

Smell Disorders and COVID-19 Pandemic: A Cross-sectional Study

Ahmed Fadhil Hasan ¹, Amjed Hayder Ali ², Wael Jasim Hasan ³

^{1,3} Consultant ENT surgeon, Basrah Teaching Hospital, Basrah, Iraq

²Senior ENT surgeon, Alzubair General Hospital, Alzubair district, Basrah, Iraq

ABSTRACT

Background: Since its emergence in December 2019, SARS-CoV2 infection has been characterized by several signs and symptoms related to the respiratory and other body systems. One of the important symptoms of this infection includes smell disorders that result in the reduction, complete loss, or alteration in smell perception. Although several studies have investigated these disorders from various perspectives, these disorders require further elucidation.

Objective: The objective of this study was to analyze the data pertaining to COVID-19 infected individuals who suffered from smell disorders, and to identify the correlation between different variables.

Materials and Methods: A total of 310 individuals from 5 countries participated in the web-based electronic questionnaire conducted from June 15 to July 15, 2021. Data were collated and analyzed using the IBM SPSS (v. 23) software.

Results: Out of the 310 participants, 228 individuals (73.5%) exhibited a history of COVID-19 infection, with 151 males (66.2%) and 77 females (33.8%). The most common age-group infected by SARS-CoV2 was 41–60 years (44.2%), and 168 patients (73.7%) exhibited smell disorders during infection, with the most common disorder being complete loss of smell. Furthermore, 45.2% patients reported reduced or alterations in smell perception (hyposmia and dysosmia, respectively), while 87.5% patients recovered completely, with most patients recovering within 1–3 weeks. More than one-third of the patients with smell disorders undertook olfactory training at home, and more than half of them benefitted from the training. Moreover, 45.7% of the patients with smell disorders experienced some form of depression during or after the infection. However, no correlation was observed between patients with allergic rhinitis and COVID-19 infection.

Conclusion: Different types of smell disorders were common in individuals infected with COVID-19. Nonetheless, most patients recovered completely and spontaneously. While olfactory training may have benefitted in recovery, few patients suffered from depression and required early psychological intervention to overcome the COVID-19 sequelae.

KEYWORDS: Olfactory, Coronavirus, Dysfunction, SARS-COV2, Infection.

Corresponding author: Ahmed F. Alosfoor. Email: hamadafh2019@gmail.com

Disclaimer: The authors Have no conflict of interest.

Copyright © 2022 The Author. Published by Iraqi Association for Medical Research and Studies. This is an open-access article distributed under the terms of the Creative Commons Attribution, Non-Commercial License 4.0 (CCBY-NC), where it is permissible to download and share the work provided it is properly cited.

DOI: 10.37319/iqnjm.4.2.8

Received: 12 April 2022

Accepted: 21 June 2022

Published online: 1 July 2022

INTRODUCTION

COVID-19, caused by severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), became a pandemic in no time.¹ It affected people of all ages and gender, with symptomology ranging from asymptomatic to lethal infection.² Reports suggested that the disease could cause olfactory and taste dysfunctions, in addition to symptoms such as fever, cough, and shortness of breath.³ However, the pathogenesis of loss of smell owing to SARS-CoV-2 has not been completely understood.⁴ Loss of smell could result either from the direct destruction of the olfactory epithelium by the virus to prevent odors from binding to the olfactory receptors in the olfactory epithelium,⁵ or because of sinonasal mucosal oedema causing conductive olfactory dysfunction.⁶ Few previous studies reported loss of smell in >80% of COVID-19 patients, while others reported smell disorders in only 11.8–35.5% of COVID-19 patients.⁷ Furthermore, loss of smell was temporary in most COVID-19 patients, with improvement rates of approximately 80% within one week.⁸ However, 10.6% of the patients did not recover even within one month.⁹ Therefore, this study aimed to elucidate the clinical features of olfactory dysfunction in COVID-19 patients and determine its temporal evolution.

