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Survey of Oral Manifestation of Covid-19 in Medical Specialties in Sulaimaniyah City Hospitals

Sangin Ali M Amin (BDC)[1] ,Khadija Mohamed Ahmed (PhD)[2]
[1] Ministry of Health , Sulaimaniyah , Iraq
[2] Department of Oral Diagnosis, College of Dentistry, University of Sulaimani, Sulaimani, Iraq

Abstract

Background: The coronavirus disease 2019 is a serious infection resulting in a global threat caused by coronavirus 2 (SARS-CoV-2) characterized by different symptoms, ranging from mild flu to severe pneumonia.
Objective: To focus on the oral manifestations which could be present in some cases of COVID-19 and to assess the associations between oral health and COVID19.
Patients and Methods: An online questionnaire survey was performed on188 medical specialists in Sulaimaniyah city. The questionnaire was composed of 3 parts; the 1st part included demographic features. The 2nd part was composed of questions concerning the oral hygiene condition of the participants, and the 3rd section encompassed questions about oral complications during infection with COVID-19.
Results: Among 188 participants, 92% complained of oral manifestation while being infected with Covid-19 at significant levels. Facial and masticatory muscle pain 27.1%, facial or oral numbness 8%, jaw bones or joint pain 39.9%, changes in buccal mucosa and gingiva 10.1%, bleeding gingivitis 9%, Altered taste sensation 67.6%, altered smell sensation 69.1% and xerostomia 54.8% were highly associated with Covid-19.
Conclusion: Some cases of Covid-19 usually present with different oral manifestations. Therefore, oral care monitoring should be enhanced for Covid-19 patients and maintain good oral health.
Keywords: Xerostomia, ageusia, dysgeusia, hypergeusia, hypogeusia, anosmia, parosmia, hyposmia, hyperosmia, coronavirus, COVID-19

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Correspondence Address: Sangin Ali M Amin
Ministry of Health , Sulaimaniyah , Iraq
Email: sangin.m.amin@gmail.com

Website: https://djm.uodiyala.edu.iq/index.php/djm

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Introduction

Coronavirus disease 2019 (COVID-19) is a major extensive threat caused by coronavirus 2 (SARS-CoV-2), resulting in critical acute respiratory syndrome. Since the outbreak, COVID19 has affected 11,301,800 people [1, 2]. This human-to-human transmission of COVID-19 has recently come out affecting thousands of individuals throughout the world and having lifethreatening outcomes. It affects healthy young and immunocompromised individuals as well. The coronavirus apparently has special abilities to spread and weaken the immune mechanisms in humans [3]. Current research shows that coronavirus invades human cells via the receptor angiotensin-converting enzyme 2 (ACE2), which is largely present in humans in the epithelia of the lung and small

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intestine and has also been found in oral mucosa, especially with more density on the dorsum of the tongue and salivary glands relative to buccal mucosa or palate [4,5]. This is because coronavirus targets cells scattered with ACE2 receptors and hence causes inflammatory responses in organs and tissues with such receptors, including the tongue mucosa and salivary glands. This interaction between the virus and ACE2 receptor in tongue mucosa may also debilitate gustatory responses through damaging taste bud sensitivity [6-9].

Among the general manifestations of Covid-19, the most commonly reported symptoms are fever, myalgia or fatigue, headache with nausea, vomiting, dry cough, shortness of breath, sore throat and nasal congestion, dysosmia, and dysgeusia [10, 11].

Regarding the oral manifestations, since various pulmonary diseases and systemic disorders with pulmonary involvement are associated with oral manifestations, COVID-19 can also manifest itself through oral symptoms [12]. Oral health deteriorated in hospitalized patients with serious systemic illness due to mouth breathing, lack of mouth care, and hyposalivation resulting in rapid oral health degradation and subsequent complications [13].

