



## Scientific Research Report

## Prevalence of Anosmia or Ageusia in Patients With COVID-19 Among United Arab Emirates Population

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## ABSTRACT

**Objective:** The aim of this research was to determine the relationship and prevalence of taste and smell dysfunction in patients with COVID-19 in the United Arab Emirates (UAE) population.

**Methods:** Enrolled participants were interviewed online via a phone call after obtaining their informed consent. Quantification of smell, taste, and other sensations before, during, and after COVID-19 infection was correlated with the severity of COVID-19 symptoms.

**Results:** A total of 500 patients with (mild–severe) COVID-19 completed the survey. A total of 26.4% were asymptomatic, and 21.4% were classified as paucisymptomatic with less severe symptoms. Almost equal proportions of the studied population experienced extreme taste sensation reductions (43%) and loss of smell sensation (44%). Statistically significant drastic decreases in smell and taste senses were seen among younger individuals. The magnitude of reduction in both sense changes increased steeply from the asymptomatic group to the paucisymptomatic group to the symptomatic group.

**Conclusions:** Sudden anosmia or ageusia need to be recognised for early detection of COVID-19 infection to identify otherwise hidden carriers, thus favoring an early isolation strategy that will restrict the spread of the disease.

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## Introduction

Evidence has demonstrated that an abrupt absence of smell and taste has been observed even when other general symptoms of COVID-19 infection are not present. This may act as another gateway to the early identification of patients with COVID-19.<sup>1–3</sup> The exact mechanism that causes patients with COVID-19 to experience such manifestations is still not clear. Zhou et al. suggested that the angiotensin-converting enzyme 2 (ACE2) receptor is used by COVID-19. ACE2 is distributed throughout the oral and nasal cavities, especially

throughout the tongue, where it plays a part in the sense of taste. The COVID-19 virus influences the role of taste by acting as an inhibitor of ACE2.<sup>4</sup> On the other hand, Bran et al. proposed another pathway in which the COVID-19 virus activates olfactory nonneuronal cells, rather than sensory or bulb neurons, subsets of olfactory epithelium sustentacular cells expressed CoV-2 receptor and failed to detect ACE2 expression in mature olfactory sensory neurons.<sup>5</sup> Lee et al. stated that taste and smell impairment was substantially more common among females and younger people.<sup>6</sup> The study also examined the relationship of anosmia and ageusia with multiple comorbidities in patients with COVID-19 (hypertension, diabetes, cancer, congestive heart failure, etc). Among 2342 patients, 15.7% reported anosmia or ageusia.

In view of these results, the correlation of anosmia and/or ageusia to the early detection of COVID-19-infected cases could identify otherwise hidden carriers, thus favoring an

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early isolation strategy that will restrict the spread of the disease. Therefore, the purpose of this study was to determine the relationship and prevalence of smell and taste dysfunction in patients with COVID-19 in the United Arab Emirates (UAE) population.

## Materials and methods

This cross-sectional observational study was conducted in Dubai with the approval of the Dubai Research Ethics Committee (DSREC-08/2020 31). Patients diagnosed with COVID-19 in private and governmental clinics and hospitals report to the Dubai Health Authority (DHA), which is the governmental health care entity responsible in Dubai. All the cases recruited in this study were from the DHA records; thus, the study sample was from all governmental and private clinics and hospitals in Dubai. Cases based on clinical features and confirmed by a real-time polymerase chain reaction test using a nasopharyngeal swab were recruited from August 28 to September 11, 2020. The study involved patients who were home-isolated, hotel-isolated, or hospitalised during the active period of the disease. A total of 880 participants were approached during the data collection process to fill out the questionnaire. Patients excluded were those younger than 18 years old, as they require the presence of a guardian and might not answer accurately, patients under ventilation, those with a previous history of dementia or taste and smell dysfunction, patients who did not answer, those who refused to participate, patients with a language barrier, and those who did not provide clear answers. Therefore, the overall number of participants in this study who matched the exclusion and inclusion criteria was 500 participants. The patients' consent was obtained by uploading the consent form via an online application and requesting a reply with their approval.

