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ARAŞTIRMA / RESEARCH

Prevalence of smell and taste dysfunction in patients infected with COVID-19

COVID-19 ile enfekte hastalarda koku ve tat disfonksiyonu prevalansı

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Abstract

Purpose: This study aims to evaluate olfactory and gustatory dysfunctions (OGDs) in COVID-19 patients according to hospital admission type and possible risk factors for OGD.

Materials and Methods: This study included 200 adult patients who were diagnosed with COVID-19 between January 2021 and September 2021. Patients were separated into two groups. The first group comprised 100 patients who applied to pandemic outpatient clinics with a milder course and were isolated at home. The second group comprised 100 patients with a more severe clinical course hospitalized in the pandemic ward. Patients completed a data form in which olfactory and gustatory functions and various clinical information were inquired about and rated their smell and taste dysfunction using a visual analog scale (VAS).

Results: In the ambulatory group, 72% of patients were female and the mean age was 39.6±13.2 years. In the admitted group, 50% of patients were female, and the mean age was 52.4±11.0 years. The most common symptoms in all patients were loss of taste (41%) and smell (45.5%). Females and younger individuals were significantly more likely to have OGD. OGD was more common in the ambulatory group. Smell/taste VAS scores were significantly lower in the ambulatory group.

Conclusion: OGD is associated with various mechanisms depending on the increased inflammatory response in the early stages of COVID-19. OGD appears to be the key symptom and diagnostic indicator and should be inquired about. It should be kept in mind that the frequency of OGD may differ according to age and gender.

Keywords:. COVID-19, smell and taste dysfunction, admission type, visual analog scale

Öz

Amaç: Bu çalışma, COVID-19 ile enfekte kişilerin hastaneye başvuru şekline ve olası risk faktörlerine göre koku ve tat alma disfonksiyonunu (KTD) değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntem: Çalışmaya Ocak ve Eylül 2021 arasında COVID-19 tanısı konan toplam 200 hasta dahil edildi. Hastalar iki gruba ayrıldı. İlk grupta; kliniği daha hafif seyreden, evde izole olan 100 hasta, ikinci grupta; kliniği daha ağır seyreden pandemi servisinde yatan 100 hasta bulunmaktaydı. Hastalar hastaneye başvuru sırasında koku ve tat fonksiyonları ve çeşitli klinik bilgileri hakkında veri formu doldurdu. Hastalardan ayrıca görsel analog skalası (GAS) kullanarak koku ve tat bozukluklarını derecelendirmeleri istendi.

Bulgular: Evde izole olarak takip edilen hastaların, %72' si kadın olup, yaş ortalaması 39,6±13,2'dır. Pandemi servisinde takip edilen hastaların ise %50' si kadın ve ortalama yaş 52.4±11,0. Tüm hastalarda en sık görülen semptom tat (%41) ve koku (45,5) kaybıydı. Kadın cinsiyette ve gençlerde KTD daha yüksek bulundu. Ayaktan hastalarda KTD daha sıktı. Tat ve koku VAS skorları ayakta takip edilen hastalarda daha düşüktü.

Sonuç: KTD; COVID-19 ile enfekte kişilerde çeşitli mekanizmalar aracılığıyla artmış inflamatuar yanıta bağlı oluşur. KTD, anahtar semptom ve tanı göstergesi olarak görülmeli ve sorgulanmalıdır. KTD sıklığının yaş gruplarında ve cinsiyete göre farklılıklar gösterebileceği akılda tutulmalıdır.

Anahtar kelimeler: COVID-19, koku ve tat disfonksiyonu, başvuru tipi, görsel analog skala

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INTRODUCTION

Coronavirus 2019 disease, or COVID-19, is an infectious disease that has caused many challenges among physicians due to its mutation rate. Patients who are infected with COVID-19 face various symptoms. The most common symptoms are fever, myalgia, cough, fatigue, dyspnea, sore throat, headache, and diarrhea[1]. During the outbreak's spread, smell and taste dysfunction (OGD) have been associated with COVID-19 infection, which is usually a transient entity with a median time to recovery ranging between 1 and 3 weeks[2]. Also, many countries' ministries of health have recognized that COVID-19 patients may have smell/taste loss and have included these symptoms in their diagnostic guidelines. Some reports claimed that OGD might be highly predictive factors for the disease and occur in the early days[3].

