COVID-19 Anosmia Reporting Tool: Initial Findings

Rachel Kaye, MD, Rutgers New Jersey Medical School, Newark, NJ

C.W. David Chang, MD, FACS, University of Missouri School of Medicine, Columbia, MO
(ORCID 0000-0002-0141-7583)
One Hospital Dr, MA 314, Columbia, MO 65212
615.414.5932
changda@health.missouri.edu

Ken Kazahaya, MD, MBA, FACS, Children's Hospital of Philadelphia, Philadelphia, PA

Jean Brereton, MBA, American Academy of Otolaryngology—Head and Neck Surgery Foundation, Alexandria, Virginia, USA

James C. Denneny III, MD, FACS, Johns Hopkins School of Medicine, Baltimore, MD

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Abstract

There is accumulating anecdotal evidence that anosmia and dysgeusia are associated with the COVID-19 pandemic. In order to investigate their relationship to SARS-CoV2 infection, the American Academy of Otolaryngology–Head and Neck Surgery (AAO-HNS) developed the COVID-19 Anosmia Reporting Tool for Clinicians for the basis of this pilot study. This tool allows healthcare providers to confidentially submit cases of anosmia and dysgeusia related to COVID-19. We analyzed the first 237 entries which revealed that anosmia was noted in 73% of subjects prior to COVID-19 diagnosis and was the initial symptom in 26.6%. Some improvement was noted in 27% of patients, with mean time to improvement of 7.2 days in this group (85% of this group improved within 10 days). Our findings suggest that anomia can be a presenting symptom of COVID-19,consistent with other emerging international reports. Anosmia may be critical in timely identification of individuals infected with SARS-CoV2 who may unwittingly be transmitting the virus.

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Anosmia (loss of sense of smell) and dysgeusia (alteration of sense of taste) have been reported in association with the COVID-19 pandemic. Dysgeusia may be related to alteration in the perception of taste due to loss of the sense of olfaction. There have been published and non-published anecdotal reports of anosmia related to COVID-19 emanating from around the world, including South Korea, Germany, Italy, United Kingdom, Iran and the United States. In South Korea, the Daegu City Council's informal phone survey found 15.3% of 3191 confirmed SARS-CoV-2 cases had anosmia or dysgeusia.[1]. Hendrick Streeck, a German virologist, reported a loss of smell and taste in over two-thirds of 100 COVID-19 positive people interviewed with mild symptoms.[2] Massimo Galli, an Italian infectious disease specialist at the University of Milan, noted that anosmia and dysgeusia seems to be observed in patients even with modest symptoms or limited severity, however, they appear to present later in the course of infection.[3] A non-peer reviewed Iranian study[4] on 10,069 subjects with anosmia or hyposmia (unknown COVID-19 status) noted sudden symptom onset in 76.2%

In an effort to establish a platform allowing healthcare providers of all specialties worldwide to submit data to confidentially report on anosmia symptoms related to COVID-19, the American Academy of Otolaryngology—Head and Neck Surgery (AAO-HNS) established the COVID-19 Anosmia Reporting Tool for Clinicians (Supplement Data 1).[5] The survey was developed by expert panelists and stakeholders from the AAO-HNS Infectious Disease and Patient Safety Quality Improvement Committees. After multiple iterations, consensus was reached, satisfying adequate face validity. The content of the tool, especially the data elements, was based on review of multiple

COVID-19 reports related to anosmia. As this is a pilot study conducted in an expedited manner to address the rapidly changing situation, additional validation will be forthcoming. Data collection is hosted on a platform similarly used for the AAO-HNS Patient Safety Event Reporting Tool,[6] with digital safeguards built to ensure anonymity. No identifiable data about the user was solicited. Computer's IP address was not captured from the submitting provider to preserve the confidentiality of the report/reporter. If identifiable information was inadvertently provided by the reporter in the free-text entry boxes, this information was immediately discarded. This preliminary analysis is based on data collected from the opening of the survey March 25, 2020 to April 3, 2020. Descriptive statistics were used to describe submissions to the database.