There is a long-standing association between olfactory disorder and taste disturbances with respiratory viral infections [14, 15]. About 38% of patients with COVID-19 complain of taste disturbance as the first recognizable oral symptom [5]. Aphthous-like lesions are among the most common oral manifestation of COVID-19 disease. In addition to herpetiform lesions and candidiasis. The most common factors predisposing to the severity of oral lesions in COVID-19 patients are older age and severity of COVID-19 disease. Among the most important factors leading to the development of oral lesions in COVID-19 patients are decreased oral hygiene maintenance, emotional disturbance, underlying systemic diseases, compromised immune system, and hyper-inflammatory response secondary to COVID-19 [16].

Concerning the management of Covid-19, the treatment of choice for COVID-19 includes antiviral drugs or specific therapy and supportive management of complications, including advanced organ support [17,18]. Systemic and topical steroids are not recommended for COVID-19 infection [19]; therefore, some of the immune-related long-term oral medicine conditions (pemphigus, lichen planus, pemphigoid) may potentially aggravate in CoVID-19positive patients who were instructed to discontinue such therapy [20].

Patients and Methods

This survey study was conducted from December 2021 to May 2022 among 185 medical specialists in Sulaimaniyah hospitals who recovered from COVID-19, including recovered dentists, nurses, and physicians, who voluntarily answered the questionnaire. Furthermore, ethical approval was acquired from the Research Protocol Ethics Committee of the Kurdistan Board of Medical Specialties. Furthermore, a Google Form was developed to create an online questionnaire containing multiple manifestations that were to be associated with COVID-19 based on the available evidence. The inclusion criteria were any

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medical specialist previously or currently infected with laboratory-confirmed COVID-19 infection (The polymerase chain reaction (PCR) test), willing to participate and fill the electronic case sheet, and have no underlying systemic diseases. The questionnaire consisted of 3 sections; the 1st section included demographic data as well as smoking and alcohol consumption. The 2nd section is composed of questions regarding the oral hygiene status of the patients; it was designed to accommodate Kamel *et al*.'s questionnaire [21] and the WHO oral health surveys [22].Furthermore, a question regarding participants' hygienic measures taken while being infected with COVID-19 was added to the same section. The 3rd section included questions referring to the oral manifestations the patients complained of while being infected with COVID-19.

Statistical Analysis

The statistical study was performed using the SPSS software package (version 16). Tables and graphs illustrated the frequency distribution, percentages, and relation of studied parameters. The Chi-square test was conducted in order to see the correlation between categorical variables. Statistical significance for variables was considered with a P value<0.05.

Results

Patient characterization and demographic features of the studied samples

A total of 188 patients with covid-19 were enrolled in this study. Most patients were female (73.4%), with the (66%) age range between 20-30 years old. The majority of the patients were in the Sulaimaniyah region (92%), and most of them reported no smoking (86.2%) and no drinking (93.1%). Regarding the frequency of tooth brushing (91.5) reported tooth brushing once a day or more frequently, with (66%) using a toothbrush, toothpaste, and fluoride. However, only about (47.9) claimed to visit a dentist once every few years or just in case of pain. Nevertheless, amongst 188 patients, 7 of them (3.7%) reported having mobile teeth. Details are shown in Table (1).

Table (1): Demographic features of the participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	**Male**	50	26.6	26.6	26.6
	Female	138	73.4	73.4	100.0
	Total	188	100.0	100.0	
Age	**20-30**	124	66.0	66.0	66.0
	30-40	58	30.9	30.9	96.8
	40-50	6	3.2	3.2	100.0
	Total	188	100.0	100.0	
Region	**Sulaimaniyah center**	173	92.0	92.0	92.0
	Rural Area	15	8.0	8.0	100.0
	Total	188	100.0	100.0	
Smoking	**No**	162	86.2	86.2	86.2
	Yes	26	13.8	13.8	100.0
	Total	188	100.0	100.0	