PATIENTS AND METHODS

This is a cross-sectional, analytic statistical study comprising 310 participants from 5 countries, including Iraq, United Kingdom, Oman, Egypt, and United States of America. Data obtained from a web-based electronic questionnaire conducted from

June 15 to July 15, 2021, was used in this study. The questionnaire included information, such as age, gender, and clinical history of allergic rhinitis (AR) and SARS-CoV-2 infection. Based on this information, the participants were divided into four age groups (<20 years, 21–40 years, 41–60 years, and >60 years), and those that exhibited a history of SARS-CoV-2 infection were asked to provide the following information: 1. History of smell disorders during infection, which were classified into four categories — complete loss of smell (anosmia), reduced sense of smell (hyposmia), alterations in sense of smell (dysosmia), and no alteration in smell. 2. History of loss of taste (ageusia) during infection. 3. State and period of recovery, with the recovery period divided into the following five groups: <1 week, 1–3 weeks, 3–12 weeks, 3–6 months, and >6 months. 4. Any medical consultation received for smell disorders, and whether the patient benefitted from therapy. 5. History of olfactory training using any type of odorants at home, and whether the patient benefitted from the training. 6. Whether the patient experienced any form of depression or required psychological intervention because of loss of smell during or after infection.

Data were recorded in a Google sheet, and statistical analysis was performed using the IBM SPSS (v. 23) software.

RESULTS

A total of 310 individuals from 5 countries participated in this study, out of which, 51% (158) and 73.5% (228) participants

exhibited a history of AR and COVID-19, respectively. Furthermore, 66.2% (151) of the participants with a history of COVID-19 were males and 33.8% (77) were females (Table 1).

COVID-19 was most common in participants in the age-group of 41–60 years

(44.2%), whereas it was least common in >60-year-old participants (1.6%) (Table 2). Moreover, there was no correlation between AR and the incidence of COVID-19 (Table 3).

Table 1: Gender distribution of COVID-19-positive and negative participant.

			Gender		TOTAL
			Male	Female	
COVID-19 infection	Positive	Count	151	77	228
		% with COVID-19 infection	66.2%	33.8%	100.0%
	Negative	Count	68	14	82
		% with COVID-19 infection	82.9%	17.1%	100.0%
Total		Count	219	91	310
		% with COVID-19 infection	70.6%	29.4%	100.0%

Table 2: Distribution of participants with respect to age group.

			Age group in years				Total
			Less than 20	21 to 40	41 to 60	More than 60	
COVID-19 infection	Positive	Count	7	79	137	5	228
		% of total	2.3%	25.5%	44.2%	1.6%	73.5%
	Negative	Count	5	23	50	4	82
		% of total	1.6%	7.4%	16.1%	1.3%	26.5%
Total		Count	12	102	187	9	310
		% of total	3.9%	32.9%	60.3%	2.9%	100.0%

Table 3: Correlation between history of allergic rhinitis (AR) and incidence of COVID-19 infection.

			COVID-19 infection		Total
			Positive	Negative	
AR	Positive	Count	119 _a	39 _a	158
		% with AR	75.3%	24.7%	100.0%
		% with COVID-19 infection	52.2%	47.6%	51.0%
		% of total	38.4%	12.6%	51.0%
	Negative	Count	109 _a	43 _a	152
		% with AR	71.7%	28.3%	100.0%
		% with COVID-19 infection	47.8%	52.4%	49.0%
		% of total	35.2%	13.9%	49.0%
Total		Count	228	82	310
		% with AR	73.5%	26.5%	100.0%
		% with COVID-19 infection	100.0%	100.0%	100.0%
		% of total	73.5%	26.5%	100.0%
P value: 0.518					

P value: 0.518

In this study, 73.7% (168) participants with a history of COVID-19 infection

complained of smell disorders, whereas 26.3% (60) COVID-19 patients reported no

change in the sense of smell during or after infection.

Anosmia was the most common disorder (45.2%), followed by hyposmia (22.4%) and dysosmia (6.1%), in the 168 participants with smell disorders occurring during infection (Table 4).

Approximately 87.5% of the COVID-19 patients recovered completely from smell disorders post-COVID-19 recovery, while 12.5% still complained of smell disorders (Fig. 2).

Table 4: Distribution of COVID-19-positive participants with smell disorders.