The questionnaire used in this study was obtained from the Global Consortium of Chemosensory Research (<https://gchemosensr.org/>) in both Arabic and English versions with some applied modifications to assess both quantitative and qualitative changes in smell, taste, and other sensations in the mouth (eg, burning, tingling, cooling) before, during, and after the active period of the disease.<sup>1</sup>

To assess the personal perception of nasal block severity, smell intensity, taste sensation, and the ability to feel other sensations in the mouth (eg, burning, cooling, or tingling), a visual analog scale with a score varying from 1 to 10, where a score of 1 is the minimum and a score of 10 is the maximum, was used. The personal perception of the mentioned sensations was recorded at 3 different durations, the first was a baseline right before COVID-19 infection, the second was during the illness, and the last was recorded after recovery. To measure the changes at each time point, the score at the given time point was subtracted from the comparison time frame. A negative sign of the resulting change score reflects a reduction in sensation, while a positive sign reflects an increase in magnitude for that specific sense. These changes in the scores were grouped into five categories. Scores ranging between  $-1$  and  $+1$  were assigned to the no-change category (these low-change scores were considered random variations). Scores between  $-2$  and  $-5$  were categorised as

moderate reduction, and scores of  $-6$  to  $-9$  were categorised as extreme reduction. The same classification algorithm applies to the plus sign referring to an increase in magnitude.

The statistical significance, direction, and strength of linear correlation between 2 quantitative variables was measured by Spearman's rank linear correlation coefficient. *P* values less than the .05 level of significance was considered statistically significant using SPSS Version 24.

## Results

The results presented in this section were based on the analysis of an open invitation sample size of 500 adult registered patients who self-reported their answers and who resided in the UAE. Among the study sample, approximately 28% had lost their taste and smell sensation during the active period of the disease. Regarding comorbid status, approximately 27.1% had chronic illnesses, and hypertension was the most common illness, followed by hyperlipidemia, respiratory illness, diabetes mellitus, and allergies. Only one-third (34.2%) of the sample was aged 40 years and older. Females constituted approximately one-third (35.5%), and more than half of the sample were non-Arab Asians (53.2%). Smokers constituted slightly more than one-fifth (22%) of surveyed individuals. Approximately one-quarter (26.4%) of the study sample was asymptomatic, and another one-fifth (21.4%) was classified as paucisymptomatic with less severe symptoms (Table 1).

### Changes during COVID-19 compared to predisease

The changes attributed to COVID-19 are listed in Table 2. Only 16.2% had nasal block during COVID-19 infection. However, 44% of the population studied had a reduction in the sense of smell, with most classified as an extreme reduction. The taste sensation was diminished in 43% of the studied population, an almost equal proportion to the percentage that experienced a reduction in smell sensation. Moreover, one-quarter (25%) had a decline in the ability to sense other stimuli in the mouth (eg, burning, cooling, or tingling).

### Changes in smell and taste sensations attributed to COVID-19

Young participants experienced a drastic decrease in smell and taste senses ( $P < .05$ ), as seen in Tables 1 and 2. However, there was no statistically significant positive linear association between age and improvements in the severity of smell and taste. Smell and taste changes were also not significantly different between males and females. There was a slightly greater decrease in smell and taste sensations among UAE nationals, while non-Arab Asians reported the lowest average decrease relative to other nationals. Smokers had a severe drop in both sensations when compared to nonsmokers ( $P < .05$ ). The magnitude of reduction in both sense changes increased steeply from the asymptomatic group to the paucisymptomatic group to the symptomatic group. The most severe form of the disease was associated with 58.2% and 53.3% of patients showing extreme reductions in smell and taste sensation, respectively.