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Drinking	**No**	175	93.1	93.1	93.1
	Yes	13	6.9	6.9	100.0
	Total	188	100.0	100.0	
Brushing Teeth	**None**	3	1.6	1.6	1.6
	once a day or more frequently	172	91.5	91.5	93.1
	once a week or less frequently	13	6.9	6.9	100.0
	Total	188	100.0	100.0	
ways to clean teeth	**None**	5	2.7	2.7	2.7
	using toothbrush only	59	31.4	31.4	34.0
	using toothbrush, fluoride, toothpaste, and dental floss	124	66.0	66.0	100.0
	Total	188	100.0	100.0	
How often do you visit dental clinic?	**None**	18	9.6	9.6	9.6
	once a year or more frequently	80	42.6	42.6	52.1
	once every few years or during pain	90	47.9	47.9	100.0
	Total	188	100.0	100.0	
Do you have teeth that are mobile?	**no/i don't know**	181	96.3	96.3	96.3
	Yes	7	3.7	3.7	100.0
	Total	188	100.0	100.0	

The patients' oral manifestations during Covid-19 infection

Regarding the occurrence of the oral manifestations concomitant with the Covid-19 infection, the result showed a statistically significant correlation, in which (92%) of the participants complained of the oral manifestations during the pandemic. However, subjective findings like facial muscles and joint pain, oral numbness, and mucosal change were not increased during the pandemic, and the majority of the participants reported negative results (72.9%, 60.1%, 92.0%, and 89.9%, respectively). Furthermore, the differences were statistically significant. Interestingly, subjective findings like the altered taste, altered smell, and xerostomia were highly increased during the pandemic (67.6%, 69.1%, and 54.8%, respectively), and the result for each again showed statistically significant correlation, as shown in Table (2)

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Table (2): Highly significant correlation between the oral manifestations and the pandemic

	oral manifestations while being infected with COVID-19				
oral manifestations	Answer	Number	percentage [%]	chi-square	p-value
Occurrence of oral manifestations	No	15	8.0	132.787	< 0.000 *
	Yes	173	92.0		
facial and masticatory muscle pain	No	137	72.9	39.34	< 0.000 *
	Yes	51	27.1		
facial or oral numbness	No	173	92.0	132.787	< 0.000 *
	Yes	15	8.0		
pain in jaw bones or joint pain	No	113	60.1	7.681	< 0.000 *
	Yes	75	39.9		
changes in buccal mucosa, gingiva	No	169	89.9	119.681	< 0.000 *
	Yes	19	10.1		
bleeding gingivitis	No	171	91.0	126.149	< 0.000 *
	yes	17	9.0		
xerostomia	No	85	45.2	1.723	0.189
	Yes	103	54.8		
Altered taste	No	61	32.4	23.17	< 0.000 *
	Yes	127	67.6		

Degrees of altered taste sensation during infection with Covid-19

Table (3) demonstrates the highly significant correlation between the degrees of taste change during the pandemic. Moreover, it shows that (34.6%) of the participants reported having ageusia during the infection, followed by hypogeusia (31.5%) and dysgeusia (22.8%). However, the lowest percentage complained of hyperguesia (11%).

Table (3): significant correlation between the degree of taste change and the pandemic

		Number	percentage [%]	chi-square	p-value
Altered Taste	Ageusia	44	34.6	17.031	< 0.001 *
	Dysgeusia	29	22.8		
	Hypergeusia	14	11.0		
	Hypogeusia	40	31.5		

Degrees of altered smell sensation during infection with Covid-19

According to the result, more than half of the participants (51.5%) claimed to have anosmia and (29.2%) complained of hyposmia, and the least percentages reported having parosmia (10%) and hyperosmia (9.2%). Moreover, the result for all of them showed a statistically significant correlation. Details are shown in Table (4).

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Table (4): significant association between the degree of smell change and the pandemic

		Number	percentage [%]	chi-square	p-value
Altered Smell	Anosmia	67	51.5	62.185	< 0.000 *
	Hyperosmia	12	9.2		
	Hyposmia	38	29.2		
	Parosmia	13	10.0		

Oral manifestations before the pandemic compared to the oral manifestations during the pandemic

When considering the oral manifestations, the results of this study show that only 74 out of 188 participants reported having oral manifestations before the pandemic. However, this number increased to 173 during the pandemic, indicating increased oral manifestations during the pandemic. Hence, it shows a statistically significant association between oral manifestations and the pandemic. Details are shown in Table (5).

