Advanced Medical Journal, Vol.10, No.2, P.150-157,2025 https://doi.org/10.56056/amj.2025.354

Hypoxia, Taste, and Smell Loss in Severe Hospitalized COVID-19 Patients in Correlation with HRCT Chest Involvement

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Abstract

Background & Objective: An infectious disease called coronavirus disease (COVID-19) is brought on by the SARS-CoV-2 virus. Most adult COVID-19 infections resulted in gustatory or olfactory impairment. The purpose of this research is to ascertain the frequency of taste and smell impairments in hospitalized COVID-19 patients.

Methods: This prospective cross-sectional study was carried out in the Dr. Hemn Teaching Hospital in Sulaimani, Iraq, from May 2021 to January 2022. This study included the selection and enrollment of 100 hospitalized COVID-19 patients (50 males and 50 females). We assessed if they have preserved ability to taste and smell as well as tested for O2 saturation level.

Results: A total of 100 patients who were enrolled in the study male 50%, and female 50 patients. The mean age was 54.5 ± 16.5 years. Ninety of the patients had significant COVID-19, according to their High-Resolution CT scan. Thirty patients experienced taste loss and forty-three patients claimed loss of smell. Although 23 patients have both taste and smell loss, they also have hypoxia. Severe hypoxia was established by about 25.7% of those with taste perception. Patients with smell and taste loss were more frequently found to have positive RT-PCR results, 41(95.3%) and 29(96.7%), respectively (p-value <0.001). High resolution CT-scan scan examination of the patients showed that 90 (90%) patients had the severe form of COVID-19.

Conclusion: The frequencies of taste and/or smell impairment were lower in severely hospitalized individuals. Moreover, the chemosensory deficits are less common in patients who experience acute hypoxia.

Keywords: COVID 19, Oxygen saturation, Smell and Taste loss

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Introduction:

The virus that causes the severe acute respiratory syndrome (SARS-CoV-2) is the source of the coronavirus disease-2019 (COVID-19). Since its initial reports in Wuhan, China, the pandemic has spread to over 200 countries, earning it recognition as a worldwide health emergency. There is a wide range in the clinical manifestation of COVID-19, from very mild or asymptomatic symptoms to severe viral pneumonia with respiratory failure or, in extreme cases, death.[1] A subgroup of COVID-19 patients experiences taste and smell impairment; therefore, additional assessments should take these symptoms into account as clinical indications of the illness and determine whether they continue after the disease resolves.[2] The most common symptoms of SARS-CoV-2 infection in patients include fever, cough, dyspnea, exhaustion, and myalgia, which can manifest anywhere from two to fourteen days following viral exposure.[3,4] A cough and/or dyspnea were considered respiratory symptoms, and they were associated with more frequent and severe neurological symptoms.[5] Among COVID-19's notable characteristics are clinical indications of taste and smell impairment. When an individual's ability to detect scent is compromised by ageing, medical conditions, or specific drugs, food may appear tasteless or neutral. There has been an increase in the proportion of confirmed COVID-19 patients having problems with taste and smell, despite the early identification of respiratory-related symptoms.[6] The impairment of taste and smell was considered by the international scientific community to be one of the primary symptoms in SARS-CoV-2 patients.[7] When individuals present with these symptoms, rhinolaryngologists ought to be highly suspicious of COVID-19.[5] According to preliminary research from Italy and South Korea, approximately 34% of COVID-19 patients had anosmia, or loss of smell. While anosmia was discovered in as many as 85.6% of moderate-to-mild cases of the illness in a later, significant report from Europe, a large multicenter CORANOSMIA research conducted in France indicated that the prevalence of taste and smell loss in COVID-19 cases that had been diagnosed was 90.3% and 78.5%, respectively.[8] The pathophysiological mechanisms behind gustatory dysfunction (GD) and olfactory dysfunction (OD) have not yet been fully elucidated. Since taste and smell are chemical senses that interact, taste loss in COVID-19 has been mostly linked to smell loss. [9] It's unclear how soon after COVID-19 smell and taste loss begin to appear and how long it takes for these feelings to return. Most patients in numerous studies have reported making a full recovery quickly. Nonetheless, even several months after the disease's beginning, persisting symptoms upon COVID-19 recovery have also been seen, including taste and smell impairment.[10] Another diagnostic technique that can be utilized to identify COVID-19 is high-resolution CT (HRCT) of the chest. It describes a technique for HRCT that involves obtaining thin-sliced chest images and using a high-spatial-frequency reconstruction algorithm for post-processing. This method produces images with finely detailed lungs, which are perfect for evaluating diffuse interstitial lung disease.[11]