**Table 1 – The magnitude of change in smell sensation attributed to COVID-19 (compared to predisease status) by age, sex, nationality, smoking status, and disease severity (measured by symptoms score).**

	Change in smell sense attributed to COVID-19												Mean rank	p
	Extreme reduction (–9 to –6)		Moderate reduction (–5 to –2)		No change (–1 to 1)		Moderate increase (2to 5)		Extreme increase (6to 9)		Total			
	N	%	N	%	N	%	N	%	N	%	N	%		
Age group (years)														< .001
18-29	55	(37.7)	9	(6.2)	81	(55.5)	1	(0.7)	0	(0.0)	146	(100)	248.9	
30-39	76	(41.5)	16	(8.7)	90	(49.2)	0	(0.0)	1	(0.5)	183	(100)	234.1	
40-49	26	(28.3)	10	(10.9)	56	(60.9)	0	(0.0)	0	(0.0)	92	(100)	265.8	
50+	21	(26.6)	7	(8.9)	51	(64.6)	0	(0.0)	0	(0.0)	79	(100)	273.6	
<i>r</i> = 0.071 <i>P</i> = .12[NS]														
Sex														.67 [NS]
Female	63	(35.6)	19	(10.7)	94	(53.1)	1	(0.6)	0	(0.0)	177	(100)	246.7	
Male	115	(35.7)	23	(7.1)	183	(56.8)	0	(0.0)	1	(0.3)	322	(100)	251.8	
Nationality														< .001
Local UAE nationals	46	(55.4)	2	(2.4)	35	(42.2)	0	(0.0)	0	(0.0)	83	(100)	206.0	
Other Arabs	35	(42.7)	10	(12.2)	36	(43.9)	0	(0.0)	1	(1.2)	82	(100)	226.5	
Non-Arab Asian	69	(25.9)	25	(9.4)	171	(64.3)	1	(0.4)	0	(0.0)	266	(100)	274.9	
Non-Arab Europe/American/ Australian	18	(39.1)	4	(8.7)	24	(52.2)	0	(0.0)	0	(0.0)	46	(100)	239.9	
Non-Arab African	10	(43.5)	1	(4.3)	12	(52.2)	0	(0.0)	0	(0.0)	23	(100)	235.2	
Smoking status														.005
No	126	(32.3)	34	(8.7)	228	(58.5)	1	(0.3)	1	(0.3)	390	(100)	259	
Yes	52	(47.3)	8	(7.3)	50	(45.5)	0	(0.0)	0	(0.0)	110	(100)	220.2	
Classification of symptoms in patients with COVID-19														< .001
Asymptomatic	1	(0.8)	1	(0.8)	130	(98.5)	0	(0.0)	0	(0.0)	132	(100)	356.2	
Paucisymptomatic	25	(23.4)	8	(7.5)	73	(68.2)	0	(0.0)	1	(0.9)	107	(100)	285.8	
Symptomatic	152	(58.2)	33	(12.6)	75	(28.7)	1	(0.4)	0	(0.0)	261	(100)	182.6	
<i>r</i> = –0.525 <i>P</i> < .001														

*r* = correlation coefficient significant at *P* < .05.

UAE, United Arab Emirates.

**Table 2 – The magnitude of change in taste sensation attributed to COVID-19 (compared to predisease status) by age, sex, nationality, smoking status, and disease severity (measured by symptoms score).**