			Change in smell				Total
			Complete loss	Decrease	Abnormal smell	No change	
COVID-19 infection	Positive	Count	103 ^a	51 ^a	14 ^a	60 ^a	228
		% with COVID-19 infection	45.2%	22.4%	6.1%	26.3%	100.0%

Additionally, only 178 COVID-19 patients responded to the section on change in taste,

out of which 70.8% (126) reported a history of change in the perception of taste (Fig. 1).

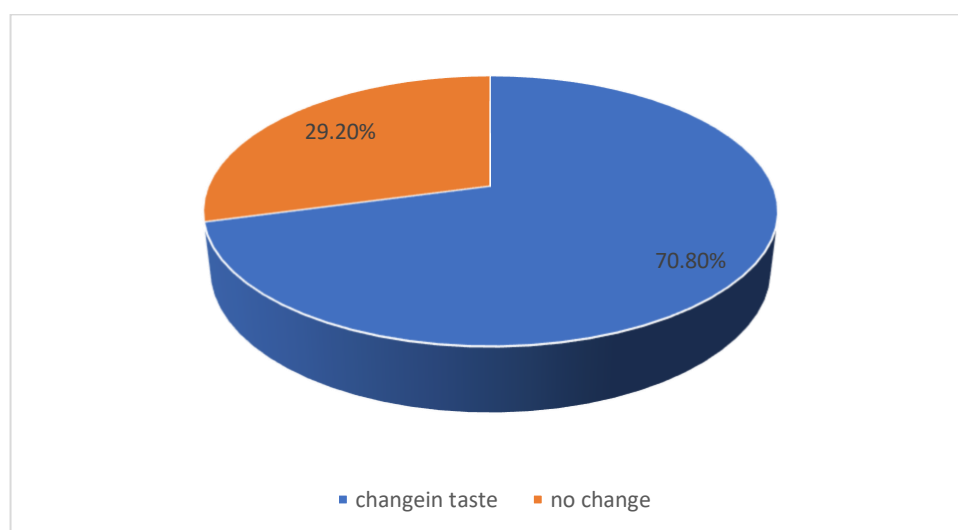


Figure 1: Distribution of COVID-19 patients with respect to change in perception of taste.

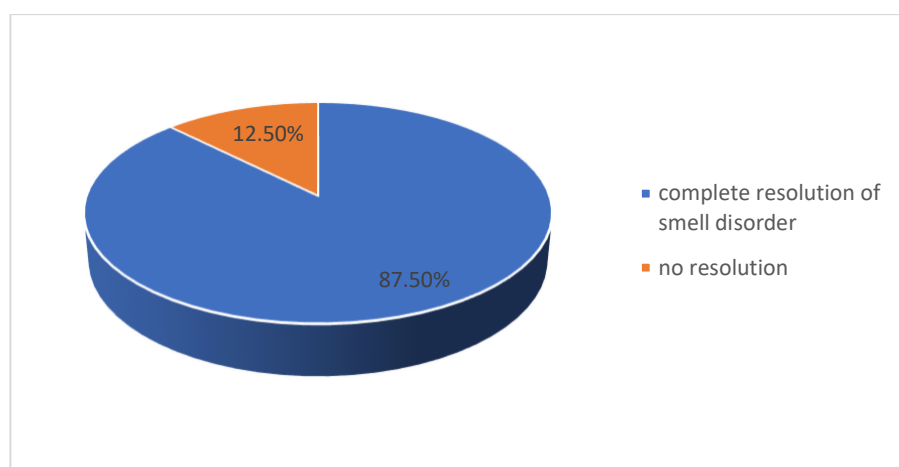


Figure 2: Percentage of resolution of smell disorders in positive covid19 subjects.

Regarding the recovery period from smell disorders, most participants (47.5%) reported normal smell within 1–3 weeks, followed by those with recovery in <1 week

(27.8%) (Fig. 3). However, recovery in few participants (3.7%) required >6 months (Fig. 3).

