



The role of self-reported smell and taste disorders in suspected COVID-19

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Abstract

Purpose The sudden onset of smell and taste loss has been reported as a symptom related to COVID-19. There is urgent need to provide insight to the pandemic and evaluate anosmia as a potential screening symptom that might contribute to the decision to test suspected cases or guide quarantine instructions.

Methods Systematic review of the PubMed/Medline, Cochrane databases and preprints up to May 3, 2020. Combined search terms included: “COVID-19”, “SARS-CoV-2”, “coronavirus”, “nose”, “anosmia”, “hyposmia”, “olfactory loss”, “smell loss”, “taste loss”, and “hypogeusia”.

Results Our search identified 18 reviewed articles and 6 manuscript preprints, including a large epidemiological study, four observational case series, five case–controlled studies, five cross-sectional studies, five case series of anosmic patients and four electronic surveys. Great methodological differences were noted. A significant prevalence of anosmia is reported in COVID-19 patients. Controlled studies indicate that anosmia is more common in COVID-19 patients than in patients suffering from other viral infections or controls. Most of the studies reported either smell loss or smell plus taste loss. Less severe COVID-19 disease is related to a greater prevalence of anosmia. A quick recovery of the smell loss may be expected in most COVID-19 cases.

Conclusion Anosmia is more prevalent in COVID-19 patients than in patients suffering from other respiratory infections or controls.

Keywords Anosmia · COVID-19 · Olfactory dysfunction · Loss of smell · SARS-CoV-2 · Taste

Since the outbreak of the COVID-19 pandemic, observations and scientific reports have been accumulating rapidly that sudden anosmia and taste disorders are symptoms associated with the COVID-19 infection [1, 2]. Recently the World Health Organization has included the loss of smell or taste as a new symptom of COVID-19 infection as have many Health Authorities after a surge of publications and press releases that pointed to anosmia as a potential screening symptom that might contribute to the decision to test suspected cases or guide quarantine instructions. Subsequently, Otolaryngologic and Rhinologic Societies have worldwide also advised to consider patients with newly acquired sudden loss of smell as potentially positive for SARS-CoV-2. Given

the increase of publications concerning anosmia, and the fact that most current research is under “time-pressure” to provide insight to the pandemic, we undertook a review of the published relevant literature. The objective of this systematic review was to examine existing scientific evidence on the role of anosmia detection in the COVID-19 pandemic and highlight the areas of need for further research.

A computerized search of the PubMed/Medline and Cochrane databases was performed of all indexed studies to identify all relevant manuscripts and preprints up to May 3, 2020. Preprints’ repositories included medRxiv. Combined search terms included: “COVID-19”, “SARS-CoV-2”, “coronavirus”, “nose”, “anosmia”, “hyposmia”, “olfactory loss”, “smell loss”, “taste loss”, and “hypogeusia”. Adjunctive searches were performed based on the studies that were identified (and their references). Studies were excluded if full texts could not be obtained.

Our search identified 18 reviewed articles published or accepted for publication [1–18] and 6 manuscript preprints

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Table 1 Studies on the role of smell and taste disorders in suspected COVID-19

Author source	Country	Study type	No of patients	Participants	Anosmia %	Course of anosmia	Level of evidence
Giacomelli A, et al. [1]	Italy	Cross-sectional	59	SARS-CoV-2+, hospitalized	33.9% taste/smell loss 18.6% both	20.3% pre-admission anosmia	IV
Lechien et al. [2]	Eur Arch Otorhinolaryngol	Case series observational	417 mild-to-moderate COVID-19	SARS-CoV-2+, hospitalized and home	85.6% smell loss 79.6% anosmic	11.8% initial symptom Taste loss in 88.8% 72.6% recovered smell in 8 d	IV
Mao L, et al. [3]	France Italy, Spain JAMA Neurol	Case series, observational	214	SARS-CoV-2+, hospitalized	5.1% 6.3% in mild disease	5.6% taste loss	IV
Beltrán-Corbellini A, et al. [4]	China Eur J Neurol	Case-control	79 COVID-19 40 controls	SARS-CoV-2+, hospitalized influenza controls	31.6% in COVID-19 12.5% in controls (OR 21.4)	35.5% initial symptom 35.4% taste loss 12.9% nasal obstruction 56.7% recovery (mean: 7.5 d)	III
Spinato J, et al. [5]	Spain JAMA	Cross-sectional	202	SARS-CoV-2+, home	64.4%	3% only symptom 36.1% nasal obstruction	IV
Moein ST, et al. [6]	Iran Int Forum Allergy Rhinol	Case-control	60 patients 60 controls	SARS-CoV-2+, hospitalized matched controls olfactory test	29% reported a loss 58% tested anosmic/ severely hyposmic 18% of controls mild hyposmia	Not an initial symptom 24% taste loss	III
Yan CH, et al. [7]	USA Int Forum Allergy Rhinol	Cross-sectional	59 SARS-CoV-2+ 203 SARS-CoV-2-	suspect case SARS-CoV-2+ mostly home	68% in SARS-CoV-2+ 16% in SARS-CoV-2-	Taste loss 71% in SARS-CoV-2+ 17% in SARS-CoV-2- 72.5% improvement 18% < 1 W, 37.5% 1-2 W	IV
Yan CH, et al. [8]	USA Int Forum Allergy Rhinol	Case series, observational	128	SARS-CoV-2+, 20% hospitalized	26.9% in hospitalized patients 66.7% in home-treated patients	Taste loss 23.1% in hospitalized vs 62.7% in home-treated Patients with loss of smell were 10 times less likely to be admitted	IV
Gudbjartsson DF, et al. [9]	Iceland N Engl J Med	Epidemiological	1044	Targeted Tests SARS-CoV-2+	11.5%		High level epidemiological