Patients & methods:

This is a prospective cross-sectional study performed from May 2021 to January 2022 in Sulaimani at Dr. Hemn Teaching hospital. A total of 100 hospitalized COVID-19 patients (50 males and 50 females) enrolled in whom the infection was confirmed by RT-PCR or High-resolution CT scan HRCT, were selected and enrolled in this study via a non-randomized sampling method. Patients hospitalized for Covid-19 infection are included in the study and those who are

https://doi.org/10.56056/amj.2025.354

excluded are those on ventilator (ICU patients), patients with dementia, patients with pre-existing olfactory and gustatory disorders and dead (we have two cases of death). after informed consent was obtained from each participant, data collected from hospitalized patients by interviewing them and from their file records. A specialized questionnaire was prepared for data collection; and the questionnaire consists of socio-demographic characteristic (age, gender, body mass index, smoking status, alcohol status), past medical history, questions regarding their signs and symptoms, HRCT descriptions, their available investigations and diagnostic records including RT-PCR and duration of their stay at hospital. After collecting the sample data were entered in to Microsoft excel program then transferred in to SPSS program version (22) here two approaches were used for statistical analysis; descriptive approach and analytical approach. Statistical tests like Chi-square test and p-value were used, a p-value ≤0.05 were used as statistically significant. A letter of confirmation was obtained from Sulaimani directorate of health and specialized hospital in order to collect the data and oral informed consent was taken in order to take permission from all the patients who participated in our study.

Results:

Of the total patients enrolled in this study (n = 100), 50 (50%) were male and 50 (50%) were female. They had a mean age of 54.5 ± 16.5 years (ranging from 19 to 90 years). The BMI is classified into 4 categories (<18.5, 18.5-24.9, 25-30, >30). Most of the patients (42, 42%) had a BMI of more than 30, 36 (36%) were between 18.5-24.9, and 22 (22%) patients had a BMI of between 25-30. Most of the participants were non- smoker (77) patients while others were either smokers or ex-smokers (4 and 19 respectively). The most common co-morbidity was hypertension (HTN) (27%) and diabetes mellitus (DM) (19%) among the enrolled participants. HRCT scan examination of the patients showed that 90 (90%) patients had the severe form of COVID-19, and moderate severity was detected in only 10 (10%) patients. Forty-three (43%) of patients reported loss of smell and 30(30%) reported loss of taste. The mean duration from the onset of symptoms to the beginning of anosmia and ageusia was 1.96 ± 1.56 days (1-7). In our study, the recovery rate of patients from smell and taste impairment was recorded as 25.35±16.41 days (9-90 days). Regarding oxygen saturation, 18 (18%) of the participants had sever hypoxia, 66 (66%) had moderate hypoxia, 15 (15%) had mild hypoxia, and 1(1%) was normal. The most common symptom among the patients was shortness of breath (SOB), which was seen in 98 patients (98%), followed by dry cough (89%), gastrointestinal (GIT) problems (78%), headache (69%), and productive cough (57%). Problems in the CNS and cardiovascular system (CVS) manifested only in a small portion of the patients, 25% and 11% respectively. The distribution of the symptoms and signs with their percentages illustrated in Figure (1).

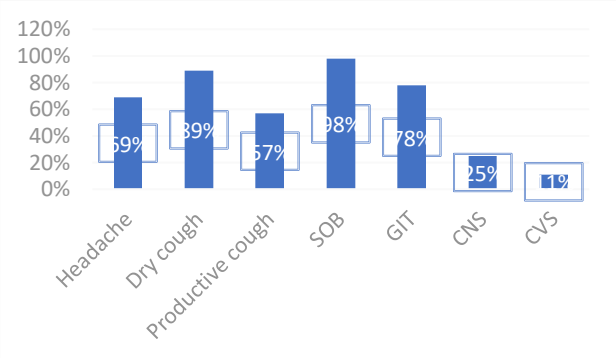

Figure (1): Prevalence of presenting symptoms in COVID-19 patients.