Otolaryngologists also know that viral upper respiratory tract infections may cause olfactory disorders. Olfactory dysfunction may be caused by rhinovirus, parainfluenzavirus, Epstein-Barr virus, and coronavirus. Perhaps in COVID-19, the pathogenesis of the smell/taste impairment is different from many other common cold viruses because in some patients, there is no rhinorrhea and nasal obstruction[2,4,5]. Also, there are many theories explaining the pathogenesis of olfactory/gustatory disorders in patients with COVID-19. One of them is angiotensin-converting enzyme 2 (ACE2) receptors on the olfactory epithelium and oral mucosa, especially on the tongue. When a person is infected, epithelial damage of the olfactory and oral mucosal epithelium can cause smell and taste loss[6]. Some scientists believe that olfactory cleft inflammation/obstruction and/or olfactory damage cause anosmia[7]. In addition, coronaviruses can bind to sialic acid receptors. Reduced concentrations of sialic acid in the saliva are connected to an increase in the threshold for taste[8].

The hypothesis of our study is that the frequency and severity of taste/smell loss in COVID-19 disease is related to the clinical course of the disease, age, gender, and other symptoms. It is known that there is an inverse relationship between the severity of the disease and odor and taste disorders in COVID-19 disease. OGD is less frequency in patients with severe disease. In many studies, OGD was evaluated in outpatients with milder clinical symptoms, while in our study, we also evaluated hospitalized patients. Although the mechanisms of anosmia and ageusia are unclear, they are the key symptoms and indicators for COVID-19 diagnosis, especially in the early stages of the disease. Therefore, this study aimed to evaluate OGD in COVID-19 patients according to hospital admission type and possible risk factors for OGD.

MATERIALS AND METHODS

Study population

This cross-sectional study was approved by the Adana City Hospital Ethical committee of clinical research (Project no: 1641, Approval Date: 18.11.2021). The study included 200 patients diagnosed with COVID-19 between January 2021 and September 2021. All cases recruited in this study were from the Adana Çukurova State Hospital's records.

Cases based on clinical features and confirmed by a real-time polymerase chain reaction test using a nasopharyngeal swab were recruited. Patients with good clinical signs and patients with COVID-19 symptoms first admitted to the pandemic outpatient clinic in the hospital, where tests are taken, analyses are performed if necessary, and medical treatment is arranged. Patients with a worse clinical course are admitted to the pandemic clinic through the emergency service reserved for COVID-19. The diagnosis was confirmed with a positive reverse transcription-polymerase chain reaction (RT-PCR) test on a sample obtained from the nasopharynx and oropharynx. An informed consent form was obtained from all patients before participating in the study.

The patients were divided into two groups based on different clinical features (such as gender, admission type). In the COVID-19 positive ambulatory group, there were 100 patients who applied to pandemic outpatient clinics with a milder course and were isolated at home. In the COVID-19 positive admitted group, there were 100 patients with an oxygen saturation of less than 95%, pneumonia with a more severe clinical course, and who were hospitalized in the pandemic ward. The clinical severity was evaluated based on the severity of symptoms, radiological results (CT or PA chest radiograph), laboratory parameters, and clinical data (fever, pulse, arterial blood pressure, and oxygen saturation).

The study involved patients who were home isolated or hospitalized during the active period of the disease between January and September 2021. A total of 330

participants were approached during the data collection process to fill out the data form. Patients excluded were those younger than 16 years old, patients under ventilation due to COVID-19, those with a previous history of dementia, patients who did not answer, those who refused to participate, patients with a history of previous rhinological, oropharyngeal and laryngeal surgery, who were immobile, who had allergic rhinitis and who had head trauma. Inclusion criteria were having no mental or physical defects preventing communication and having no history of smell and taste dysfunctions before COVID-19. Therefore, the overall number of participants in this study who matched the exclusion and inclusion criteria were 200 participants (100 isolated at home, 100 hospitalized).

Patient demographics (age, sex, and comorbidities), symptoms, complete blood count results (hemoglobin, white blood cell-neutrophil-lymphocyte count), CRP (C-reactive protein), ferritin, D-dimer level, and radiological results (presence of ground-glass appearance on chest CT) were retrieved from the medical records.

