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Alterations in Smell or Taste in Mildly Symptomatic Outpatients With SARS-CoV-2 Infection

Since December 2019, a pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread globally.[1] A spectrum of disease severity has been reported, with main symptoms that include fever, fatigue, dry cough, myalgia, and dyspnea. Previous strains of coronavirus have been demonstrated to invade the central nervous system through the olfactory neuroepithelium and propagate from within the olfactory bulb.[2] Furthermore, nasal epithelial cells display the highest expression of the SARS-CoV-2 receptor, angiotensin-converting enzyme 2, in the respiratory tree.[3]

Despite anecdotal reports of anosmia, only 1 study to our knowledge has evaluated the prevalence of smell and taste disturbance in hospitalized patients with COVID-19, reporting an overall prevalence of 34% but without data on timing of onset in relation to other symptoms.[4]

This study evaluated prevalence, intensity, and timing of an altered sense of smell or taste in patients with SARS-CoV-2 infections.

Methods | The study was approved by the ethics committee of Treviso and Belluno provinces, and informed consent was obtained verbally for telephone interviews. Adults (aged ≥18 years) consecutively assessed at Treviso Regional Hospital between March 19 and March 22, 2020, were included if they tested positive for SARS-CoV-2 RNA by polymerase chain reaction on nasopharyngeal and throat swabs that were performed according to the World Health Organization recommendation[5] and if they were suitable for home management as mildly symptomatic.

Patients were contacted 5 to 6 days after the swab was performed, the demographic information was reported, and the Acute Respiratory Tract Infection Questionnaire (ARTIQ; with symptoms scored as none, 0; a little, 1; a lot, 2) was administered. During the telephone interview, they were asked whether they had experienced a sudden onset of an altered sense of smell or taste in the 2 weeks before the swab through completion of the Sino-nasal Outcome Test 22 (SNOT-22). The SNOT-22 grades symptom severity as none (0), very mild (1), mild or slight (2), moderate (3), severe (4), or as bad as it can be (5).[6] Symptom prevalence was expressed as the percentage of total patients; 95% confidence intervals were calculated using the Clopper-Pearson method. Prevalence was compared using the Fisher exact test. A 2-sided $P < .05$ was considered statistically significant. Statistical analyses were performed using R version 3.6.

Results | Of 374 eligible patients, contact information was available for 283; 202 (71.4%) completed the telephone survey.

Demographic data and clinical features are summarized in **Table 1**. The median age was 56 years (range, 20-89 years); 52.0% were women. Any altered sense of smell or taste was reported by 130 patients (64.4%; 95% CI, 57.3%-71.0%), with a median SNOT-22 score of 4 (interquartile range, 3-5); 23.8% reported a score of 5 (**Table 2**). Of 130 patients reporting an altered sense of smell or taste, 45 (34.6%) also reported blocked nose. Other frequent symptoms were fatigue (68.3%), dry or productive cough (60.4%), and fever (55.5%). Among all patients, the timing of an altered sense of smell or taste onset in relation to other symptoms occurred before other symptoms in 24 (11.9%); at same time as in 46 (22.8%); and after other symptoms in 54

Table 1. Characteristics and Prevalent Symptoms of 202 Patients Positive for SARS-CoV-2

Characteristics	No. of patients	Prevalence, % (95% CI)[a]
Age, median (IQR), y	56 (45-67)	
Sex		
Men	97	48.0 (41.0-55.1)
Women	105	52.0 (44.9-59.0)
Smoking status		
Never	139	68.8 (61.9-75.1)
Ever	63	31.2 (24.9-38.0)
Current alcohol drinking		
No	80	39.6 (32.8-46.7)
Yes	122	60.4 (53.3-67.2)
Comorbidity		
None	89	44.1 (37.1-51.2)
Any	113	55.9 (48.8-62.9)
Indication for testing		
Exposure to confirmed SARS-CoV-2 contact	70	34.7 (28.1-41.7)
Symptomatic presentation	132	65.4 (58.3-71.9)
Symptoms based on the ARTIQ[b]		
Fever	113	55.9 (48.8-62.9)
Dry cough or coughing up mucus	122	60.4 (53.3-67.2)
Blocked nose	73	36.1 (29.5-43.1)
Problems breathing	83	41.1 (34.2-48.2)
Headache	86	42.6 (35.7-49.7)
Sore throat	63	31.2 (24.9-38.1)
Muscle or joint pains	90	44.6 (37.6-51.7)
Chest pain	33	16.3 (11.5-22.2)
Sinonasal pain	35	17.3 (12.4-23.3)
Loss of appetite	110	54.5 (47.3-61.5)
Tiredness	138	68.3 (61.4-74.7)
Diarrhea	88	43.6 (36.6-50.7)
Nausea	40	19.8 (14.5-26.0)
Vomiting	13	6.4 (3.5-10.8)
Abdominal pain	25	12.4 (8.2-17.7)
Dizziness	28	13.9 (9.4-19.4)

Abbreviations: ARTIQ, Acute Respiratory Tract Infection Questionnaire; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

[a] 95% CIs were calculated using Clopper-Pearson method.

[b] Patients were asked, "During the 2 weeks preceding the swab administration of the questionnaire, did you experience any of the following symptoms?" (Prevalence is combined responses of "a little" or "a lot.")