In this study, the occurrence of smell loss and taste loss were not significantly associated with gender, age, BMI, smoking status or the presence of co-morbidities. The HRCT

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findings showed that the relationship between smelling loss and HRCT severity was not significant, as 53 (93%) of patients who still had smelling ability were severe cases, and 37 (86%) of those lost smelling ability were found to be severe. However, the association between HRCT severity and taste loss was found to be significant (p-value = 0.004), as 67 (95.7%) of patients who still had tasting ability were severe cases, and 23 (76.7%) of that lost tasting ability were found to be severe. Patients who lost smelling ability were found to have only mild or moderate hypoxia (30.2% and 65.1%, respectively), with only 1 (2.3%) case being associated with severe hypoxia. On the other hand, those who did not lose this sensation were more frequently associated with severe hypoxia (29.8%) (p-value = 0.001). Similar observations were noted regarding taste loss, as 25.7% of those who had tasting sensation developed severe hypoxia, however, none of the patients with taste impairment developed severe hypoxia (p-value = 0.002). Further information is provided in Table (1) and (2). Patients with smell and taste loss were more frequently found to have positive RT-PCR results, 41(95.3%) and 29(96.7%), respectively, when compared to those without smell and taste impairments (30, 53.6% and 42, 60.9%, respectively) (p-value <0.001).

Table (1): The association of different factors with smell loss.

Variable		Smell loss, N (%)		p-value
		No (N=57)	Yes (N=43)	
Age (mean±SD)		56.77±14.45	51.46±18.65	0.112
Gender:	Male	32(56.1)	18(41.9)	0.157
	Female	25(43.9)	25(58.1)	
Smoking status:	Non-smoker	40(70.2)	37(86)	0.089
	Smoker	4(7)	0(0)	
	Ex-smoker	13(22.8)	6(14)	
BMI:	<18.5	0(00	0(0)	0.440
	18.5-24.9	19(33.2)	17(39.5)	
	25-30	15(26.3)	7(16.3)	
	>30	23(40.5)	19(44.2)	
Comorbidities:	DM	11(19.3)	8(18.6)	0.410
	HTN	18(31.6)	9(20.9)	
	CVD	4(7)	4(9.3)	
	Asthma	2(3.5)	1(2.3)	
	COPD	3(5.3)	0(0)	
	Other	19(33.3)	21(48.8)	
Oxygen saturation level:	Normal	0(0)	1(2.3)	<0.001
	Mild hypoxia	2(3.5)	13(30.2)	
	Moderate hypoxia	38(66.7)	28(65.1)	
	Sever hypoxia	17(29.8)	1(2.3)	
HR-CT severity:	Mild	0(0)	0(0)	0.252
	Moderate	4(7)	6(14)	
	Severe	53(93)	37(86)	
PCR:	Positive	30(53.6)	41(95.3)	<0.001
	Negative	26(46.4)	2(4.7)	

https://doi.org/10.56056/amj.2025.354

Table (2): The association of different factors with taste loss.

Variable		Taste loss, N (%)		*p-value*
		No (N=70)	Yes (N=30)	
Age (mean±SD)		55.22±15.56	52.83±18.72	0.514
Gender:	Male	38(54.3)	12(40)	0.190
	Female	32(45.7)	18(60)	
Smoking status:	Non-smoker	51(72.9)	26(86.7)	
	Smoker	4(5.7)	0(0)	0.228
	Ex-smoker	15(21.4)	4(13.3)	
BMI:	<18.5	0(0)	0(0)	
	18.5-24.9	22(31.4)	14(46.7)	0.288
	25-30	17(24.3)	5(16.7)	
	>30	31(44.3)	11(36.6)	
Comorbidities:	DM	13(18.6)	6(20)	
	HTN	21(30)	6(20)	
	CVD	5(7.1)	3(10)	0.732
	Asthma	2(2.9)	1(3.3)	
	COPD	3(4.3)	0(0)	
	Other	26(37.1)	14(46.7)	
Oxygen saturation level:	Normal	1(1.4)	0(0)	
	Mild hypoxia	6(8.6)	9(30)	0.002
	Moderate hypoxia	45(64.3)	21(70)	
	Sever hypoxia	18(25.7)	0(0)	
HR-CT severity:	Mild	0(0)	0(0)	0.004
	Moderate	3(4.3)	7(23.3)	
	Severe	67(95.7)	23(76.7)	
PCR:	Positive	42(60.9)	29(96.7)	<0.001
	Negative	27(39.1)	1(3.3)	