Table (5): Comparison of the oral manifestations before and after the pandemic

		Before	**During**	**Chi-square**	**p-value**
oral manifestation	**no**	114	15	115.657	< 0.000 *
	yes	74	173		
	Total	188	188		

Oral manifestations during Covid-19 infection with gender

As illustrated previously, most participants were female; thus, there is a statistical association between most of the subjective oral findings during the pandemic and gender. Among these findings that are significantly associated with the female gender are (altered smell and taste, xerostomia, pain in facial bones and joints, and facial and masticatory muscle numbness). Further illustrations are found in Figure (1).

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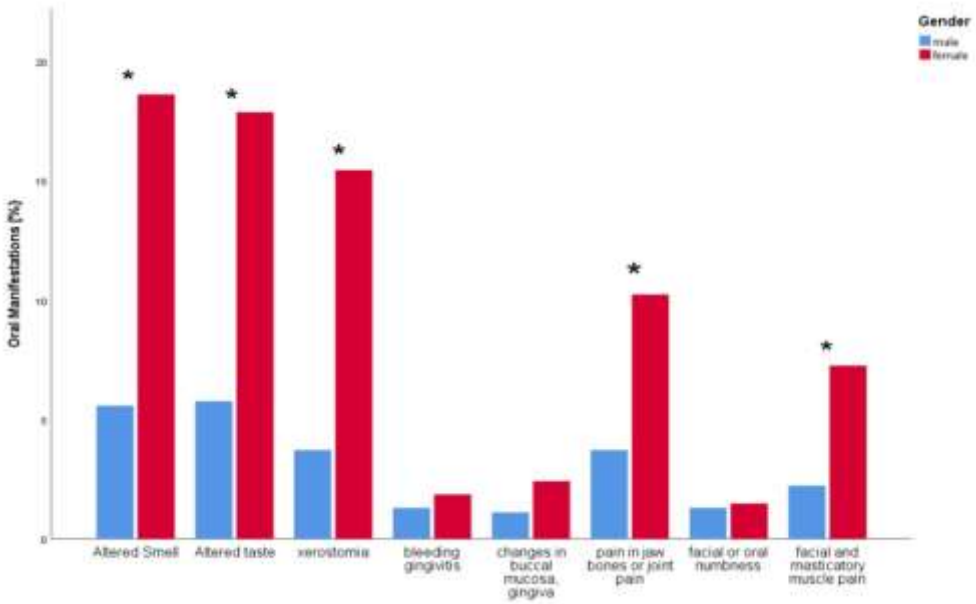

Figure (1): Oral manifestations during Covid-19 infection in relation to gender

The association between oral hygiene measures and the incidence of oral manifestations during infection with Covid-19.

The following result shows that the participants' responses regarding the oral hygiene measurements were the same (neither increased nor decreased) and were significantly associated with the incidence of oral manifestations like the altered smell, altered taste, xerostomia, facial bone, and facial muscle pain. On the other side, the oral hygiene measure was either increased or decreased in relation to other manifestations. The demonstration is seen in Figure (2).