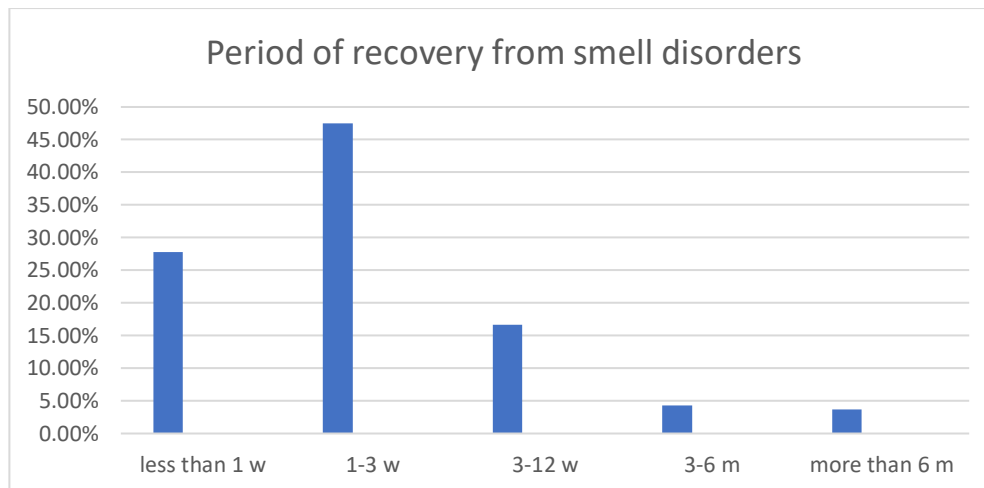


Figure 3: Period of recovery from smell disorders.

Furthermore, only 18.7% of the COVID-19 patients with smell disorders sought medical intervention. From these 18.7%

participants, 57.3% benefitted from therapy, while 42.7% did not observe any notable change (Fig. 4).

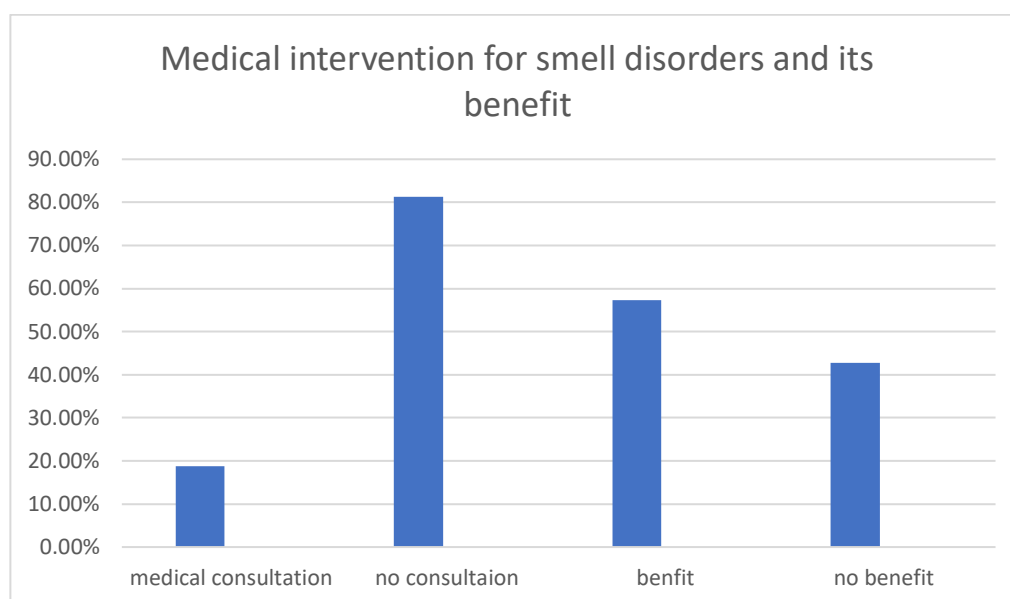


Figure 4: Medical intervention for smell disorders and its benefit.

Few participants (35.4%) also underwent olfactory training for smell disorders using concentrated odorants at home. Of these, 35.4% completely recovered, 26.3% benefitted slightly from the training, whereas 38.4% reported no benefit from olfactory training (Fig. 5).

We also observed that 45.7% of the COVID-19 patients with smell disorders showed a history of depression because of abnormal olfactory perception, while 54.3% experienced no psychological problems during infection.