Parameters

We analyzed the results of laboratory work up, including parameters upon admission and the worst values during the entire hospitalization including hemoglobin (Reference Value (RV):11-16g/dl), leukocytes (RV: 4.5-10 $10^3/\mu l$), neutrophils (RV: 2-7 $10^3/\mu l$), lymphocytes (RV: 0.8-4 $10^3/\mu l$), C-reactive protein((CRP) RV: 0-5mg/l), Ferritin (RV: 10-322ng/ml), and D-dimer (RV: 0-0.55 µg/l).

We inquired into olfactory/gustatory functions concerning COVID-19. Patients completed a data form that addressed clinical symptoms, age, gender, concomitant diseases, and loss of taste and smell immediately after diagnosis of COVID-19. Because of physician-patient contact, we believed there was a high risk of infection transmission. As a result, we used a data form and a visual analog scale (VAS) to assess smell and taste function using the self-report method. The VAS was used to assess the severity of smell and taste dysfunction. Patients were requested to score the symptom severity between 0 and 10, where 0 represented "I can't smell/taste at all" and 10 represented "I can smell/taste excellently". The average VAS score of those who had lost their sense of smell or taste was then determined. The data in the study were collected by Dr. NEK (First author) during the pandemic period while he worked in the outpatient clinic and service. Author completed the data forms and gave the VAS assessment to the patients. Afterwards, laboratory parameters were extracted from hospital records and all data were evaluated by the two authors of the article.

Statistical analysis

Sample size was determined by G*Power (v.3.0.9.4) software for Windows. The effect size was calculated as 0.566 by Cohen's D test assuming the assessment was performed between groups. This power analysis indicated that a total sample of 200 participants with two equally sized groups of 100 patients was necessary to achieve a power of 0.95. All statistical analyses in this study were performed using Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. SPSS Inc., Chicago, Illinois, United States). GraphPad Prism 8 (8.0.2 version 263 for Windows) was used for the graphics. The normality distribution analysis of the variables was performed using the Kolmogorov–Smirnov test and histogram. We used the mean ± standard deviation and median (minimum–maximum) for continuous variables. Skewed data are expressed as medians with interquartile ranges. The Student's t-test or Mann-Whitney U-test was used for two group comparisons, according to the distribution of the data. Spearman correlation analysis was used to investigate the interdependence between the continuous variables. Categorical variables were compared using Pearson's chi-square ($\chi 2$) test, continuity correction, and Fisher's exact test as appropriate. The taste and smell VAS scores to determine admission type in COVID-19 patients was assessed using receiver operating characteristic (ROC) curves. MedCalc 20 statistical software (Ostend, Belgium) was used in the analysis for ROC curves. Statistical significance was set at a value of $p<0.05$.

RESULTS

A total of 200 patients consisting of 122 females (61%) and 78 males (39%) were included in the study. All patients had laboratory-confirmed SARS-CoV-2 infection. The mean age of the subjects in the COVID-19 positive ambulatory group was 39.6±13.2 years, while the COVID-19 positive admitted group was 52.4±11.0 years. When patients were classified according to their age, 164 were under the age of 60, while 36 were over the age of 60. There was a significant difference in the mean ages between

groups (p<0.01). The median age was lower in the COVID-19 positive ambulatory group than in the admitted group.

In the ambulatory group, there were 28 males and 72 females. In the admitted group, there were 50 males and 50 females. There was a significant difference in terms of gender between groups (p<0.05). Chest CT scans with unilateral or bilateral findings compatible with COVID-19 pneumonia were found in 110 (55%) of patients. There were only 15 patients with pneumonia in the ambulatory group, while there were 95 in the admitted group (p<0.01). Diabetes mellitus and hypertension were significantly more prevalent in the admitted group than in the ambulatory group, and the difference was significant (p=0.03 and p=0.017, respectively). C-reactive protein (CRP) and ferritin levels were significantly higher in the admitted group (p<0.001 for both). There were no significant differences in the other laboratory parameters between groups. Demographic features, concomitant diseases, and laboratory parameters of patients according to different categories are summarized in Table 1.