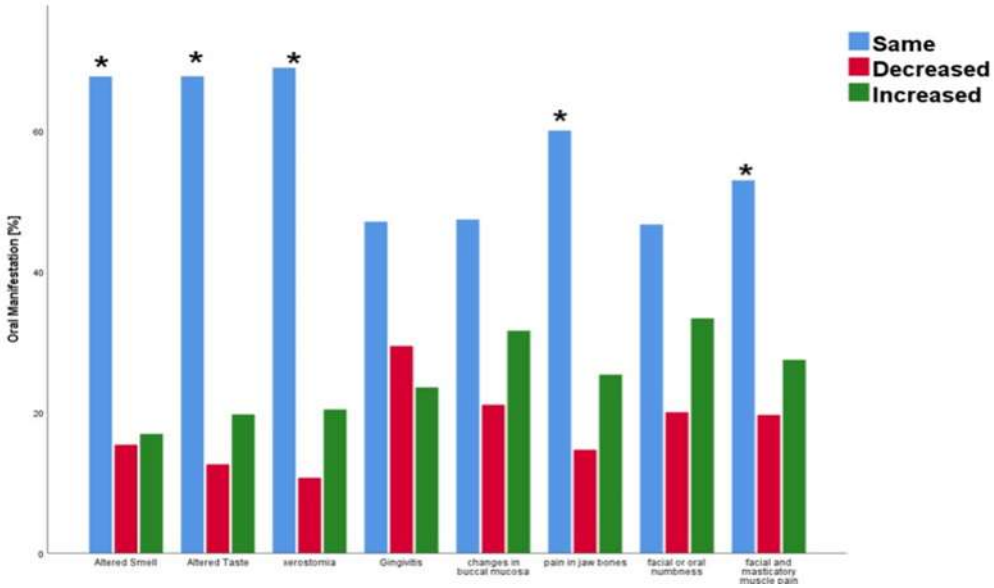

Figure (2): Correlation between oral hygiene measures and the incidence of the oral manifestations during the pandemic

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Discussion

Coronavirus 19 (COVID-19) was discovered in 2019 and rapidly developed worldwide [23]. The current study showed that Covid-19 infection was significantly higher among female patients since more female participants were enrolled in the study than male participants. However, it also revealed that many participants were young [20-30]. Hence, This result is in agreement with a previous study by Covid *et al*., who reported that 55% of patients with covid19 were aged between (16-44) and 73% were female [24].

The present study shows the prevalence and type of oral manifestations of COVID-19 survivors. It was investigated, and it has been found that 27% of the participants reported having oral and facial muscle pain and 8% claimed to have orofacial numbness during the pandemic; this finding confirms the results of the previous studies conducted by Abubakr *et al*., [25] who proved that oral manifestations could be seen in some cases of COVID-19 infection at a varying rate. Moreover, it agrees with the study by Gherlone *et al.* [26], who concluded that facial pain and masticatory muscle weakness were also common among Covid-19 patients. This finding is attributed to a psychological problem or emotional discomfort that alleviates orofacial or dental pain, which is observed in almost all COVID-19 patients [27, 28]. Moreover, 39.9% of the participants complained of facial bone and joint pain which can be explained by the fact that bone and joint tissue physiology are affected by systemic inflammation during COVID-19, and the cytokines known to be induced as a result of COVID19 are IL-17 and TNF-α which increase bone resorption and decrease bone proliferation (2931).

Additionally, some psychological symptoms such as irritation, fear, anxiety, tension, malnutrition, and insomnia are frequently seen in patients with Covid-19 and are known to aggravate facial and joint pain. [27,28]. This result supports a previous study by Abubakr *et al*., who assumed that joint pain in COVID-19 patients is most likely caused by stress and psychological discomfort rather than mechanical and occlusal aspects. Worried people usually grind and clench their teeth which in turn causes muscle spasms and fatigue [25].

Furthermore, since all the participants were enrolled in this study through an online questionnaire and there was a lack of direct oral examination, any ulcerative lesion, candidal infection, or swelling were considered changes in buccal mucosa and gingiva. In the present study, 10.1 % of the participants reported changes in their buccal mucosa and gingiva during the pandemic, and this result is concomitant with the previous study conducted by Iranmanesh *et al.* [32]. The elevated level of tumor necrosis factor (TNF)-α in Covid-19 patients could explain this fact as it results in chemotaxis of neutrophil to oral mucosa and formation of oral lesions [33]. In this study, oral measures (bleeding gingiva and mobile teeth) were set in the questionnaire indicating periodontal disease. Increased dental plaque results in microbial overload, which may provide an oral environment for respiratory pathogens and may associate with Covid-19 pathology [34]. The result of this study shows that a considerable range of the participants had mobile teeth and bleeding gingiva; this result

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is in concordance with a finding of the study by Larvin *et al*., who found increased bleeding gingiva and mobile teeth during Covid-19 and concluded that periodontitis is associated with the severe outcome of Covid-19 [34].

