



# Evaluation of COVID-19 Patients with the Assessment of Self-reported Olfactory Functioning and Olfaction-related Quality of Life Questionnaire

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## Abstract

**Objective:** This study aims to investigate the olfactory and taste disorders (OTD) in Coronavirus disease-2019 (COVID-19) and their effects on the quality of life (QoL).

**Methods:** This study was conducted between December 2021 and January 2022. The study group consisted of 30 COVID-19 patients, and the control group consisted of 30 healthy volunteers. The assessment of self-reported olfactory functioning and olfaction-related quality of life (ASOF) questionnaire was administered to all subjects. ASOF consists of 3 sections: The subjective olfactory capability scale (SOC), the self-reported capability of perceiving specific odors scale (SRP), and the olfactory-related quality of life scale (ORQ). The ASOF questionnaires, frequency, and type of OTD were examined.

**Results:** Twelve (30%) patients had olfaction disorders (OD). Five patients (16.66%) had anosmia, and 7 (23.33%) had hyposmia. Ten (33.33%) patients had taste disorders (TD). Seven (23.33%) patients had hypogeusia and 3 (10%) had ageusia. Nine (30%) patients defined the most disordered taste as salty taste and 1 (3.3%) described it as sweet. In the ASOF results, the number of subjects with abnormal olfactory abilities was 0 in the control group, and 12 in the study group the number of subjects with problems in odor perception was 0 in the control group, and 8 in the study group, the number of subjects with odor-related problems in QoL was 0 in the control group, and 12 in the study group. ASOF-SOC, ASOF-SRP, and ASOF-QRQ scores were significantly higher in the study group ( $p=0.001$ ,  $p=0.001$ ,  $p=0.001$ , respectively).

**Conclusion:** OTD is common in COVID-19 and may affect QoL.

**Keywords:** COVID-19, olfaction disorders, SARS-CoV-2, surveys and questionnaires, taste

## INTRODUCTION

Coronavirus disease-2019 (COVID-19) has devastated the world order in all areas for about 3 years (1). COVID-19, caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), is the biggest global contagious disease that humanity has faced since the 1918 influenza pandemic (Spanish flu) (2,3).

The clinic of the disease is very variable. COVID-19 can be asymptomatic or can lead to death by causing complications (1-4). Symptoms of COVID-19 appear between 2 days and 2 weeks

after exposure to the virus (5,6). In addition to symptoms such as fever, fatigue, muscle pain, nasal congestion, nasal discharge, cough, and shortness of breath seen in typical respiratory tract infections, high rates of smell and taste disorders are observed in COVID-19 (5,7). Olfactory disorders can be classed into two: Smell detection and smell identification disorders. Hyperosmia, hyposmia, and anosmia are defined as odor detection disorders, parosmia, phantosmia, and cacosmia are odor identification disorders (7).



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Olfaction and taste are complex processes that have many components and affect the quality of life. There are assessment tools that examine the effect of olfactory disorders on quality of life (8). The assessment of self-reported olfactory functioning and olfaction-related quality of life (ASOF) survey, which is validated on the Turkish population, is one of them (8,9). This questionnaire, which evaluates the psychometric properties of patients with olfactory disorders, is used to distinguish between people with normal olfactory function and patients with hyposmia, as well as to evaluate the subjective symptom severity of patients (8).

The aim of this study was to determine the effect of smell and taste disorders on the quality of life in COVID-19 patients.

## METHODS

This present cross-sectional study was conducted at Istanbul University-Cerrahpasa Cerrahpasa School of Medicine and Eyupsultan State Hospital between December 2021 and January 2022. This study, which complies with the World Medical Association Declaration of Helsinki, was approved by the Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine Clinical Research Ethics Committee (date-decision no: 03.08.2021-152409). Informed consents were obtained from all subjects.

Thirty subjects were selected randomly among the patients who applied to Eyupsultan State Hospital Emergency Service with at least one of the symptoms of COVID-19 on the first day of symptoms and were diagnosed with COVID-19 by reverse transcription-polymerase chain reaction. The study group was formed with these patients. Patients with chronic diseases, neurological and psychiatric diseases; patients with a history of head or facial trauma, upper respiratory tract surgery, regular drug use in the last 3 months, and smokers were excluded from the study. The control group consisted of 30 healthy individuals.

### Data Collection

The contact informations of the subjects were obtained from the hospital records. Patients were called on day 7 of their COVID-19 diagnosis. The presence of smell and taste disorder symptoms was questioned in the patients. The patients were given a description of olfactory and taste disorders. Hyposmia was defined as decreased sense of smell, anosmia as the inability to perceive odors completely, parosmia as the perception of odors different from what they are, and phantosmia as the perception of the smell of something that is not (10). Hypogeusia was defined as a decrease in the sense of taste, while ageusia was defined as the absence of the sense of taste (11). The patients were asked which

taste (sweet, salty, bitter, sour) perception problems they had the most. The ASOF questionnaire was applied to all the subjects. All questionnaires were administered by the same person via telephone.