Table 1. Demographic features, concomitant diseases, and laboratory parameters of patients according to different categories

Variables	All patients (n=200)	Admission Type			Smell/taste dysfunction		
		COVID-19–positive Ambulatory (n=100)	COVID-19–positive Admitted (n=100)	p value	Absence of smell/taste dysfunction (n=103)	Presence of smell/taste dysfunction (n=97)	p value
Age, years	46.0±13.7	39.6±13.2	52.4±11.0	<0.001 [a]	49.1±12.2	42.6±14.5	0.001[a]
≥60 years	36 (18%)	10 (10%)	26 (26%)	0.003	21 (20.4%)	15(15.5%)	0.365[c]
Gender (Female)	122(61%)	72 (%72)	50 (50%)	0.001	46 (44.7%)	76 (78.4%)	<0.001[c]
Concomitant diseases							
Diabetes Mellitus (%)	31 (15.5%)	8 (8%)	23 (23%)	0.03 [c]	21 (20.4%)	10 (10.3%)	0.076[c]
Hypertension (%)	36 (18%)	11 (11%)	25 (25%)	0.017 [c]	24 (23.3%)	12 (12.4%)	0.068 [c]
Asthma (%)	14 (7%)	6 (8%)	8 (8%)	0.579 [c]	2 (1.9%)	12 (12.4%)	0.009 [c]
Cardiovascular Disease (%)	24 (12%)	8 (8%)	16 (16%)	0.128 [c]	15 (14.6%)	9 (9.3%)	0.250 [c]
Other (%)	12 (6%)						
Clinic							
Ambulatory (%)	100 (50%)				39 (37.9%)	61 (62.9%)	<0.001 [c]
Admitted (%)	100 (50%)				64 (62.1%)	36 (37.1%)	<0.001 [c]
Pneumonia (%)	110 (55%)	15 (15%)	95 (95%)	<0.001 [c]	65 (63.1%)	45 (46.4%)	0.018 [c]
Laboratory parameters							
Hemoglobin (g/dL)	13.0±1.7	12.7±1.7	13.2±1.8	0.051 [a]	13.0±1.6	12.9±1.8	0.630 [a]
Leukocyte (count) ($10^3/\mu l$)	9.7±4.0	9.7±2.9	9.7±4.6	0.934 [a]	9.8±4.1	9.5±3.9	0.638 [a]
Neutrophil (Count) ($10^3/\mu l$)	6.8±3.3	6.6±2.2	7.1±4.2	0.231 [a]	7.2±3.6	6.4±3.1	0.087 [a]
Lymphocyte (Count) ($10^3/\mu l$)	1.5±0.8	1.7±1.0	1.4±0.6	0.066 [a]	1.4±0.6	1.7±1.0	0.014 [a]
CRP (mg/L)	18 (8-44)	10 (5-22)	36 (15-58)	<0.001 [b]	24 (11-46)	11 (6-34)	<0.001[b]
Ferritin (ng/mL)	175 (48-436)	34 (23-101)	234 (102-480)	<0.001 [b]	198 (69-462)	169 (35-360)	0.419[b]
D-dimer (µg/L)	0.6 (0.4-1.1)	0.7 (0.4-1.0)	0.6 (0.4-1.2)	0.836 [a]	0.6 (0.4-1.1)	0.6 (0.3-1.1)	0.884[a]

CRP: C-reactive protein.; a independent samples t-test; b Mann–Whitney U test; c Pearson chi square, Fisher exact test, and continuity correction

Olfactory loss occurred in 45.5% (91 subjects) and loss of taste was observed in 41% (82 subjects) of confirmed cases of COVID-19. Ninety-seven patients experienced both OGD. Six subjects had only taste dysfunction, while 15 subjects had only smell dysfunction (Figure 1). The presence of OGD was significantly more common among females and younger individuals (p=0.001 and p<0.001, respectively). The age group under 60 showed a tendency to be more associated with OGD. The frequency of OGD was significantly higher in young age (49.1±12.2 vs 42.6±14.5; p=0.001) and female

gender (44.7% vs 78.4%; p<0.01). Also, OGD frequency was significantly higher in the ambulatory group than the admitted group (62.9%, p<0.01). The median lymphocyte count was significantly higher but the CRP level was significantly lower in OGD subjects (p=0.014 and p<0.001, respectively). The demographic features, comorbidities, and laboratory parameters of patients with and without OGD in the ambulatory and admitted groups are summarized in Table 1.

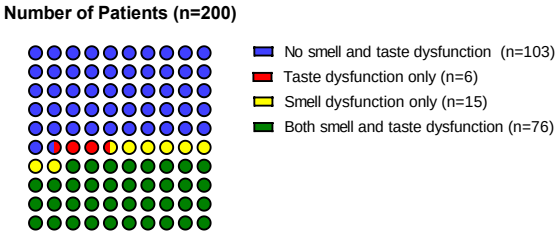

Figure 1: Proportion of smell/taste dysfunction in COVID-19 patients.

