



SHORT COMMUNICATION

Self-reported taste and smell impairment among patients diagnosed with COVID-19 in Brazil

Felipe T. D. Silva¹  | Marcelo Sperandio¹ | Selly S. Suzuki¹ | Heglaine P. V. Silva² |
Derley G. de Oliveira² | Letícia Stefenon¹ | Aguinaldo S. Garcez¹ 

¹São Leopoldo Mandic Institute and Research Center, Campinas, Brazil

²LACEN/RN, Natal, Brazil

Correspondence

Aguinaldo S. Garcez, São Leopoldo Mandic Institute and Research Center, Rua Taquara Branca, 78, 02069-000, Campinas, São Paulo-SP, Brazil.

Email: aguinaldo.garcez@slmandic.edu.br

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1 | INTRODUCTION

Hypogeusia and hyposmia (decreased gustatory and olfactory perception, respectively) have been reported in patients diagnosed with the novel corona virus disease (COVID-19) (Russell et al., 2020).

The most common symptoms of respiratory viruses include fever, dry cough, dyspnea, and fatigue (Lovato & de Filippis, 2020). Nonetheless, a significant number of patients affected by COVID-19 appear to have loss of smell and taste, even before symptoms of fever or dry cough appear (Giacomelli et al., 2020 and Lechien et al., 2020).

The first case of COVID-19 in Brazil was reported on February 26, 2020. Meanwhile and on the same day, 131 patients were hospitalized for other respiratory syndromes (MS-Brasil, 2020). To the best of our knowledge, no study has been presented reporting gustatory and olfactory disorders in patients affected by COVID-19 in Brazil. Therefore, the aim of this study was to investigate the prevalence of hypogeusia and hyposmia comparing COVID-19 and other respiratory syndromes (RS), through a cross-sectional survey.

2 | MATERIALS AND METHODS

This study was submitted and approved by the Ethics Committee of São Leopoldo Mandic Institute and Research Center. A written informed consent was signed by each participant, before any data collection.

Contact information was obtained from patients whose samples were tested for RS in Central Public Health Laboratory (LACEN) at Rio Grande do Norte, Brazil.

The inclusion criteria were (1) adult individuals (>18 years old) with laboratory-confirmed diagnosis of viral RS by reverse transcription-polymerase chain reaction (RT-PCR) and (2) ability to fulfill the questionnaire (mandatorily to be done by the patient). Individuals with previous symptoms of olfactory or gustatory dysfunctions and patients in intensive care unit were excluded from the study.

The focus of this study was related to mild-to-moderate respiratory infection, and therefore, in order to report the prevalence of olfactory and gustatory impairment, patients in intensive care unit were excluded from this study.

Four hundred invitations were sent of which, a total of 166 patients completed the survey between March and April 2020. A self-reported questionnaire created using Google forms (Google Co.), which included questions about diagnosis, RS symptoms, taste, and smell disturbances, and comorbidities were submitted in online by the participants.

Regarding loss of taste, questions describing the taste sensation which was perceived to be lost; for instance, sweet (sugar and ice-cream), salty (meat and chips), acid/sour (fruits and sodas), bitter (spinach and arugula), or umami (cheese, soy sauce) were included.

3 | RESULTS

Out of 166 patients, 85 were diagnosed with COVID-19, and the rest 81 presented other respiratory syndromes (RS). Sample characteristics and general symptoms are shown in Table 1.

Regards of hyposmia, olfactory disturbance was reported in 19% of patients with other RS compared to 53% of patients affected by COVID-19. On an average, the duration of the loss of smell was 8.3