Table 2. Characteristics of Altered Sense of Smell or Taste in 202 Patients Positive for SARS-CoV-2

Characteristics	No. of patients	Prevalence, % (95% CI)[a]
Severity of alteration of sense of smell or taste		
None	72	35.6 (29.1-42.7)
Very mild	5	2.5 (2.5-5.7)
Mild or light	23	11.4 (7.4-16.6)
Moderate	27	13.4 (9.0-18.9)
Severe	27	13.4 (9.0-18.9)
As bad as it can be	48	23.8 (18.1-30.2)
Time of onset of alteration of sense of smell or taste		
None	72	35.6 (29.1-42.7)
Only symptom	6	3.0 (1.1-6.4)
Prior to other symptoms	24	11.9 (7.8-17.2)
Concomitant with other symptoms	46	22.8 (17.2-29.2)
After other symptoms	54	26.7 (20.8-33.4)

Abbreviation: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

[a] 95% CIs were calculated using Clopper-Pearson method.

(26.7%; Table 2). An altered sense of smell or taste was reported as the only symptom by 6 patients (3.0%). An altered sense of smell or taste was more frequent among 105 women (72.4%; 95% CI, 62.8%-80.7%) than among 97 men (55.7%; 95% CI, 45.2%-65.8%; P = .02).

Discussion | Alterations in smell or taste were frequently reported by mildly symptomatic patients with SARS-CoV-2 infection and often were the first apparent symptom. The results must be interpreted with caution due to study limitations: data were self-reported and based on a cross-sectional survey, the sample was relatively small and geographically limited, more severe patients were not included, and data regarding the subsequent course of the disease was not available. Although the SNOT-22 questionnaire has been shown to correlate with objective testing of olfactory function, patients may have difficulty in quantifying olfactory function; objective tests should be included in future studies.

If these results are confirmed, consideration should be given to testing and self-isolation of patients with new onset of altered taste or smell during the COVID-19 pandemic.

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Exposure to a Surrogate Measure of Contamination From Simulated Patients by Emergency Department Personnel Wearing Personal Protective Equipment

A major challenge with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic is the effective protection of health care workers.[1] Recommendations for the use of personal protective equipment to protect against SARS-CoV-2 exposure by health care workers were recently published by the World Health Organization and the US Centers for Disease Control and Prevention. For aerosol-generating procedures, N95 respirators, eye protection, isolation gowns, and gloves were recommended. Coveralls, boots with a cover, and hair coverings were not part of the recommended protective clothing.[2,3]

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We assessed the protection of emergency physicians and nurses wearing the recommended personal protective equipment while caring for a simulated patient with respiratory distress.

Methods | A simulation study was conducted in the emergency department of Rambam Health Care Campus in Haifa, Israel, on March 21, 2020, examining the presence of a surrogate measure of contamination on exposed skin of participants wearing personal protective equipment to protect against SARS-CoV-2 exposure.[4] Two scenarios of patients with respiratory distress requiring airway management similar to those commonly encountered in the emergency department were conducted using adult and child high-fidelity manikins (SimMan and SimJunior, Laerdal). An atomizing device (MAD Nasal, Teleflex) was used to simulate droplets exhaled during coughing episodes.[5]

The adult scenario consisted of a 74-year-old man experiencing fever and shortness of breath with a decline in oxygen saturation level prompting endotracheal intubation and peripheral intravenous cannulation. The simulation lasted 20 minutes. The simulated patient had 2 coughing episodes during which droplets were expelled from the manikin's nostrils.[5] Participating health care workers were instructed to provide airway management and ventilatory support meeting the standard of care for patients with the novel coronavirus disease 2019.[6]

The intubation was performed by the most skilled physician present using a rapid-sequence intubation technique and was assisted by a second physician. Because bag-mask ventilation prior to intubation could generate aerosols, participants were allowed to use it only when preoxygenation was ineffective. One nurse was responsible for intravenous access and medication administration and a second nurse recorded and assisted with all procedures.

The pediatric scenario was similar. Before the simulation, a nonvisible fluorescent compound (Glo Germ) as a marker of contamination was applied on predetermined surface areas (around the nose and mouth, palms, and upper chest) of the manikin and was added to the simulated secretion areas. After completion of the simulation and before doffing, the fluorescent markers on the participants were visualized and photographed under UV light. The simulations were videotaped to capture all physical contacts between each participant and the manikin to assess possible infection risk.

The ethics committee of Rambam Health Care Campus waived the need for approval and consent because the study was considered a quality control project.

Results | For each simulation (adult and child manikins), 2 physicians and 2 nurses participated (8 total participants). All participants were experienced in emergency department care and had participated in resuscitations.

In the adult scenario, intubation was successful during the second videolaryngoscopic attempt. In the pediatric scenario, intubation was successful using direct laryngoscopy after 1 failed videolaryngoscopic attempt. Seven of 8 participants had fluorescent markers on their exposed skin, 6 on the neck and 1 on an ear (**Figure**).

All team members had fluorescent markers on their hair and 4 had markers on their shoes. During the adult and pediatric scenarios, there were 102 and 88, respectively, participant-manikin contacts.

Discussion | Despite personal protective equipment, fluorescent markers were found on the uncovered skin, hair, and shoes of participants after simulations of emergency department management of patients experiencing respiratory distress. The findings suggest that the current recommendations for personal protective equipment may not fully prevent exposures in emergency department settings. Clothing that covers all skin may further diminish exposure risk.