Moreover, a remarkable number of the participants had dry mouth (xerostomia) in this study. This result supports a study by Biadsee et al., who found xerostomia in many of their participants and associated it strongly with burning mouth and taste change [35]. In another study by Abubakr *et al*., 47.6% of the participants reported xerostomia as one of their symptoms [25]. The certainty could suggest that angiotensin-converting enzyme 2 (ACE2)-positive cells are the target of SARS-CoV-2, and these cells are abundant in the duct epithelium of the salivary glands. Therefore, the salivary glands are a possible target for COVID-19 infection [36].In addition, dry mouth could be the negative impact of drugs, particularly antibiotics [26].

In the present study, the participants reported altered taste and smell in a significant amount which is concomitant with the findings of the previous studies conducted by Biadsee *et al*. [35] and Parma *et al*. [37], suggesting that Covid-19 predominantly affects chemosensory function across multiple sensory modalities and hence disruption of these may be a possible indicator of Covid-19 [37].

Anosmia (loss of sense of smell) and dysgeusia (alteration of the sense of taste) have been reported in association with the Covid-19 pandemic. Dysgeusia may be associated with disturbance in taste perception caused by loss of the sense of olfaction [38]. The present study revealed a significant correlation between the degree of taste and smell disturbance during the pandemic. This result supports a previous study by Kerr *et al*. [39], who concluded that 28% of the patients reported complete loss of sense of smell (anosmia), and 17% reported complete loss of sense of taste (ageusia). It also agrees with a study by Kaye *et al*., who reported on 237 patients with COVID-19 and found that 73% reported anosmia and that loss of sense of smell was the initial symptom in 26.6%[38].

Furthermore, the result of the current study shows that the oral manifestations increased during the pandemic among the participants compared to before the onset of the disease. In terms of taste and smell disturbance, this finding supports the result of the previous study conducted by Parma *et al.* [37] who reported a significant impairment of smell and taste sensation during the pandemic compared to before the onset of that disease.
Regarding the gender associated with the oral manifestation during Covid-19, this study shows that the female gender had a significantly higher association with the oral manifestations than the male gender during Covid-19 infection. Several studies support this finding. Biadsee *et al*. concluded that facial pain was significantly higher among female than male patients (35). In another study by Omezli and Torul, taste and smell impairments were more frequently observed in female patients [40]. Also, Abubakr *et al*.; stated that jaw bone and joint pain were significantly higher among female patients (25). It also agrees with the findings of the study reported by Gaş *et al*., who stated that temporomandibular joint and muscle pain

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tended to be more prevalent among female patients during the Covid-19 pandemic [41].

The final parameter in this study is the incidence of oral manifestations during infection with Covid-19 concerning the rate of the oral hygiene measures taken by the participants. It shows that the oral hygiene measure was the same (neither increased nor decreased) in relation to some of the oral findings (altered smell, altered taste, xerostomia, jaw bone, and facial muscle pain). This is because our participants were highly educated and maintained good oral hygiene before and during the pandemic. However, in relation to other oral findings, the oral hygiene measure of the participants was changed. A study by Zhang et al. found that the prevalence of gingival bleeding, bad breath, and oral ulcer decreased as the participants brushed their teeth twice or more; however, no significant change was found in the prevalence of joint and muscle pain in relation to tooth brushing, and this could support the result of the present study [42].

Furthermore, in a study by Folayan *et al*., about 10% of respondents reported decreased toothbrushing frequency, and about 13% had oral ulcers during the COVID-19 pandemic [43].