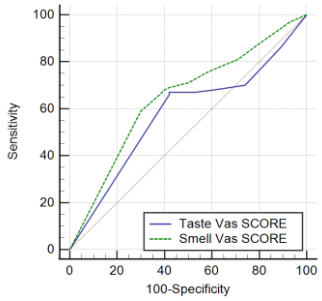

Figure 2. The graph of receiver operating characteristic (ROC) curve analysis performed to determine admission to the pandemic ward in COVID-19 patients

Table 2. COVID-19 clinical symptoms and smell/taste VAS scores of patients in different categories

Categories Symptoms	All patients (n=200)	Age			Admission Type			Gender		
		<60 years (n=164)	≥ 60 years (n=36)	p value	COVID-19–positive Ambulatory	COVID-19–positive Admitted	p value	Female (n=122)	Male (n=78)	p value
Fever	74 (37.0%)	56 (34.1%)	18 (50.0%)	0.074[b]	19 (19.0%)	55 (55.0%)	<0.001 [b]	39 (32.0%)	35 (44.9%)	0.065 [b]
Dry Cough	71 (35.5%)	53 (32.3%)	18 (50.0%)	0.069 [b]	34 (34.0%)	38 (38.0%)	0.556 [b]	38 (31.1%)	33 (42.3%)	0.108 [b]
Malaise	72 (36.0%)	58 (35.4%)	14 (38.9%)	0.690 [b]	34 (34.0%)	38 (38.0%)	0.556 [b]	40 (32.8%)	32 (41.0%)	0.236 [b]
GIS Symptoms	18 (9.0%)	17 (10.4%)	1 (2.8%)	0.150 [b]	7 (7.0%)	11 (11.0%)	0.323 [b]	13 (10.7%)	5 (6.4%)	0.306 [b]
Headache	36 (18.0%)	31 (18.9%)	5 (13.9%)	0.478 [b]	31 (31.0%)	5 (5.0%)	<0.001 [b]	24 (19.7%)	12 (15.4%)	0.441 [b]
Myalgia	72 (36.0%)	33 (20.1%)	3 (8.3%)	0.095 [b]	29 (29.0%)	7 (7.0%)	<0.001 [b]	26 (21.3%)	10 (12.8%)	0.127 [b]
Sore throat	49 (24.5%)	40 (24.4%)	9 (25.0%)	0.939 [b]	24 (24.0%)	25 (25.0%)	0.869 [b]	28 (23.0%)	21 (26.9%)	0.524 [b]
Taste Dysfunction	82 (41.0%)	68 (41.5%)	14 (38.9%)	0.212 [b]	51 (51.0%)	31(31.0%)	0.004 [b]	64 (52.5%)	18(23.1%)	<0.001 [b]
Smell Dysfunction	91 (45.5%)	78 (47.6%)	13(36.1%)	0.416 [b]	58 (58.0%)	33(33.0%)	<0.001 [b]	72 (59.0%)	19(24.4%)	<0.001 [b]
VAS SCORES										
Smell. mean±SD	6.1±4.3	6.0±4.3	6.6±4.5	0.457 [a]	5.4±4.2	7.0±4.4	0.012 [a]	5.0±4.3	7.9±3.8	<0.001 [a]
Taste. mean±SD	6.4±3.8	6.3±3.8	7.0±4.0	0.343 [a]	5.4±3.8	7.4±3.7	<0.001 [a]	5.5±3.8	7.9±3.4	<0.001 [a]

VAS: Visual analogue score, SD: Standard Deviation, GIS: Gastrointestinal symptom score; [a] independent samples t-test; [b] Pearson chi square, Fisher exact test, and continuity correction

The COVID-19 clinical symptoms and smell/taste VAS scores are summarized in Table 2. In the ambulatory group, the most common symptoms were smell dysfunction (58%) and taste dysfunction (51%), while in the admitted group, the most common symptoms were fever (55%), dry cough and malaise (38% for both). There was a significant difference in symptoms between the ambulatory and

the admitted groups. Patients who were in the admitted group were significantly less likely to report taste (31% vs 51%, p=0.004) and smell dysfunction (33% vs 58%, p < 0.001), headache (5% vs 31%, p < 0.001), and myalgia (7% vs 29%, p < 0.001) than those who were in the ambulatory group. In contrast, fever was more common in the admitted group (p<0.001). When the VAS scores regarding the sense of smell and taste were examined, the mean smell VAS score was 5.4 ± 4.2 for those in the ambulatory group and 7.0 ± 4.4 for those in the admitted group (p=0.012). The mean VAS score for taste was significantly lower in the ambulatory group (5.4 ± 3.8 vs. 7.4 ± 3.7; p<0.001) than in the admitted group. OGD was also more common in the females in both groups. In the case of OGD, there was a significant difference between genders (p<0.01).