	Taste sensation: Changes during COVID-19 infection												Mean rank	P
	Extreme reduction (-9 to -6)		Moderate reduction (-5 to -2)		No change (-1 to 1)		Moderate increase (2to 5)		Extreme increase (6to 9)		Total			
	N	%	N	%	N	%	N	%	N	%	N	%		
Age group (years)														< .001
18-29	54	(37.0)	7	(4.8)	84	(57.5)	1	(0.7)	0	(0.0)	146	(100)	247.9	
30-39	66	(36.1)	21	(11.5)	94	(51.4)	1	(0.5)	1	(0.5)	183	(100)	239.9	
40-49	26	(28.3)	14	(15.2)	52	(56.5)	0	(0.0)	0	(0.0)	92	(100)	253.5	
50+	17	(21.5)	10	(12.7)	52	(65.8)	0	(0.0)	0	(0.0)	79	(100)	276.3	
<i>r</i> = 0.06 <i>P</i> = .18[NS]														
Sex														.87 [NS]
Female	60	(33.9)	17	(9.6)	98	(55.4)	2	(1.1)	0	(0.0)	177	(100)	248.7	
Male	103	(32.0)	35	(10.9)	183	(56.8)	0	(0.0)	1	(0.3)	322	(100)	250.7	
Nationality														< .001
Local UAE nationals	45	(54.2)	4	(4.8)	34	(41.0)	0	(0.0)	0	(0.0)	83	(100)	199.6	
Other Arabs	28	(34.1)	12	(14.6)	41	(50.0)	0	(0.0)	1	(1.2)	82	(100)	240.1	
Non-Arab Asian	66	(24.8)	29	(10.9)	169	(63.5)	2	(0.8)	0	(0.0)	266	(100)	271.3	
Non-Arab Europe/American/ Australian	13	(28.3)	7	(15.2)	26	(56.5)	0	(0.0)	0	(0.0)	46	(100)	253.5	
Non-Arab African	11	(47.8)	0	(0.0)	12	(52.2)	0	(0.0)	0	(0.0)	23	(100)	225.2	
Smoking status														.006
No	116	(29.7)	40	(10.3)	231	(59.2)	2	(0.5)	1	(0.3)	390	(100)	258.8	
Yes	47	(42.7)	12	(10.9)	51	(46.4)	0	(0.0)	0	(0.0)	110	(100)	221	
Classification of symptoms in patients with COVID-19														< .001
Asymptomatic	1	(0.8)	0	(0.0)	131	(99.2)	0	(0.0)	0	(0.0)	132	(100)	354.4	
Paucisymptomatic	23	(21.5)	11	(10.3)	72	(67.3)	0	(0.0)	1	(0.9)	107	(100)	281.7	
Symptomatic	139	(53.3)	41	(15.7)	79	(30.3)	2	(0.8)	0	(0.0)	261	(100)	185.2	
<i>r</i> = -0.499 <i>P</i> < .001														

*r* = correlation coefficient significant at *p* < 0.05.

UAE, United Arab Emirates.

**Table 3 – The magnitude of change in the ability to feel other sensations in the mouth (eg, burning, cooling, or tingling) attributed to COVID-19 (compared to predisease status) by age, sex, nationality, smoking status, and disease severity (measured by symptoms score).**