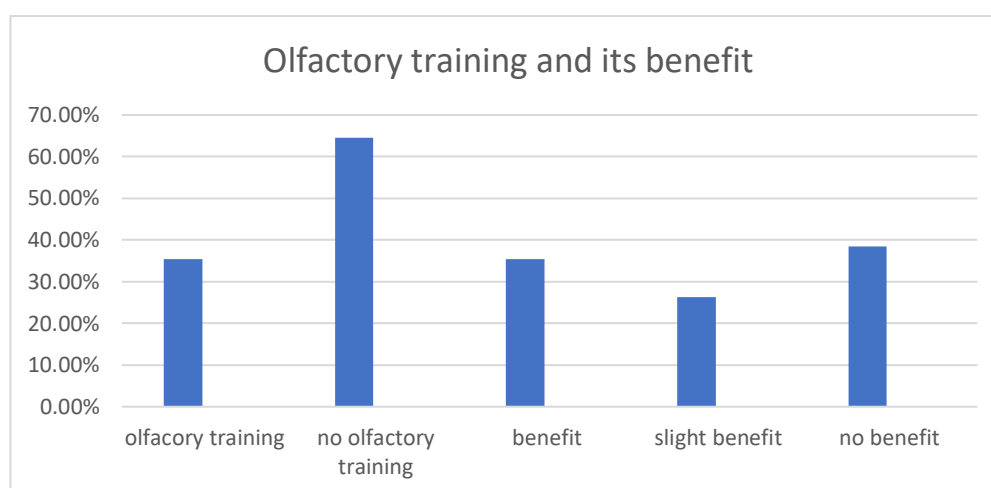


Figure 5: Olfactory training and its benefit.

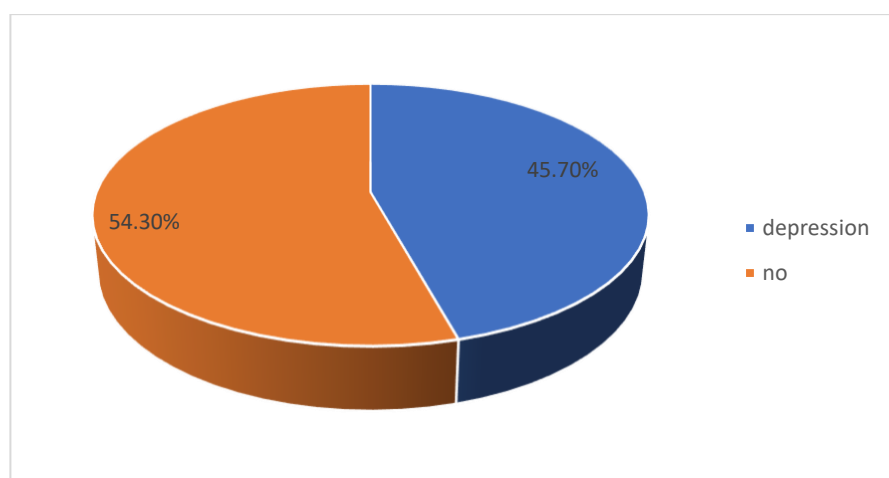


Figure 6: Percentage of participants with depression because of smell disorders.

DISCUSSION

We report that COVID-19 incidence was higher in males than in females, with a male: female ratio of 2:1 (Table 1). This finding is slightly similar to that of Kumar L.,¹⁰ where 58.9% males were affected, but differs from that of Klopfenstein et al. and Chiesa-Estomba et al.,^{11,12} where only 41% and 36.4% males were affected, respectively. This can be attributed to the fact that more males participated in the web-based electronic questionnaire than females.

In this study, there was no correlation between a history of AR and incidence of COVID-19 (Table 3), which is consistent with the findings of Joffily et al.¹³

We also observed that 73.7% of the participants suffered from smell disorders during or after infection (Table 4). This proportion was lower than that reported by Joffily et al. (88.8%),¹³ but higher than that reported by Klopfenstein et al. (53%),¹¹ Menni et al. (59%),¹⁴ Song et al. (11.4%),¹⁵ Ibekwe et al. (48.47%),¹⁶ Altundag et al.