In 10 days of data accrual, 240 entries were made. Three were removed due to clinical inconsistencies and thus 237 entries were analyzed. While otolaryngologists contributed 47% of entries, the majority came from a variety of other specialists (Figure 1). Demographics are shown in Table 1. Age distribution histogram is found in Appendix 1. Over one-third of the cases were of healthcare workers.

One of the most relevant findings is the timing of anosmia in relationship to diagnosis and the presence—or absence—of other symptoms (Table 2). Anosmia was noted in 73% prior to diagnosis. Anosmia contributed to recommending testing in 40%. More critically, anosmia was the initial symptom in more than a quarter of patients. The remainder demonstrated more common symptoms of COVID-19, with myalgias and sore throat highly noted as free-text entries in the "Other" category. Some improvement in anosmia was noted in 27% of patients, with mean time to improvement of 7.2 days in

this group (85% of this group improved within 10 days). This data is subject to significant interpretation as many entries were submitted before long-term follow up was achieved.

Although the exact pathophysiology of how SARS-CoV-2 could produce olfactory dysfunction has not been firmly established, direct extension through the nasal mucosa (via angiotensin-converting enzyme 2 receptor on the basal layer of the nasal epithelium) and/or extension to the olfactory bulb are potential hypotheses. Post-viral olfactory dysfunction is a common cause of olfactory dysfunction and is thought to be caused by neuroepithelial dysfunction.[7,8] Deems et al[6] reported 26% of patients had anosmia as a result of an upper respiratory infection or cold, with a preponderance of females (63%) being affected more than males. More recently, Fornazieri et al[9] reported a 13% incidence of post-viral loss of smell.

Although coronaviruses are a known etiology for post-viral olfactory dysfunction,[10] there is only one case report of SARS-CoV producing anosmia.[11] SARS-CoV-2 appears to differ in this regard, as the mounting anecdotal evidence caused ENT UK and the AAO-HNS to announce the potential association.[12,13] For the current COVID-19 pandemic, scientific data is emerging. A European multi-center study released recently had 417 COVID-19 patients with mild-to-moderate symptoms (mean age = 36.9 years; 263 (63%) female).[14] Olfactory dysfunction was reported in 11.8% of cases before any other symptom.

Currently, neither the WHO nor the CDC recognize anosmia as a screening symptom. As we continue to treat this pandemic, it is vital to identify additional symptoms outside of the classic triad of fever, cough, and dyspnea in an effort to promote timely identification of infected individuals who may unknowingly transmit the virus. Characteristic symptoms inclusive of anosmia can be utilized to direct early and widespread testing to mitigate this disease.

With this survey, some caveats should be considered. Entries are provider initiated and limited by the awareness of the tool. Because of limitations to testing availability, diagnosis of some patients is presumed and not confirmed. By the nature of the capture strategy, analysis has been made of a subset of COVID-19 patients only: those that have anosmia. It is difficult to determine the prevalence of this symptom among all COVID-19 patients.

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Table 1. Demographics, n=237

Age, y	
Mean (±SD)	39.6 (± 14.6)
Median	36
Range	2-89
Sex, M/F (%)	108/129 (46/54)
Patient location (%)	
United States	158 (67)
Mexico	11 (5)
Italy	9 (4)
UK	7 (3)
Other	52 (22)

Table 2. Timing of Anosmia

Anosmia onset (%)	
Before diagnosis	**172 (73)**
Anosmia contributed to testing for COVID-19	94 (40)
After diagnosis	65 (27)
Symptoms before anosmia (%)	
None	**64 (27)**
Fever	90 (38)
Chills	63 (27)
Malaise	93 (39)
Cough	98 (41)
Headache	88 (37)
Nasal congestion	60 (25)
Rhinorrhea	42 (18)
GI distress	24 (10)
Other	28 (13)
Resolution of Anosmia (%)	
Complete resolution	30 (13)
Partial resolution	32 (14)
None, not yet	175 (74)
Mean time to improvement, d (±SD)	7.2 (±3.1)

References

(1) Kim Y. [(Exclusive) Daegu 15% of 3191 confirmed patients lost their sense of smell or taste]. Jungang Daily. March 24, 2020. Accessed April 6, 2020.