Table 1 (continued)

Author source	Country	Study type	No of patients	Participants	Anosmia %	Course of anosmia	Level of evidence
Wee LE, et al. [10] Eur Arch Otorhinolaryngol Singapore		Case-control	870 suspect case 154 SARS-CoV-2+ 71 other viruses+, rhinovirus, influenza, adenovirus, coronaviruses	Suspect cases SARS-CoV-2+ routine panel of respiratory viruses	5% in suspect cases 22.7% in SARS-CoV-2+ 2.8% in other viruses (OR 10.14)	8.6% only symptom 28.5% rhinorrhea Smell loss as screening: 98.7% specificity, 22.7% sensitivity	III
Vaira LA, et al. [11] Head Neck Italy		Case series observational	72	SARS-CoV-2+ 22 hospitalized 47 home, healthcare personnel Olfactory/taste test	73%	18% initial symptom 66% recovery at evaluation (mean 19 d) most recovered earlier than 5 d	IV
Kaye R, et al. [12] Otolaryngol Head Neck Surg USA		Online AAOHNS Reporting Tool	237 physician-submitted cases of COVID-19 related smell/taste loss	The AAOHNS COVID-19 Anosmia Reporting Tool	All	27% initial symptom 25% nasal obstruction 18% rhinorrhea Mean time to improvement of 7.2 d	IV
Hopkins C, et al. [13] Rhinology UK		Survey prompted by queries about anosmia	2428 reporting new onset anosmia	80 had been tested for SARS-CoV-2, 74% were positive	All		IV
Heidari F, et al. [14] Rhinology Iran		Anosmia case series	23	Sudden anosmia SARS-CoV-2+	All	83% initial symptom 69.6% only symptom in 2 weeks 75% improvement in 2 weeks	IV
Gilani G, et al. [15] Medical Hypothesis Iran		Anosmia case series	8	Sudden anosmia 5 tested, SARS-CoV-2+	All	Anosmia followed other symptoms	IV
Ottaviano G, et al. [16] Rhinology Italy		Anosmia case series	6 healthcare personnel	Sudden anosmia SARS-CoV-2+	All	75% initial symptom Improvement in 15 d	IV
Gane SB, et al. [17] Rhinology UK		Anosmia case series	11	Sudden anosmia 1 tested, SARS-CoV-2+	All	55.5% only symptom	IV
Eliezer M, et al. [18] JAMA Otolaryngol Head Neck France		Case report	1	SARS-CoV-2+ CT, MRI	Anosmia without nasal obstruction	Bilateral inflammatory obstruction of the olfactory clefts	IV

Table 1 (continued)

Author source	Country	Study type	No of patients	Participants	Anosmia %	Course of anosmia	Level of evidence
Haehner A, et al. [19] medRxiv Germany		Cross-sectional controlled	500 suspect cases 34 SARS-CoV-2+ 466 SARS-CoV-2–	Suspect cases Anosmic were 22 SARS-CoV-2+ 49 SARS-CoV-2–	13.8% in all suspect cases 64.7% in SARS-CoV-2+ 10.1% in SARS-CoV-2– Anosmic pts had less severe COVID-19	4.5% initial symptom COVID-19 anosmic patients had less nasal obstruction and rhinorrhea Smell loss as screening: 65% sensitivity, 90% specificity	III
Hornuss D, et al. [20] medRxiv Germany		Cross-sectional controlled	45 patients 45 controls	SARS-CoV-2+, hospitalized Hospitalized controls Olfactory test (Sniffin' Stick12)	SARS-CoV-2+ 49% reported smell loss Tested anosmic 40%, hyposmic 40% 0% of controls reported anosmia		III
Levinson R, et al. [21] medRxiv Israel		Cross-sectional	42	SARS-CoV-2+ hospitalized mild COVID-19	35.7%	33.3% taste loss Anosmia follow-up/4d: 73.3% recovery, median duration 7.6 d	IV
Lechien J, et al. [22] medRxiv Belgium		Cross-sectional	78 reporting sudden anosmia 49 SARS-CoV-2+	Sudden anosmia SARS-CoV-2+ Olfactory test, 46pts	All Anosmia ≤ 12 d: 87.5% SARS-CoV-2+ Lasting: 23% SARS-CoV-2+	46.2% nasal obstruction 24% of reported anosmic patients were non-anosmic on olfactory testing	IV
Menni C, et al. [23] medRxiv UK		Online app Community survey For general population	1702 responders reported having being tested 579 SARS-CoV-2+ 1123 SARS-CoV-2–	Responders to RADAR COVID-19, an app asking about COVID-19 symptoms	59% in SARS-CoV-2+ 18% in SARS-CoV-2–		IV
Bagheri SHR, et al. [24] medRxiv Iran		Online community survey	10069 reporting new onset anosmia	Volunteers reporting anosmia, general population	Anosmia increased as did COVID-19 positivity in provinces of Iran		IV