	Ability to feel other sensations in the mouth (eg, burning, cooling, or tingling): Changes during COVID-19 disease									P
	Extreme reduction (–9 to –6)		Moderate reduction (–5 to –2)		No change (–1 to 1)		Total		Mean rank	
	N	%	N	%	N	%	N	%		
Age group (years)										< .001
18-29	33	(22.6)	6	(4.1)	107	(73.3)	146	(100)	244.8	
30-39	42	(23.0)	14	(7.7)	127	(69.4)	183	(100)	236.5	
40-49	5	(5.4)	12	(13.0)	75	(81.5)	92	(100)	272.6	
50+	9	(11.4)	6	(7.6)	64	(81.0)	79	(100)	267.7	
<i>r</i> = 0.091 <i>P</i> = .043										
Sex										0.24 [NS]
Female	34	(19.2)	17	(9.6)	126	(71.2)	177	(100)	242.2	
Male	55	(17.1)	21	(6.5)	246	(76.4)	322	(100)	254.3	
Nationality										.03
Local UAE nationals	24	(28.9)	8	(9.6)	51	(61.4)	83	(100)	216.4	
Other Arabs	16	(19.5)	4	(4.9)	62	(75.6)	82	(100)	251.5	
Non-Arab Asian	37	(13.9)	20	(7.5)	209	(78.6)	266	(100)	261.1	
Non-Arab Europe/American/Australian	8	(17.4)	5	(10.9)	33	(71.7)	46	(100)	244.9	
Non-Arab African	4	(17.4)	1	(4.3)	18	(78.3)	23	(100)	258.3	
Smoking status										0.06 [NS]
No	65	(16.7)	26	(6.7)	299	(76.7)	390	(100)	255.5	
Yes	24	(21.8)	12	(10.9)	74	(67.3)	110	(100)	232.9	
Classification of symptoms in patients with COVID-19										< .001
Asymptomatic	1	(0.8)	0	(0.0)	131	(99.2)	132	(100)	312	
Paucisymptomatic	12	(11.2)	5	(4.7)	90	(84.1)	107	(100)	274.2	
Symptomatic	76	(29.1)	33	(12.6)	152	(58.2)	261	(100)	209.7	
<i>r</i> = –0.347 <i>P</i> < .001										

*r* = correlation coefficient significant at *p* < .05.

UAE, United Arab Emirates.

### Changes in the ability to feel other sensations in the mouth (eg, burning, cooling, or tingling) attributed to COVID-19

The mean reduction in the ability to sense other sensations in the mouth (eg, burning, cooling, or tingling) was slightly more severe at younger ages, as seen in Table 3. A statistically significant positive linear correlation was found between age and the change in the magnitude of these sensations. However, the changes were not significantly different between males and females. A significantly higher reduction in this type of sensation was seen in local UAE nationals, while non-Arab Asians and non-Arab Africans showed the lowest average reduction compared to other nationals. Smokers had a more extreme reduction in other mouth sensations than non-smokers, but this association failed to reach a statistically significant level. Additionally, the count of screened COVID-19 symptoms showed a statistically significant weak linear correlation with the magnitude of change in other mouth sensations during COVID-19 ( $r = -0.347$ ). The magnitude of the reduction in taste increased steeply from the asymptomatic group to the paucisymptomatic group and reached its maximum in the symptomatic group. In the most severe form of the disease, 29.1% showed an extreme reduction in taste sensation.

### COVID-19 recovery

More than half (59%) of those who had experienced a reduction in smell and taste sensation during COVID-19 infection fully regained smell sensation 2 weeks after the recovery period (Figure Part A), whereas one-third (26.9%–30.7%) had a smell sense that recovered during the active disease period. Taste sensation recovery showed similar results.

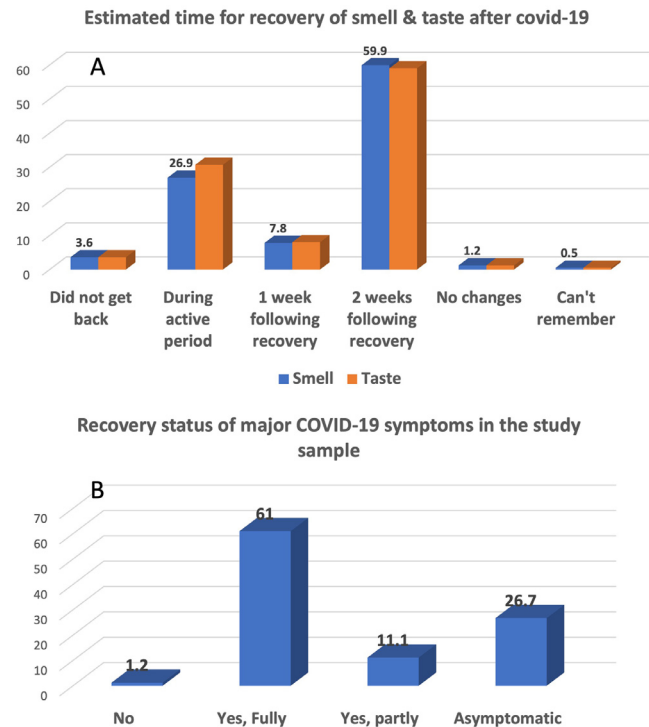
As shown in the Figure Part B, approximately 61% of surveyed individuals stated that they were fully recovered, and 11.1% were partially recovered from major COVID-19 symptoms. A total of 26.7% of the studied sample was initially asymptomatic, as previously stated.