Discussion:

Patients with COVID-19 classified as having a respiratory ailment, the viral sickness is also regarded as a systemic illness that affects several body organs. It is known to be neurotropic and neuro-invasive in addition to epitheliotropic.[12] Chemoreceptor dysfunction is one of the primary neurological signs, according to numerous investigations. Chemosensory dysfunction has been found to be a prominent early symptom in most COVID-19 patients worldwide, which between 50% and 85% of COVID-19 patients experience. [13,14,15,16] Furthermore, unlike influenza, COVID-19 usually does not cause nasal blockage in addition to smell loss.[5] In my study, forty-three (43%) of patients reported smell loss and thirty (30%) reported taste loss. There is ongoing disagreement on the actual relationship between gender and taste and smell loss in COVID-19 patients, as conflicting results have been reported in several research. Despite the fact that a number of researches found no conclusive links between gender and chemosensory impairment.[13,17] According to recent research, a higher percentage of women than men may have chemosensory issues.[13,18,19] Because of differences in their inflammatory processes, males are more likely to have the severe type of the condition, while females are more likely to get the mild to moderate version.[2,20] In the current study, no significant difference between the genders were observed regarding smell and taste impairment. Regarding the age of COVID-19 patients and chemosensory disturbances, we found no significant association, which is in

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agreement with other reports in the literature; however, it is worthy to note that all the enrolled participants of this study were above the age of 18 years old.[10,21] Some studies noticed that the incidence of smell and taste loss decreased with increasing age.[2,4,22,23] This is partially due to an unclear cause. Mueller et al., however, hypothesized that the young immune system responds in the olfactory epithelium more forcefully and rapidly, potentially harming the olfactory neurons in the process.[24] In a study by Bhutani et al., there was no difference in the chemosensory impairment symptoms between obese and non-obese subjects. Therefore, they reached the conclusion that COVID-19 individuals who are obese have experiences that are comparable to those who are not obese, despite a possible diminished sensitivity to chemosensory stimuli.[25] Moreover, it has been noted that the result of chemosensory deficits is unrelated to BMI.[26] Similar results were found in this study. Graham et al. report that in severe patients with hypertension, diabetes, and coronary artery disease, chemosensory impairment is less common.[27] Additionally, chemosensory deficits were more common in outpatients than in hospitalized patients, according to Paderno et al. and Bartheld et al.[18,28] This is also consistent with research by Lechien et al. and Romero-Sánchez et al., which found a correlation between the mild form of the disease and taste and odor impairment.[29] This indicates that COVID-19 patients with chemosensory loss may represent a weaker version of the disease.[6] Although the majority of the conducted research agrees with this theory, Printza et al. found no difference in the prevalence of chemosensory problems in patients with severe, moderate, and mild COVID-19 disease.[10] The findings of our study also showed that patients with severe hypoxia were less likely to develop smell and taste impairments. Nonetheless, a study in patients with a history of smoking and hypertension and allergic rhinitis identified a connection between comorbidities and impaired olfactory recovery.[30]

Conclusion:

Lower rates of taste and/or smell impairment were reported by severely hospitalized individuals; these are rather common symptoms of mild and moderate COVID-19. Furthermore, we observed that these chemosensory deficits are less common in hospitalized patients with severe hypoxia. Our findings indicated that these symptoms frequently go away within 3 months of onset (after 25 days on average), and that other demographic variables, such as gender, age, and BMI, were not shown to be connected with the probability of having these symptoms.

Recommendations:

Patients experiencing acute loss of smell during the COVID-19 outbreak should start social distance and home isolation measures as soon as possible. They should also get tested for the SARS-COV-2 diagnostic test. Olfactory training can be initiated sooner but is advised when the smell does not return after a month. Patients with COVID-19 should contact an ENT expert if their gustatory or olfactory impairment lasts more than three months.

Conflicts of interest:

There are no conflicts of interest.

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