(59.3%),¹⁷ Lechien et al. (44.6%),¹⁸ and Lee et al. (15.3%).¹⁹

Furthermore, complete loss of smell was reported in 66.8% of the participants, whereas partial loss was reported in 33.2% of the participants (Table 4). These findings differ from those of Kumar et al.,¹⁰ who reported complete loss in 53% of the patients and partial loss in only 47% patients, and of Chiesa-Estomba et al.,¹² who recorded complete loss in 83% and partial loss in 17% of the patients. We also observed that 9% of the COVID-19 patients with smell disorders complained of abnormal olfactory perception, which was differ from the observations made by Le Bon et al.,²⁰ where 37.5% patients exhibited persistent dysosmia.

Alterations in the taste perception was reported in 70% of COVID-19 patients (Fig. 1). This value differs from those reported by Menni et al. (59%),¹⁴ Song et al. (20.6%),¹⁵ Ibekwe et al. (41.47%),¹⁶ Lee et al. (15.3%),¹⁹ and Kumar et al. (24.1%).¹⁰ In this study, 87.5% of COVID-19 patients with smell disorders completely recovered

to a normal sense of smell after infection, while 12.5% complained of smell disorders until data collection (Fig. 2). These findings are similar to those of Boscolo-Rizzo et al.²¹ (89.4% recovered and 10.6% did not recover) and Lechien et al.¹⁸ (79.5% recovered and 20.5% did not recover even after two months of infection).

We found that 47.5% and 27.8% of COVID-19 patients with smell disorders returned to normal smell perception within 1–3 and <1 week, respectively, but 3.7% of them required >6 months to recover. This indicates that most of the participants in this study recovered from smell disorders within three weeks (Fig. 3). These findings are similar to those of Song et al. (80% patients recovering in two weeks),¹⁵ Altundag et al. (recovery within 2–15 days),¹⁷ Chiesa-Estomba et al. (recovery within 3–31 days),¹² and Boscolo-Rizzo et al. (89% patients recovered within 4 weeks),²¹. However, the findings of Lechien et al.¹⁸ were different, with only 25% patients recovering olfaction within 14 days, 54.5% patients recovering between the 16th and the 70th day, and 20.5% patients did not recover normal olfactory perception.

We observed that of the 18.7% participants that sought medical intervention, only 57.3% benefitted from the therapy (Fig. 4). Few participants (35.4%) also underwent olfactory training using concentrated odorants at home. Approximately 35.4% of these participants benefitted completely and 26.3% benefitted slightly, while 38.4% participants did not benefit at all (Fig. 5). Le Bon et al.²⁰ suggest a combination of a short course of oral corticosteroids and olfactory training to assist patients with

dysosmia recover from olfactory loss due to COVID-19.

Interestingly, 45.7% of COVID-19 patients with smell disorders exhibited a history of depression because of abnormal olfaction, while 54.3% experienced no psychological problems during infection (Fig. 6). These results differ from the findings of Moayed et al.,²² who reported depression in 54.29% of the patients.

CONCLUSIONS

Various types of smell disorders occur in COVID-19 patients, but most patients recover completely and spontaneously. In this regard, olfactory training and therapy may assist in recovery. However, COVID-19 patients suffering from depression early require psychological support to overcome the infection sequelae.