As seen in Table 4, more than half of the recovered patients had improved smell and taste sensations (63.6% and 61.9%, respectively), while one-third (35.9%) had an increase in the ability to feel other sensations in the mouth (eg, burning, cooling, or tingling) compared to the active duration of the disease. Approximately three-quarters of the recovered patients (75.1%) showed no change in nasal blockage after recovery compared to the active disease period, while less than one-quarter (13.4%) showed only a moderate reduction.

### Discussion

Over 5 months, a total of 32 published articles discussed the lack of sense of smell and taste in patients with COVID-19, all of which stated that olfactory dysfunction could occur at a very early stage of the disease prior to diagnosis confirmation by a polymerase chain reaction test.<sup>7</sup>

Some studies have shown that males are more prone to loss of taste and smell sensation than females.<sup>8-10</sup> This study did not detect significant differences between sexes, which agrees with the study by Moein et al.<sup>11</sup> On the other hand, Lee



**Figure—Part A and B. Recovery status of major COVID-19 symptoms. Part A describes recovery time for smell and taste sensation for those described in Part B who had complete recovery of major symptoms and experienced any degree of reduction in the ability to smell during COVID-19 infection.**

et al. found that changes in taste and smell sensations were more dominant in females than in males.<sup>6</sup> Consistent with the female predominance, Meng et al. also reported that several studies of upper respiratory disease have found that olfactory deficiency is more predominant among females.<sup>12</sup>

This study showed that young adults presented extreme declination in smell and taste sensations, with more significant declination shown in individuals in their late 30s. Similar results were presented by Lee et al., who found that more significant changes were recorded among the young population.<sup>6</sup>

In the present study, approximately one-quarter of the studied population were smokers (22%), demonstrating a significantly higher percentage of taste and smell sensation changes ( $P = .005$ ). A study conducted in Qatar showed similar results, where a significant correlation was seen between ageusia and anosmia among smokers.<sup>10</sup>

In this study, most of the participants were symptomatic (52%) or paucisymptomatic (21.4%). Lee et al. showed that more than 84% of patients positive for COVID-19 were asymptomatic or had moderate symptoms.<sup>6</sup> Identification of asymptomatic or paucisymptomatic patients is important, as isolating these patients will break the infection chain and restrict the spread of the disease. Symptomatic patients in this study reported more severe changes in smell and taste than paucisymptomatic and asymptomatic patients, but the severity of the symptoms was not studied. Mutiawati et al., in

**Table 4 – Changes after recovery from COVID-19 compared to during the disease for those who fully or partially recovered.**

	N	%
<b>Ability to smell—Changes after recovery from COVID-19: Categories</b>		
No change (–1 to 1)	130	(36.4)
Moderate increase (2 to 5)	56	(15.7)
Extreme increase (6 to 9)	171	(47.9)
Total	357	(100.0)
<b>Nasal block—Changes after recovery from COVID-19: Categories</b>		
Extreme reduction (–9 to –6)	32	(9.0)
Moderate reduction (–5 to –2)	48	(13.4)
No change (–1 to 1)	268	(75.1)
Moderate increase (2 to 5)	3	(0.8)
Extreme increase (6 to 9)	6	(1.7)
Total	357	(100)
<b>Taste sensation—Changes after recovery from COVID-19: Categories</b>		
Moderate reduction (–5 to –2)	1	(0.3)
No change (–1 to 1)	135	(37.8)
Moderate increase (2 to 5)	59	(16.5)
Extreme increase (6 to 9)	162	(45.4)
Total	357	(100)
<b>Ability to feel other sensations in the mouth (eg, burning, cooling, or tingling)—Changes after recovery from COVID-19 disease: Categories</b>		
Extreme reduction (–9 to –6)	2	(0.6)
Moderate reduction (–5 to –2)	2	(0.6)
No change (–1 to 1)	225	(63.0)
Moderate increase (2 to 5)	42	(11.8)
Extreme increase (6 to 9)	86	(24.1)
Total	357	(100)