No number; Level of evidence of prognostic studies; d days; w weeks; AAOHNS American Academy of Otolaryngology–Head and Neck Surgery; tested: with RT-PCR for SARS-CoV-2+

(not peer-reviewed) [19–24] reporting on patients presenting sudden anosmia/taste loss in the context of COVID-19 infection (Table 1). The studies took place from mid-January to mid-April. There were great methodological differences among the studies. A large epidemiological study reported on 9199 persons who were recruited for targeted testing in Iceland [9]. Four large observational case series reported anosmia prevalence in COVID-19 cohorts from China [3], Belgium and other European countries [2], USA [8], Italy [11]. Five case–controlled studies compared the smell/taste loss between SARS-CoV-2 PCR-positive participants and patients PCR-positive for influenza [4], a panel of respiratory viruses [10], matched hospitalized controls [6, 20], and patients tested for influenza-like symptoms for COVID-19 [19]. Five cross-sectional studies of SARS-CoV-2+ patients report on smell/taste loss in patients with varying COVID-19 disease severity [1, 5, 7, 21, 22]. Four small case series and a case report of anosmic patients, most of whom had been tested for SARS-CoV-2 with various indications [14–18] and four electronic surveys about smell loss [12, 13, 23, 24] commented on the increase of the patients seeking treatment for smell loss during the COVID-19 pandemic. The electronic surveys included the AAOHNS COVID-19 Anosmia Reporting Tool (completed by healthcare providers) [12], The RADAR COVID-19, an online app for the UK general population [23] and two surveys prompted by patients' queries about smell loss (in UK [13] and Iran [24]), one reporting on a small percentage tested for SARS-CoV-2.

Prevalence of smell loss: A large epidemiological study reported a prevalence of 11.5% for smell loss in 1044 SARS-CoV-2 + identified through targeted tests [9]. Four observational case series reported smell loss in their studied cohorts at 5.1% (hospitalized patients) [3], 26.9% (hospitalized patients) and 66.7% (home-treated patients) [8], 73% (hospitalized and home-treated patients) [11], and 85.6% (hospitalized and home-treated patients) [2]. The observed discrepancies most likely are related to varying research methods and possible patient selection biases. A significant proportion of the cohort in the studies reporting high anosmia prevalence was healthcare personnel [2, 11]. Cross-sectional studies found the prevalence of anosmia to be at 33.9% [1] and 35.7% [21] for hospitalized patients and 64.4% [5] and 68% [7] for out-patients. Smell loss prevalence was compared between COVID-19 patients and control groups in five case-controlled studies: 22.7% of COVID-19 patients compared to 2.8% of patients positive for a panel of respiratory viruses [10], 31.6% of COVID-19 compared to 12.5% of influenza [4], 29% of COVID-19 patients compared to 18% for controls [6], 49% compared to 0% for controls [20], and 64.7% of COVID-19 patients compared to 10.1% for respiratory viral illness [19]. The smell loss as a screening symptom was found to show a high specificity and moderate sensitivity for the detection of COVID-19 infection [10, 19].

Clinical characteristics: Most of the studies reported either smell loss or smell plus taste loss. As a presenting symptom, anosmia was rated from 0 to 35%. All the studies that comment on the course of anosmia report quick recovery, in 7–10 days [2, 4, 7, 11, 14, 16, 21]. Nasal obstruction was found at rates ranging from 12.9% to 46% and rhinorrhea from 18% to 28.5%.

While great methodological differences were noted in the reviewed studies, a significant prevalence of anosmia is reported in COVID-19 patients, and controlled studies indicate that anosmia is more common in COVID-19 patients than in patients suffering from other respiratory infections or controls, taking into account seasonal patterns of olfactory dysfunction. Less severe COVID-19 disease is related to a greater prevalence of anosmia. Olfactory testing and treatment decisions should take into account that quick recovery of the smell loss may be expected in most COVID-19 cases.

Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest.

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