### Assessment of Self-reported Olfactory Functioning and Olfaction-related Quality of Life Survey

The assessment of self-reported olfactory functioning and olfaction-related quality of life (ASOF) questionnaire was developed by Pusswald et al. (8). This survey consists of 3 scales: The subjective olfactory capability scale (SOC), the self-reported capability of perceiving specific odors scale (SRP), and the olfactory-related quality of life scale (ORQ). The SOC consists of one item, SRP consists of 5 items, and ORQ consists of 6 items. The SOC scores olfactory performance between 0 (unable to smell) and 10 (best possible smell), and scores of 3 and below indicate abnormal smell capacity. The SRP measures the ability to perceive specific odors and a score of 2.9 or less indicates an odor disorder. The ORQ measures the olfactory quality of life, and scores of 3.7 and below indicate an impaired quality of life associated with an olfactory disorder (8,9).

### Statistical Analysis

SPSS 22.0 program (IBM, USA) was used for statistical analysis. The normal distribution and homogeneity of data were evaluated with the Kolmogorov-Smirnov and Levene's tests, respectively. The comparisons were made with the Pearson chi-square test, and the Mann-Whitney U test. The significance level was accepted as  $p < 0.05$ .

## RESULTS

Demographic data of the patients are presented in Table 1. There was no significant difference between the groups in terms of patient gender and age ( $p = 0.791$ ,  $p = 0.188$ , respectively).

Smell disorders were detected in 12 (40%) patients. Five patients (41.66% of those with olfactory disorders and 16.66% of COVID-19 patients) stated that their symptoms were compatible

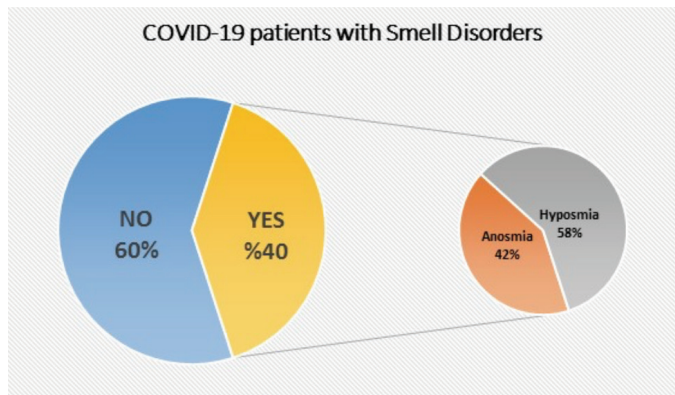
Parameters		Control (n=30)	COVID-19 (n=30)	p
Gender	Male, n (%)	18 (60)	19 (63.33)	0.791*
	Female, n (%)	12 (40)	11 (33.67)	
Age (years)	Mean $\pm$ SD (median, min-max)	42.1 $\pm$ 14.295 (47, 19-60)	37.33 $\pm$ 9.932 (36.5, 24-60)	0.188**

\*Pearson chi-square test, value: 0.071; df: 1,  $p > 0.05$ , \*\*Mann-Whitney U test  $p > 0.05$ , SD: Standard deviation, COVID-19: Coronavirus disease-2019, min-max: Minimum-maximum

with anosmia and 7 (58.34% of those with olfactory disorders and 23.33% of COVID-19 patients) patients stated that their symptoms were compatible with hyposmia (Figure 1).

In the evaluation of ASOF questionnaires, while the number of subjects with abnormal olfactory abilities according to the SOC score was 0 in the control group, it was 12 in the study group. According to the SRP score, the number of subjects with problems in their odor perception capacity was 0 in the control group, while it was 8 in the study group. According to the QRQ score, the number of subjects with odor-related problems in their quality of life was 0 in the control group, while it was 12 in the study group. The statistical data of ASOF questionnaires are given in Table 2. In the examination of ASOF scores, ASOF-SOC, ASOF-SRP, and ASOF-QRQ scores were significantly higher in the study group ( $p=0.001$ ,  $p=0.001$ ,  $p=0.001$ , respectively).

Ten (33.33%) of the COVID-19 patients stated that they had taste disorders. Five of these patients had anosmia and 5 of them had hyposmia. Hypogeusia was found in 7 (23.33%) patients and



**Figure 1.** The evaluation of smell disorders in COVID-19 patients  
COVID-19: Coronavirus disease-2019

Test domains	Control Mean ± SD (Median, min-max) (n=30)	COVID-19 Mean ± SD (Median, min-max) (n=30)	p
ASOF-SOC <sup>a</sup>	7.2±1.788 (7.4-10)	4.866±2.474 (4.5, 1-9)	0.001*
ASOF-SRP <sup>b</sup>	4.9±0.305 (5.4-5)	3.867±1.332 (5.2-5)	0.001*
ASOF-ORQ <sup>c</sup>	4.867±0.346 (5.2-6)	3.8±1.399 (5.2-6)	0.001*

<sup>a</sup>The subjective olfactory capability scale, <sup>b</sup>The self-reported capability of perceiving specific odors scale, <sup>c</sup>The olfactory-related quality of life scale, \*Mann-Whitney U test  $p<0.05$ , SD: Standard deviation, COVID-19: Coronavirus disease-2019, min-max: Minimum-maximum, SOC: Subjective olfactory capability scale, ASOF: Self-reported olfactory functioning and olfaction-related quality of life, ORQ: Olfactory-related quality of life scale, SRP: Self-reported capability of perceiving specific odors scale

ageusia in 3 (10%) patients. All patients with ageusia also had anosmia. Nine (30%) of the patients defined the most disordered taste as salty taste and one patient (3.3%) described it as sweet. The patient who had trouble perceiving the sweet taste had anosmia.