Conclusions

Coronavirus disease 2019 (Covid-19) is a serious respiratory viral infection that has spread rapidly across the world. Besides the general symptoms like dry cough, fever, fatigue, sore throat, and headache, Covid-19 patients can also complain of some oral symptoms such as dental and facial pain, facial bone/joint pain, ulceration, xerostomia, and altered taste/smell sensation. The latter could be the first manifestation of Covid-19 and present in varying degrees. These symptoms could be present during infection with the pandemic or even after recovery. A healthy oral cavity is regarded as important to overall health and well-being; hence, thorough checkups of the oral cavity during the pandemic are exceptionally important. Many factors predispose patients with Covid-19 to develop orofacial symptoms, including stress and anxiety related to the infection, systemic inflammation, and the side effects of the drugs.

Oral hygiene, on the other hand, is essential in reducing infection in the oral cavity and its transfer into the respiratory tract. Besides, oral hygiene maintenance reduces oral symptoms during the infection. Therefore, it is predominantly necessary for oral healthcare professionals to be actively involved in the control and diagnosis of Covid-19. The general management of Covid-19 includes supportive care and management of complications.

Recommendations

The present study suggests the need for a further study concerning the association of Covid-19 with oral manifestations since it’s a newly emerged disease.

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Conflict of interest: Nil

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المظهر الفموي ل كوفيد-١٩ في التخصصات الطبية لمستشفيات مدينة السليمانية

سنكين علي محمد امين [١]، خديجة محمد احمد [٢]

الملخص

خلفية الدراسة: جائحة فيروس كورونا ٢٠١٩ (COVID-19) هي عدوى عالمية خطيرة يسببها فيروس كورونا ٢ (SARS-CoV-2) وتتميز بمجموعة واسعة من الأعراض بدأ من الأنفلونزا الخفيفة وحتى الالتهاب الرئوي الحاد.
اهداف الدراسة: لتركيز على المظاهر الفموية التي يمكن الإبلاغ عنها في الحالات الخفيفة إلى المعتدلة من COVID-19)) وتقييم الارتباطات بين صحة الفم ومرض COVID-19.
المرضى والطرائق: تم إجراء استبيان إلكتروني على ١٨٨ مختصاً في المجال الصحي لمدينة السليمانية بعد تطبيق معايير الاستبعاد. الاستبيان كان عبارة عن ٣ أقسام؛ تضمن القسم الأول بيانات ديموغرافية ، احتوى القسم الثاني على أسئلة تتعلق بحالة نظافة الفم للمشاركين وتضمن القسم الثالث أسئلة حول المضاعفات الفموية أثناء الإصابة بـ COVID-19.
النتائج: تم تسجيل ما مجموعه ١٨٨ مشاركًا في هذه الدراسة الاستقصائية حيث اشتكى ٩٢ ٪ منهم من مظاهر الفم أثناء الإصابة بـ Covid-19 على مستويات كبيرة. آلام عضلات الوجه والمضغ ٢٧,١٪ ، خدر في الوجه أو الفم ٨٪ ، ألام عظام الفك أو ألام المفاصل ٣٩,٩٪ ، تغيرات في الغشاء المخاطي الشدق واللثة ١٠,١٪ ، نزيف التهاب اللثة ٩٪ ، تغير في حاسة التذوق ٦٧,٦٪ ، تغير في حاسة الشم ٦٩,١٪ ، جفاف الفم ٥٤,٨ ٪ حيث جميع هذه الحالات كانت مرتيطة بشكل كبير بـ Covid-19.
الاستنتاجات: عادة ما تظهر الحالات الخفيفة إلى المتوسطة من Covid-19 مع مظاهر فموية مختلفة لذا يجب تعزيز مراقبة العناية بالفم لمرضى Covid-19 من أجل إدراك الآثار طويلة المدى لمرض Covid-19 والحفاظ على صحة الفم بصورة جيدة.

الكلمات المفتاحية: جفاف الفم، الفقدان الكامل للتذوق، اضطراب التذوق، زيادة حاسة التذوق، فقدان الشم ، قصور حاسة الشم، نقص حاسة الشم ، فرط حاسة الشم ، فيروس كورونا ، كوفيد -١٩

البريد الالكتروني: sangin.m.amin@gmail.com

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[١] وزارة الصحة - السليمانية – العراق
[٢] كلية طب الاسنان – جامعة السليمانية - السليمانية - العراق