a systematic review and meta-analysis, calculated the global prevalence of anosmia and dysgeusia in patients with COVID-19, among whom the rate of anosmia was approximately 38.2%, whereas that of dysgeusia was 36.6%. Both of these symptoms were more common in COVID-19 compared to other respiratory infections (approximately 10 and 9 times, respectively).<sup>13</sup>

In this study, nasal blockage, the ability to smell and taste, and the perception of other stimuli in the mouth, such as burning, cooling, or tingling, were examined. The results revealed that only 25% of the individuals showed a reduction in their ability to feel other mouth sensations. Parma et al.<sup>14</sup> reported that nearly 20% of patients with COVID-19 had increased nasal obstruction but also stated that olfactory changes could not be attributed to nasal obstruction.

The results of the current study showed that slightly fewer than half of the patients positive for COVID-19 (44%) had some degree of alteration in smell and taste sensations, while a higher percentage did not feel any changes in smell (55.6%) or taste (56%). Other studies demonstrated changes in taste and smell sensation during COVID-19 infection relative to predisease status. However, the percentage and magnitude of these changes were reported differently in different studies.<sup>8-12</sup> Chary et al. reported that anosmia and hypogeusia were seen in 33% of their study population, and anosmia and ageusia were reported in comparable proportions as well.<sup>15</sup>

Vaira et al. reported that 41.7% of patients had alterations in both smell and taste, 12.5% had isolated taste alterations, and 14.4% had isolated smell alterations. Vaira et al. also reported that 51.4% of their studied population had a normal gustatory function, which is similar to the results of this study.<sup>8</sup>

The outcome of this study showed that UAE nationals had a significantly higher reduction in smell and taste sensations, while non-Arab Asians showed the lowest average reduction in smell and taste sensation. Other Arabs and non-Arab Africans showed significant changes as well. Therefore, more studies are required to decide whether smell and taste dysfunction manifest in certain ethnic groups more than in others.

In the current analysis, most patients recorded complete smell and taste improvement 2 weeks after recovery from COVID-19 symptoms. However, only a small percentage of patients did not recover from COVID-19 symptoms after testing negative. The mean days of recovery from ageusia and anosmia were recorded by Al Ani and Acharya as almost 1 week.<sup>10</sup>

Assessing smell and taste dysfunction through a phone call could limit the accuracy of the assessment, not only because it is self-reported and thus a subjective evaluation but also, in the context of a pandemic, a questionnaire might lead to overestimation by the participants. Evaluation of the sensitivity, specificity, positive predictive value, and negative predictive value in using olfactory and gustatory dysfunction as a screening test should be performed in future studies, as well as the correlation of the severity of hyposmia and hypogeusia with the severity of symptoms.

## Conclusions

Olfactory and gustatory disorders are prevalent symptoms in patients with COVID-19 in the UAE who may not have nasal symptoms, particularly in the early stage of the disease. Sudden anosmia or ageusia needs to be recognised for early

detection of COVID-19 infection to identify otherwise hidden carriers, thus favoring an early isolation strategy that will restrict the spread of the disease.

## Disclosure

This manuscript is not derived from any dissertation or thesis.

## Conflict of interest

None disclosed.

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