(2) Brodwin E. Doctors warn an inability to smell could be a symptom of Covid-19 — but caution the evidence is preliminary. STA. https://www.statnews.com/2020/03/23/coronavirus-sense-of-smell-anosmia/. March 23, 2020. Accessed April 6, 2020.

(3) Stone J. There's An Unexpected Loss Of Smell And Taste In Coronavirus Patients. Forbes. https://www.forbes.com/sites/judystone/2020/03/20/theres-an-unexpected-loss-of-smell-and-taste-in-coronavirus-patients/#33cc033a5101. March 20, 2020. Accessed April 6, 2020.

(4) Bagheri SHR, Asghari AM, Farhadi M, et al. Coincidence of COVID-19 epidemic and olfactory dysfunction outbreak. *medRxiv*. March 2020:2020.03.23.20041889. doi:10.1101/2020.03.23.20041889

(5) COVID-19 Anosmia Reporting Tool for Clinicians. American Academy of Otolaryngology—Head and Neck Surgery. https://www.entnet.org/content/reporting-tool-patients-anosmia-related-covid-19. Accessed April 6, 2020.

(6) Vila PM, Lewis S, Cunningham G, et al. A Novel Patient Safety Event Reporting Tool in Otolaryngology. Otolaryngol Neck Surg. 2017;157(1):117-122.

(7). Deems DA, Doty RL, Settle RG, et al. Smell and taste disorders, a study of 750 patients from the University of Pennsylvania Smell and Taste Center. Arch Otolaryngol Head Neck Surg. 1991;117(5):519-528.

(8) Miwa T, Ikeda K, Ishibashi T, et al. Clinical practice guidelines for the management of olfactory dysfunction - Secondary publication. Auris Nasus Larynx. 2019;46(5):653-662.

(9) Fornazieri MA, Borges BB, Bezerra TF, Pinna Fde R, Voegels RL. Main causes and diagnostic evaluation in patients with primary complaint of olfactory disturbances. Braz J Otorhinolaryngol. 2014 May-Jun;80(3):202-7. English, Portuguese. PubMed PMID: 25153103.

(10) Suzuki M, Saito K, Min WP, et al. Identification of viruses in patients with postviral olfactory dysfunction. Laryngoscope. 2007;117(2):272-277.

(11) Hwang CS. Olfactory neuropathy in severe acute respiratory syndrome: report of A case. Acta Neurol Taiwan. 2006;15(1):26-28.

(12) Hopkins C. Loss of sense of smell as marker of COVID-19 infection. ENTUK. https://www.entuk.org/categories/covid-19. Accessed April 5, 2020.

(13) Anosmia, Hyposmia, and Dysgeusia Symptoms of Coronavirus Disease. 2020. American Academy of Otolaryngology—Head and Neck Surgery. March 22, 2020. https://www.entnet.org/content/aao-hns-anosmia-hyposmia-and-dysgeusia-symptoms-coronavirus-disease. March 22, 2020. Accessed April 5, 2020.

(14) 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 [published online ahead of print April 6, 2020]. Eur Arch Otorhinolaryngol. doi:10.1007/s00405-020-05965-1

Figure 1. Sources of Data.

Supplement Data 1. The COVID-19 Anosmia Reporting Tool.