The taste and smell VAS scores to determine admission type in COVID-19 patients was assessed using ROC curves in Figure 2. A cut-off value of >6 for taste VAS score determined admission to the pandemic ward with 67% sensitivity and 58% specificity [AUC: 0.575, 95% CI: 0.504–0.645, p=0.048] and a cut-off value of >6 for smell VAS score determined admission to the pandemic ward with 68% sensitivity and 60% specificity [AUC: 0.647, 95% CI: 0.576–0.713, p<0.001], as shown in Table 3. In the pairwise ROC curves, there was a significant difference between the areas in Table 3 (p= 0.004).

Table 3. Receiver operating characteristic (ROC) curve analysis and pairwise comparison of ROC curves

Variables	Area under the ROC curve (AUC)	Standard Error[a]	95% Confidence Interval[b]	p value
Taste VAS Score	0.575	0.0380	0.504–0.645	0.048
Smell VAS Score	0.647	0.0375	0.576–0.713	<0.001

[a] DeLong et al., 1988, [b] Binomial exact; VAS: Visual analogue score, ROC: Receiver operating characteristic, AUC: Area under the ROC Curve

DISCUSSION

The symptoms of COVID-19 are diverse, and during the early stages of the pandemic, the focus was on life-threatening symptoms. It is now being realized that SARS-CoV-2 can cause smell and taste dysfunction[9]. Loss of olfactory and gustatory function appears to be very common in the early stages of COVID-19. Furthermore, sometimes OGD is the only clinical manifestation[4]. Anosmia and ageusia may aid otolaryngologists in identifying COVID-19 patients earlier, allowing for quick treatment and a decrease in infection transmission. According to the current evidence, symptoms of OGD may be utilized as a helpful screening tool and diagnostic assistance for COVID-19[10]. Also, breaking the virus cycle of infection requires identifying and isolating paucisymptomatic patients. For this reason, we aimed to investigate the occurrence of olfactory and gustatory dysfunctions in patients with laboratory-confirmed COVID-19 infection.

Although the mechanisms underlying COVID-19–related common olfactory dysfunction are unknown, nasal epithelial cells have a high concentration of ACE2 receptor, which mediates SARS-CoV-2 entrance into cells. Olfaction may be impaired temporarily or permanently if the neuroepithelium is disrupted due to an inflammatory reaction. Such changes may cause temporary or long-lasting olfactory dysfunction[11]. Ageusia could be a complication of olfactory impairment. Also, the ACE2 receptor, which is SARS-CoV-2's primary host cell receptor for binding and penetrating cells, is highly expressed on oral mucosal epithelial cells[6]. Damaging the oral mucosal epithelial cells may explain the ageusia found in the early stages of COVID-19. This evidence may help explain the pathogenesis of anosmia and ageusia in COVID-19.

The prevalence of olfactory dysfunction was reported to range from 3.2% to 98.3% with a pooled prevalence of 41.0% (95% CI: 28.5% to 53.9%). The prevalence of gustatory dysfunction varies between 5.6% to 88% with a pooled prevalence of 38.2% (95%CI: 24% to 53.6%)[2,12,13]. Having ageusia as the primary complaint is uncommon since it usually occurs in conjunction with anosmia, making it difficult to diagnose. In 85% of instances, anosmia was related to ageusia[14].