## DISCUSSION

Olfaction and taste disorders are on the COVID-19 symptom list of different associations (5,12). This study has shown that 40% of COVID-19 patients have olfactory disorders, 33% taste disorders, and 33% smell and taste disorders. The most common taste disorder is hypogeusia, while hyposmia is the most common olfactory disorder with a rate of 58%. The most common taste disorders are in salty taste. In the ASOF questionnaire, the ability to smell, perceive to smell, and odor-related problems in the quality of life are significantly higher in the COVID-19 patient group than in the control group.

Although COVID-19 has flu-like symptoms associated with rhinology, loss of smell and taste are the most specific symptoms (13). The rate of smell and taste disorders seen in COVID-19 has been determined as 41-62% (14,15). Smell disorders, which are more common in mildly symptomatic patients and females, are the good prognostic indicator for COVID-19 (14,15). Although the Sniffin' Sticks test, which is a semi-objective test, is used in studies examining the relationship between COVID-19 and smell and taste disorders, there are many self-reported survey based studies (14-16).

In this study, the ASOF questionnaire, which was shown to be highly correlated with the sniff sticks test, was used to examine the smell disorders in COVID-19 patients instead of the sniff sticks test with the thought that the sniff sticks test would increase the risk of COVID-19 transmission (8,9). COVID-19 is divided into 3 periods (17). In this study, smell and taste disorders, which have been shown to be the initial symptom in previous studies, were examined in the acute phase of the disease (14,15). Since smell and taste disorders due to COVID-19 are affected by patient gender and age, and smoking, the study groups were created statistically similar according to patient age and gender, and smokers were excluded (14,15). In addition, the rate of smell disorders in COVID-19 is different in inpatients and outpatients (18,19). Therefore only outpatients were included in this study.

Although the relationship between smell and taste disorder and COVID-19 is definitely known, the pathophysiology of these symptoms is not known precisely (14-20). There are limited studies on the pathophysiological mechanism of taste disorders in COVID-19. The expression of the ACE-2 receptor, to

which SARS-CoV-2 is attached, is quite high in the tongue (21). This expression is in epithelial cells in the basal region of the filiform papillae rather than in the taste buds (22). Therefore, it is thought that the local inflammation that occurs after the infection of tongue epithelial cells by the virus causes damage to the taste receptors and causes taste disorders (23). In the pathophysiology of the olfactory disorders, SARS-CoV-2 binds to ACE-2 and transmembrane serine protease 2 receptors in the nasal mucosa and causes an inflammation that damages nasal support cells and olfactory cells (24,25). In addition, the transmission of the sense of smell and taste may also be affected due to the direct neuroinvasive properties of SARS-CoV-2 (11).

In this study, smell disorders were detected in 40% of the patients. In the evaluation of smell disorders type, 41.66% of the detected smell disorders are anosmia and 58.34% of the smell disorders are hyposmia. Taste disorders were found in 33.3% of the patients. In the evaluation of taste disorders type 70% of the detected taste disorders are hypogeusia and 30% of the taste disorders are ageusia. Half of the patients with taste disorders have anosmia and the other half have hyposmia. All patients with ageusia also have anosmia. The most frequently spoiled taste is salty at the rate of 90%. These results of the present study are compatible with the literature (11,20). In the evaluation of the ASOF questionnaire, it was shown that the ability to smell and perceiving odors are affected in COVID-19 patients, and this effect affects the quality of life.

### Study Limitations

Some factors limit the value of this study. The first limitation is that the data of the study was obtained by questionnaires. This method was chosen in order to prevent the transmission of the disease. Another limitation is that all patients included in the study were receiving Favipiravir treatment. Favipiravir is known to have neurological effects (26). Some of the smell and taste disorders in the patient group may have been seen due to this effect. The last limitation is the limited number of patients. Despite all these limitations, this study is a valuable study that examines the smell and taste disorders seen in COVID-19 patients with numerical statistical data and it is the first in the literature with the used evaluation method

### CONCLUSION

Smell and taste disorders are one of the most common symptoms of COVID-19. These symptoms, which are often seen together, may affect the quality of life. The data we obtained need to be supported by larger studies.

### Ethics

**Ethics Committee Approval:** This study, which complies with the World Medical Association Declaration of Helsinki, was approved by the Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine Clinical Research Ethics Committee (date-decision no: 03.08.2021-152409).

**Informed Consent:** Informed consents were obtained from all subjects.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Surgical and Medical Practices: D.Ç., S.U., Concept: D.Ç., S.U., Design: D.Ç., S.U., Data Collection or Processing: D.Ç., S.U., Analysis or Interpretation: D.Ç., Literature Search: S.U., Writing: D.Ç., S.U.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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