Supplement Data 2. Age Distribution of Patients

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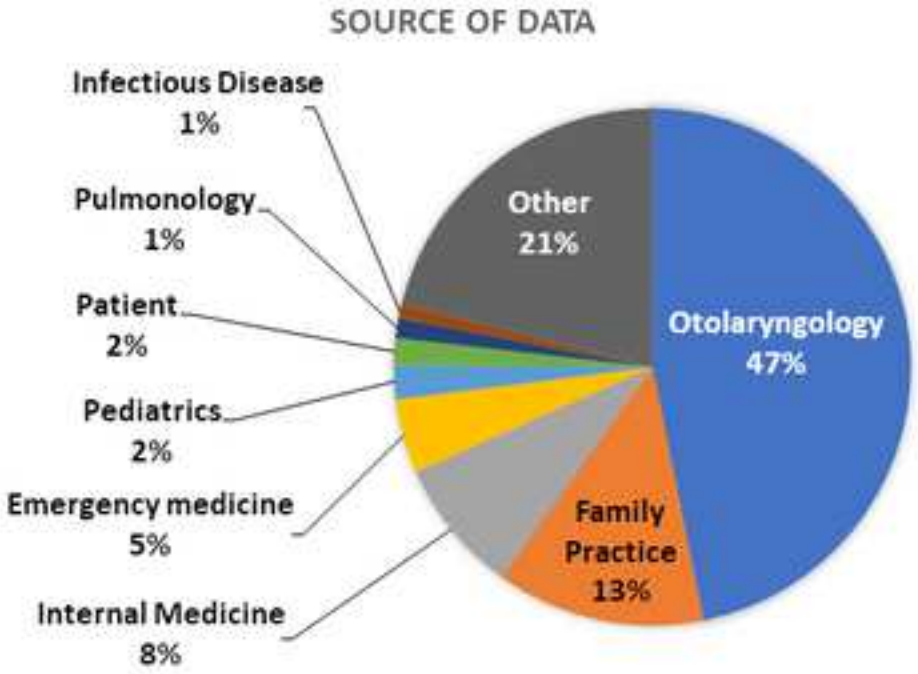

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COVID-19 Anosmia Reporting Tool

There is rapidly accumulating anecdotal evidence that anosmia with resultant dysgeusia are frequently reported symptoms associated with the COVID-19 pandemic. Similar reports are surfacing from multiple countries around the world including the United States. In an effort to establish the importance of these symptoms in diagnosis and progression of COVID-19, the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) has established an **Anosmia Reporting Tool**. This tool was developed by the AAO-HNS Infectious Disease and Patient Safety Quality Improvement Committees to allow healthcare providers of all specialties worldwide to submit data to confidentially report on anosmia and dysgeusia related to COVID-19.

There are safeguards to ensure the confidentiality of reporting. No identifiable data about the user is submitted with the report and the computer's IP address is not captured from the submitting provider to preserve the confidentiality of the report/reporter. Further, any report containing identifiable information (hospital name, location, practice name, etc.) is immediately discarded.

To maintain confidentiality, this report needs to be completed online. However, for your convenience, you may view the questions and download a pdf of the Anosmia Reporting Tool below:

Instructions:

- Please respond to as many questions as possible
- Do not report any information that may identify the physician, patient or institution in the questions with the free text boxes
- No identifiable information is collected from the submitting provider
- Once your data is submitted, an email will be sent to AAO-HNS staff notifying them of the new submission

You may contact the AAO-HNS research business unit regarding the Anosmia Reporting Tool at *Anomsia@entnet.org*

COVID-19 ANOSMIA REPORTING TOOL

1. Medical Specialty of Submitting Provider: (free text)_____

2. Patient age: ____ (Only enter a number)

3. Patient Gender: ___ Male ____Female

4. Patient location at time of diagnosis

   ___ United States
   ___ Other
   4a. If Other, please specify country: (free text)_____

5. Is the source of the COVID-19 infection identifiable? ___Yes ___No

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5a. If "yes," how many days from the contact was the anosmia/dysgeusia first observed? ____

6. Please list any risk factors for COVID-19 infection present:
   - ___ None
   - ___ Healthcare worker
   - ___ First Responder
   - ___ Close contact with a confirmed case
   - ___ Homeless
   - ___ Congregant living (dorms, fraternities/sororities, shelters, jail, prison, skilled nursing, assisted living, adult family home)
   - ___ Travel to known areas with widespread community transmission
   - ___ Other

   6a. if "Other," please specify risk factors: (free text)___

7. Other risk factors/comorbidities:
   - ___ None
   - ___ Smoking
   - ___ Head trauma
   - ___ Sinusitis/allergy
   - ___ Chronic respiratory disease/Asthma
   - ___ Cardiac disease
   - ___ Neurologic disease (e.g. Parkinson's)
   - ___ Other

   7a. If "Other," please specify risk factors/comorbidities: (free text)

8. When was the anosmia (loss of sense of smell) or dysgeusia (alteration of sense of taste) first noticed by the patient?
   ___ Before diagnosis ___ After diagnoses

   8a. If "before diagnosis," was the anosmia part of the reason for the testing for SARS-CoV2?
   - ___ Yes
   - ____ No