REFERENCES

1. World Health Organization. Coronavirus disease 2019 (COVID-19): situation report. 2020. Available from: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200816-covid-19-sitrep-2019.pdf?sfvrsn=5dde1ca2_2
2. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72,314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323:1239–42. <https://doi.org/10.1001/jama.2020.2648>
3. Chen N, Zhou M, Dong X et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*. 2020;395:507–13. Available from: [https://doi.org/10.1016/S0140-6736\(20\)30211-7](https://doi.org/10.1016/S0140-6736(20)30211-7)
4. Gane SB, Kelly C, Hopkins C. Isolated sudden onset anosmia in COVID-19 infection. A novel syndrome? *Rhinology*. 2020; 58:299–301. Available from: <https://doi.org/10.4193/Rhin20.114>
5. Murphy C, Doty RL, Duncan HJ. Handbook of olfaction and gustation. In: Richard L, editors. *Clinical disorders of olfaction*. 2nd ed. New York: CRC Press; 2003. p. 822–49. Available from: <https://doi.org/10.1201/9780203911457.ch22>
6. Boscolo-Rizzo O, Spinato G, Fabbris C, Polesel J, Cazzador D, Borsetto D, et al. Alterations in smell or taste in mildly symptomatic outpatients with SARS-CoV-2 infection. *JAMA*. 2020;323(20):2089–90.
7. Lechien JR, Chiesa-Estomba CM, De Siati DR, et al. Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study. *Eur Arch Otorhinolaryngol*. 2020;277:2251–61. Available from: <https://doi.org/10.1007/s00405-020-05965-1>
8. Hopkins C, Surda P, Whitehead E, Kumar BN. Early recovery following new onset anosmia during the COVID-19 pandemic—an observational cohort study. *J Otolaryngol Head Neck Surg*. 2020;49:26. Available from: doi: 10.1186/s40463-020-00423-8
9. Hopkins C, Surda P, Kumar N. Presentation of new onset anosmia during the COVID-19 pandemic. *Rhinology*. 2020;58:295–98. Available from: <https://doi.org/10.4193/rhin20.116>
10. Kumar L, Kahlon N, Jain A. et al. Loss of smell and taste in COVID-19 infection in adolescents. *Int J Pediatr Otorhinolaryngol*. 2021 Mar; 142.
11. Klopfenstein T, Zahra H, Kadiane-Oussou NJ, et al. New loss of smell and taste: Uncommon symptoms in COVID-19 patients in Nord Franche-Comte cluster, France. *Int J Infect Dis*. 2020;100:117–22.
12. Chiesa-Estomba CM, Lechien JR, Radulesco T, et al. Patterns of smell recovery in 751 patients affected by the COVID-19 outbreak, *Eur J Neurol*. 2020;27:2318–21. Available from: doi:10.1111/ene.14440
13. Joffily L, Ungierowicz A, David AG, et al. The close relationship between sudden loss of smell and COVID-19, *Braz J Otorhinolaryngol*. 2020;86:632–8.
14. Menni C, Valdes AM, Freidin MB, et al. Loss of smell and taste in combination with other symptoms is a strong predictor of COVID-19 infection. Available from: <https://doi.org/10.1101/2020.04.05.20048421>
15. Song J, Deng Y, Wang H, et al. Impact of COVID-19 on smell and taste; Self-reported taste and smell disorders in patients with COVID-19 : distinct features in China. Available from: <https://doi.org/10.1101/2020.06.12.20128298>
16. Ibekwe TS, Fasunla AJ, Orimadegun AE. Systematic review and meta-analysis of

- smell and taste disorders in COVID-19. *OTO Open*. 2020; 4(3):1–13.
17. Altundag A, Saatci O, Sanli DE, et al. The temporal course of COVID-19 anosmia and relation to other clinical symptoms, *Eur Arch Oto-Rhino-L*. 2021;278:1891–97. Available from: <https://doi.org/10.1007/s00405-020-06496-5>
 18. Lechien JR, Journe F, Hans S, Chiesa-Estomba CM, Mustin V, Beckers E, et al. Severity of anosmia as an early symptom of COVID-19 infection may predict lasting loss of smell. *Front Med*. 2020;7:582802. Available from: 10.3389/fmed.2020.582802
 19. Lee Y, Min P, Lee S, Kim SW. Prevalence and duration of acute loss of smell or taste in COVID-19 patients. *J Korean Med Sci*. 2020 May;35(18):e174. Available from: <https://doi.org/10.3346/jkms.2020.35.e174>
 20. Le Bon SD, Konopnicki D, Pisarski N, et al. Efficacy and safety of oral corticosteroids and olfactory training in the management of COVID-19-related loss of smell. *Eur Arch Oto-Rhino-L*. 2021;278:3113–17. Available from: <https://doi.org/10.1007/s00405-020-06520-8>
 21. Boscolo-Rizzo P, Borsetto D, Fabbris C, et al. Evolution of altered sense of smell or taste in patients with mildly symptomatic COVID-19. *JAMA Otolaryngol Head Neck Surg*. 2020 Aug;146(8).
 22. Moayed MS, Vahedian-Azimi A, Mirmomeni G, et al. Depression, anxiety, and stress among patients with COVID-19: A Cross-Sectional Study. *Adv Exp Med Biol*. 2021;1321:229-36. Available from: 10.1007/978-3-030-59261-5_19