%, dyspnea 30.82%, malaise 29.75%, fatigue 28.16%, sputum secretion 25.33%, dermatological manifestations 20.45%, sore throat 14.41%, rhinitis 14.29%, headache 12.17% and diarrhea 9.59%.

In actuality, patients with greater scores for pain feeling anxious were seen to have anxiety symptoms that worsened more quickly after the pandemic appeared; accordingly, the COVID-19 virus outbreak may serve as a stressful event toward which patients with greater pain anxiety scores react by becoming more anxious and experiencing progressive deterioration of their symptoms [33], The elevated threshold anxious scores that distinguish the burning mouth syndrome community may provide an explanation for such findings.[34,35], in accordance with our results that demonstrated that the incidence of burning mouth sensation was at a high significant relation to age groups.

Regarding the oral pain in the current study there was a high significant difference in relation to age groups, similar study reported that the pandemic's leading cause of urgent care was excruciating orofacial or dental pain [36] However, pre-pandemic research indicates that there is a higher demand for emergency visits at dental offices, some public medical offices, and emergency rooms due to the high orofacial/dental pain. [37]

Since hyposalivation and xerostomia are more common as part of the aging process, especially in those more than 60; the age-relation with COVID-19 xerostomia is still unclear as documented by Hopcraft and Tan [38]; however in our study the results show a significant differences between dry mouth and age groups, also, a study conducted by AbuBakr [22] established that 47.6% of Egyptian COVID patients having xerostomia, with a mean age of 36.2 years.

Age was found to be a statistically important risk component for oropharynx candidiasis in COVID-19, according to a study Salehi et al [39]. With age, the innate salivary defense is significantly reduced, also in the current study; the oral candidiasis had a significant difference in relation to age groups.

Age and myofacial pain have no correlation, according to research by Karaarslan et al. [40]. In contrast we found a significant relation between myofacial pain and age group. (p=0.049); SARS-CoV-2 and myofacial pain are not directly correlated with one another. However, it is conceivable that extended periods of inactivity or bed rest (such as those associated with prolonged hospitalization) could cause muscular fatigue, aplasia, or mental stress, which could then result in the development of latent fascial trigger point.

Additionally, the up regulation of Interleukine-6 results in joint and muscle pain, most frequently mediates myalgia throughout viral illness. [41]

Our study's findings demonstrated a correlation between some general and oro-facial manifestations of COVID-19 and depending on some research findings; the majority of oral symptoms were associated with severe COVID-19. [42, 43] This might be related to the COVID-19-induced hyper inflammation. [44]

A recent study of Binmadi et al [45] reported that the oral manifestations were more prone to develop in patients with fatigue that persisted for longer than 5 days ($p < 0.0007$) also reported that the most frequent oral symptom in patients who had lost their sense of smell was a taste disorder ($p = 0.0122$) and that the oral symptoms were more probable to appear in patients with chronic or recurrent headaches ($p = 0.0336$), this was in agreement with our results which demonstrated that, weakness was significantly related to dry mouth, tongue depapillation(p=0.039, 0.046) and the loss of smell sensation was strongly correlated with gustatory dysfunction (p=0.000) and headache was significantly related with dry mouth and oral pain (p=0.015,0.043).

CONCLUSIONS

According to our research, COVID-19 has a noticeable effect on oral cavity; dry mouth was the most prevalent oral symptoms followed by gustatory dysfunction. There was debate over the cause of other non-specific orofacial symptoms, which may be related to co-infections, debilitated immunity, or deleterious drug interactions and there was a correlations between some general and orofacial manifestations of COVID-19, further studies recommended for the detailed associations between the oral and systemic symptoms of this disease.

CONFLICT OF INTEREST

No conflict of interest.

FUNDING

Self-funding.

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