   8b. If "after diagnosis": how many days from diagnosis? ____

9. Did the patient have any other symptoms **BEFORE** the development of anosmia/dysgeusia? Check all that apply
   - ____ None
   - ____ Fever
   - ____ Chills
   - ____ Malaise
   - ____ Cough
   - ____ Headache
   - ____ Nasal Congestion
   - ____ Rhinorrhea
   - ____ Gastrointestinal Distress

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____ Other

9a. If "Other," please provide detail: (free text) _____

10. What symptoms did the patient have **AT THE TIME** of anosmia/dysgeusia?
    - ____ None
    - ____ Fever
    - ____ Chills
    - ____ Malaise
    - ____ Cough
    - ____ Headache
    - ____ Nasal Congestion
    - ____ Rhinorrhea
    - ____ Gastrointestinal Distress
    - ____ Other

    10a. If "Other," please provide detail: (free text) _____

11. What was the condition of the COVID-19 infection at the time the anosmia/dysgeusia was observed?
    - ____ Inpatient /hospitalized
    - ____ Outpatient

12. Did the patient's condition worsen or improve after the anosmia/dysgeusia was observed?
    - ____ Worsen
    - ____ Improve

13. What is the patient's current COVID-19 infection status
    - ___ Active
    - ____ Recovered
    - ___ Deceased

14. Did the anosmia/dysgeusia resolve?
    - ____ Yes
    - _____ No

    If "Yes" to above:

    14a. How long after the anosmia/dysgeusia was observed: (free text) _____

    14b. Was it:
    - ___ Complete resolution
    - ___ Partial Resolution

15. Did the patient receive treatments for the anosmia?
    - ___ Yes
    - ___ No

    If "Yes" to above:

15a. What treatments if any did the patient receive?

15b. How soon after did the anosmia/dysgeusia resolve:

17. Comments/Additional information: (free text)

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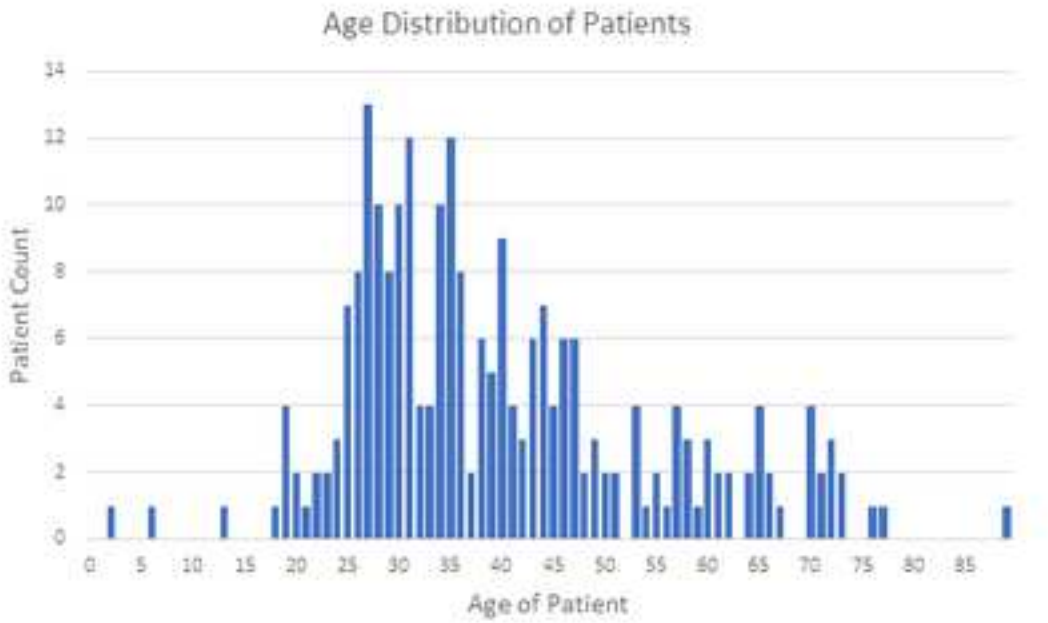
Supplement Figure



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