		Total (n = 166)	COVID-19 (n = 85)	Other RS (n = 81)	p
Sex	Women	103 (62%)	44 (43%)	59 (57%)	
	Men	63 (38%)	41 (65%)	22 (35%)	
Age	Women	38.1 (±12.8)	40.6 (±16.1)	35.6 (±9.5)	
	Men	38.4 (±14.7)	44.7 (±11.6)	32.2 (±6.2)	
Occupation	Health care	93 (56%)	42 (45%)	51 (55%)	
	Non-health care	73 (44%)	43 (59%)	30 (41%)	
Respiratory Symptoms	Cough	121 (73%)	61 (71%)	60 (74%)	0.861ns
	Fever	88 (53%)	50 (59%)	38 (47%)	0.161ns
	Fatigue	107 (65%)	63 (74%)	44 (54%)	0.009*
	Breathless	71 (43%)	36 (42%)	35 (43%)	0.912ns
	Runny nose	27 (16%)	6 (7%)	21 (26%)	0.001*
	Sore throat	90 (54%)	43 (51%)	46 (57%)	0.440ns
	Myalgia	11(7%)	4 (5%)	7 (9%)	0.361ns
	Diarrhea	54 (33%)	30 (35%)	24 (30%)	0.508ns
	Chest pain	8 (5%)	8 (9%)	0 (0%)	0.006*
	Headache	109 (66%)	54 (64%)	55 (68%)	0.624ns

TABLE 1 Characteristics of the patients diagnosed with COVID-19 and other respiratory syndromes

*p < .05.

TABLE 2 Prevalence of hypogeusia, hyposmia, and oral alterations self-reported by the patients of both groups

		Total (n = 166)	COVID-19 (n = 85)	Other RS (n = 81)	p
Hyposmia	Prevalence	60 (36%)	45 (53%)	15 (19%)	<0.0001*
	Duration on days		8.3 (±4.7)	4.3 (±3.6)	<0.0001*
Hypogeusia	Prevalence	72 (43%)	60 (71%)	12 (15%)	<0.0001*
	Duration on days		8.7 (±6.1)	5.3 (±3.7)	<0.0001*
	Loss—salty	60 COVID-19 12 Other RS	59 (98%)	12 (100%)	0.999ns
	Loss—sweet		44 (73%)	7 (58%)	0.310ns
	Loss—sour		40 (67%)	3 (25%)	0.045*
	Loss—bitter		37 (62%)	6 (50%)	0.526ns
	Loss—umami		39 (65%)	3 (25%)	0.04*
Oral Symptoms	Prevalence		64 (75%)	34 (42%)	<0.0001*
	Throat inflammation	64 COVID-19 34 Other RS	32 (50%)	26 (76%)	0.016*
	Tongue alteration		21 (33%)	3 (9%)	0.012*
	Gum Inflammation/ sensitivity		7 (11%)	3 (9%)	0.742ns
	Dry or swelled lips		19 (30%)	6 (17%)	0.230ns
	Dry mouth		3 (5%)	0 (0%)	0.549ns
	Mouthwash use	41 (25%)	25 (29%)	16 (20%)	0.520ns

*p < .05.

(±4.7) days for patients with COVID-19, compared to 4.3 (±3.6) days for patients with other RS. Regarding taste dysfunction, although patients with other RS presented hypogeusia (15%), patients with COVID-19 showed significant taste impairment (71%) compared with the other group.

Table 2 shows 60 patients diagnosed with COVID-19 report hypogeusia, with a mean duration of 8.7 (±6.1) days, compared to 12 patients diagnosed with other RS, with hypogeusia lasting for 5.3 (±3.7) days. In addition, patients with COVID-19 reported more oral alterations (n = 64) compared with other patients with RS (n = 34).

4 | DISCUSSION

Given the limitations associated with the period of quarantine, the task of performing validated tests for diagnosis of taste or smell loss was highly demanding. Therefore, a web-based questionnaire was developed. The self-reported survey showed that hypogeusia and hyposmia seemed to be a frequent symptom in patients positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, and maybe a sign that precedes the onset of full-blown clinical disease.

As previously stated (Giacomelli et al., 2020), further investigations on patients presenting COVID-19 are required, along with standardized evaluations. On the other hand, self-reported studies, for albeit unspecific, may represent a clinical screening tool to guide testing of non-symptomatic individuals.

An increasing number of studies (Gautier & Ravussin, 2020; Giacomelli et al., 2020; Lechien et al., 2020; Russell et al., 2020) and reports (Hopkins) have suggested that taste and smell loss are symptoms of COVID-19. COVID-19 infection in patients may go undetected, since these symptoms are not considered specific for the disease, and usually, the patient is not isolated in such cases (Lechien et al., 2020). In this context, it is fundamental to investigate whether early symptoms could be associated with this disease and used as a differential diagnosis of other RS.