There are a large number of studies that specify that the most common otolaryngologic symptoms are

smell and taste dysfunction[12,15]. In a prospective study by Korkmaz et al., smell disorder was reported in 37.9% and taste disorder in 41.4% [15]. In another study, smell or taste disorder was reported to be 34%[5]. In our study, the incidence of taste and smell disorder was found to be remarkably higher compared to other studies in the literature. In addition, the incidence and severity of OGD are higher in ambulatory patients. Again, we found that females accounted for 78.4% of those with OGD, showing that females are more likely to have OGD than males. The inflammatory reaction mechanism differs between males and females according to some studies, and this could explain why some females are more susceptible to developing chemosensory dysfunctions than males[14,16,17]. Yan et al. reported that males are more susceptible to losing their sense of taste and smell than females[18]. Al-Ani et al. found no significant differences between the sexes[19]. Lee et al. and Zayte et al. reported that females and younger people were more likely to suffer from anosmia or ageusia[20,21]. We obtained similar results in our study. There are more findings in the literature that corroborate our assertions about gender and age. Korkmaz et al. discovered that those under the age of 60 and women have a higher incidence and severity of smell/taste impairment[15]. According to our findings, OGD was more common in people younger than 60, while OGD was less common in people older than 60.

Yan et al. reported that patients who had a loss of smell were ten times less likely to be hospitalized for COVID-19[18]. On the other hand, Meini et al. showed that chemosensory dysfunction was more prevalent in patients admitted to the hospital due to respiratory distress. In our study, OGD was more common in the ambulatory group. COVID-19 can cause a wide range of symptoms, ranging from asymptomatic to severe sickness, with or without pneumonia. Kavaz et al. found that patients with OGD were more likely to have pneumonia[22]. Conversely, in our study, pneumonia was more common in patients without OGD. According to our laboratory data, CRP and ferritin levels were considerably higher in the admitted group. In addition, we found lower CRP levels and higher lymphocyte counts in patients with OGD.

The ambulatory group had lower VAS scores for smell and taste. In other words, we can argue that OGD was higher in the ambulatory group. This may provide insight into the fact that subjects with a milder clinical condition who are isolated at home experience greater olfactory and gustatory dysfunction. Significantly less olfactory and gustatory dysfunction was found in the admitted subjects with pneumonia who had a more severe clinical course. Unlike in our study, no link was identified between illness severity and gustatory-olfactory impairment in investigations that used psychophysical olfactory testing[3,13,23,24]. Also, several investigations have demonstrated no correlation between the occurrence of olfactory/gustatory abnormalities and the severity of COVID-19[13,23].

Some authors also believe that younger age, female gender, and fewer comorbidities were associated with a better prognosis in COVID-19 [25,26]. Our study supports these previous studies because the ambulatory group was made up of people who were young, female, and had fewer comorbidities.

According to Yan et al., milder COVID-19 instances are characterized by profound anosmia and increased self-reporting, as opposed to undetectable or mild hyposmia in moderate to severe COVID-19 cases [18]. In our study, we found similar results for loss of smell. The VAS score for smell was lower in ambulatory patients. Also, the same was true for the VAS score for taste. It is necessary to conduct additional objective olfactory and gustatory testing on both ambulatory and admitted cohorts in order to determine whether quantitative variations in the severity of olfactory and taste dysfunction correlate with differences in a self-reported loss. This study has several significant limitations. To begin, this survey utilized self-reported data from patients. We did not use an objective method to evaluate anosmia and ageusia in COVID-19 patients because of the transmission risk. Second, we did not track how long our patients' olfactory and taste dysfunctions persisted and when they recovered. Third, we did not evaluate the characteristics of OGD. Fourth, we did not ask patients about the timing of the start of OGD relative to other symptoms. Larger comprehensive objective studies are needed. It would be interesting to include additional hospitals from diverse geographic areas in future research.

At this time of the ongoing pandemic, all patients presenting with loss of smell and taste should undergo a nasopharyngeal test for COVID-19 and prompt self-isolation. Otorhinolaryngologists should keep in mind the possibility of COVID-19 infection when examining patients with complaints of anosmia and ageusia. Olfactory and gustatory dysfunctions

have been observed more commonly in patients younger, female, and those whose clinical presentation is mild and who isolate at home. Further and comprehensive studies are needed to better understand chemosensitive disorders in COVID-19 patients from a clinical pathological perspective.

Yazar Katkıları: Çalışma konsepti/Tasarımı: NEK, AK; Veri toplama: AK; Veri analizi ve yorumlama: NEK; Yazı taslağı: NEK; İçeriğin eleştirel incelenmesi: NEK; Son onay ve sorumluluk: NEK, AK; Teknik ve malzeme desteği: AK; Süpervizyon: NEK, AK; Fon sağlama (mevcut ise): yok.
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