Smell and taste impairment are linked to a broad range of viral respiratory infections (Riel et al., 2015). Therefore, it would be prudent to understand the impact of hypogeusia and hyposmia as an early sign of COVID-19, and verify whether this could be used as a guide to manage non-symptomatic individuals. Thus, this study investigated self-reported signs and symptoms in a group of positive-tested patients for COVID-19 and other RS.

A previous report has already described a decrease in smell and taste sensation following an influenza-like infection. These are commonly associated with changes in taste buds and in nasal mucous membranes. Patients with COVID-19 have significant amount of structural changes in oral cavity, such as less symptoms of throat inflammation, and more tongue alterations (color, irritation, and swelling) (Henkin et al., 1975).

The exact mechanism by which SARS-CoV-2 could compromise smell and taste is not yet determined; however, some theories are raised. It is suggested that taste bud cells and olfactory epithelium expressing ACE2 are targeted by SARS-CoV-2 through a cytopathic effect or a direct attack on olfactory neurons during the spread of the virus (Baig et al., 2020). Tropism for peripheral nerves, especially cranial nerves I, VII, IX, and X has been documented in patients infected with SARS-CoV2 (Mao et al., 2020). It has also been demonstrated in transgenic mice that SARS-CoV-2 is capable of entering the brain through the olfactory bulb, leading to rapid transneuronal spread (Netland et al., 2008). Thus, an altered neurotransmission even without the absence of sensorineural cell death could impair taste and/or smell (Netland et al., 2008). Another hypothesis for the pathogenesis of hypogeusia/disgeusia in COVID-19 is related to the accumulation of angiotensin II in the taste buds. Since ACE2 is

responsible for the degradation of angiotensin II, a blockage in the transformation of chemical taste signals in potential action and, consequently, in the sensory perception of taste could occur (Mariz et al., 2020). In another analysis, it is possible to associate the symptom to a focal immunological reaction. The virus would trigger the production of antibodies against certain membrane components or epithelial cell receptors that are predominantly expressed in the tongue and olfactory epithelium (Finsterer & Stollberger, 2020).

Several studies have associated taste and smell impairment with COVID-19 (Gautier & Ravussin, 2020; Lechien et al., 2020; Russell et al., 2020; Yan et al., 2020); however, none of them distinguish between the type of taste sensation (among the five tastes) lost by the patient. In the present study, hypogeusia was more evident in patients with COVID-19 compared with other RS (71%–15%). Both the groups reported loss of taste, but the percentage was significantly higher in COVID-19 group (almost fivefold greater for salty, sixfold for sweet, more than 10-fold for sour, sixfold for bitter and 13-fold for umami). However, this difference was significant only for sour and umami tastes.

Taste sensation is due to chemoreceptors present at specialized cells in the oral cavity and tongue (Sergi et al., 2017). In this study, the self-reported signs and symptoms, such as tongue irritation, surface color change and swelling, gum sensitivity, and dry mouth, especially in patients with COVID-19, could alter the oral tissues and may lead to loss of taste sensation.

This is the first study comparing hypogeusia and hyposmia among patients with COVID-19 and other RS in Brazilian population, as well as one of the first to distinguish the type of taste impairment or oral changes in patients. These findings suggest that both symptoms could be used as an early clinical screening tool to indicate testing of non-symptomatic individuals and may be considered as a simple differential diagnosis factor to avoid spread of COVID-19 pandemic, especially in developing countries.

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AUTHOR CONTRIBUTIONS

Felipe Thiago Dantas Silva: Conceptualization; Data curation; Investigation; Methodology; Writing-review & editing. **Marcelo Sperandio:** Conceptualization; Investigation; Methodology; Writing-original draft. **Selly S Suzuki:** Conceptualization; Formal analysis; Methodology; Writing-original draft. **Heglayne Pereira Vital da Silva:** Investigation; Methodology; Writing-review & editing. **Derley G de Oliveira:** Investigation; Methodology; Writing-review & editing. **Leticia Stefenon:** Investigation; Writing-review & editing. **Aguinaldo S Garcez:** Conceptualization; Formal analysis; Supervision; Writing-original draft; Writing-review & editing.

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ORCID

Felipe T. D. Silva  <https://orcid.org/0000-0001-6701-2119>Aguinaldo S. Garcez  <https://orcid.org/0000-0003-2037-7211>

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