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ORIGINAL ARTICL

Otorhinolaryngeal Symptoms of COVID-19 Patient in Upper Egypt

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ABSTRACT

Keyword: Otorhinolaryngeal, COVID-19, Symptoms, Upper Egypt

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Background: In 2020, the International Committee on Taxonomy of Viruses (ICTV) called Wuhan SARS-CoV-2, a novel human RNA coronavirus. World Health Organization called it COVID-19. Acute respiratory distress syndrome, fever, cough, dyspnea, loss of smell and taste, pneumonia, and death may result. **Objectives:** Measure otorhinolaryngeal symptoms in PCR-positive COVID-19 patients throughout three months. **Methods:** This prospective research of 80 PCR-positive COVID-19 adults excluded some patients and assessed symptoms using extensive histories, physical examinations, smell, and taste tests. Pennsylvania scent kits tested smell discrimination, while sweet, salty, sour, and bitter taste solutions measured taste function. Taste ratings categorized patients. At 15, 30, and 90 days after discharge, smell and taste were examined. **Results:** At admission, 90% had rhinorrhea, 83.8% fever, 65% taste dysfunction, and 90% smell dysfunction. Over time, normal smell climbed from 10% to 60%, overall anosmia fell from 45% to 16%, smell ratings improved dramatically ($p<0.001$, 19-30), taste normalization increased from 20% to 65%, and ageusia decreased from 40% to 4%. Smell and taste were highly associated ($p<0.001$, Rho: 0.72-0.8). **Conclusion:** COVID-19 causes different otorhinolaryngeal symptoms. Pennsylvania Smell Identification Test can detect unusual symptoms such loss of smell and taste, which usually resolve within three months.

INTRODUCTION

The International Committee on Taxonomy of Viruses (ICTV) identified a novel human RNA coronavirus in Wuhan, China, named it severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in 2020 [(1).] Phylogenetic analysis classified SARS-CoV-2 within the beta-coronavirus 2b subgroup. Genomic sequencing revealed that SARS-CoV-2 shares 87.99% of its sequence with a bat SARS-like coronavirus and 80% of its nucleotide sequence with the original SARS virus [(2).] Early research indicated that SARS-CoV-2 was the third zoonotic human coronavirus identified this century [(3).]

The World Health Organization (WHO) named the disease caused by SARS-CoV-2 as COVID-19 [(4)] .Some scientists suggested that the sinonasal tract might be involved in the viruses infection process [(5).] Coronaviruses, which comprise a large family of

viruses, can cause illnesses ranging from the common cold to severe respiratory conditions like MERS and SARS [(6)]. COVID-19 symptoms can include fever, dry cough, and shortness of breath, fatigue, sore throat, nasal congestion, and runny nose. In severe cases, it can lead to viral pneumonia, acute respiratory distress syndrome (ARDS), and death [(7)].

Recently, loss of smell (hyposmia or anosmia) and taste disturbances have been associated with COVID-19. Studies in South Korea, China, and Italy have reported a significant number of COVID-19 patients experiencing these symptoms. About 30% of infected individuals in South Korea reported hyposmia or anosmia. It has been suggested that COVID-19 could cause isolated anosmia, where patients exhibit this symptom without other diagnostic criteria, potentially acting as hidden carriers contributing to the viruses rapid spread [(8)].

We aimed in this study to detect and quantify the otorhinolaryngeal symptoms in PCR positive COVID-19 patients in a time over three months duration.

SUBJECT AND METHODS

This prospective study was applied at Aswan Health Insurance Hospital, from October 2020 to October 2021. Ethical approval from review board of Aswan university faculty of medicine was attained, research code **437/9/20**.

Informed consent was obtained from participated patients after explaining the objectives and steps of the research.

This study group included 80 adult patients, all over the age of 18, who tested positive for COVID-19 through nasopharyngeal swabs. These patients were carefully examined by wearing all protective measures to evaluate their symptoms.

Certain individuals were excluded from the study. Exclusion criteria comprised uncooperative patients, those requiring assisted ventilation, and individuals with a history of surgery or radiotherapy in the oral and nasal cavities. Additionally, patients with preexisting smell and taste alterations, a history of head trauma, active allergic rhinitis, and those with psychiatric or neurological disorders were not included.

The methods involved thorough evaluation of each patient, including a detailed history and physical examination. A comprehensive history was taken for each patient, followed by a meticulous physical examination. General examinations were done to all patients.

Additionally, a local examination focused on the nose, ears, and throat was performed. Investigations included a complete blood count (CBC), chest CT scans, and CT scans of the nose and paranasal sinuses.

Clinical records were assessed to gather general information such as age, gender, previous clinical history, and symptoms indicative of COVID-19. Patients were carefully questioned to establish a timeline for the onset, duration, and eventual regression of chemosensitive symptoms.

Odor discriminative ability: By using smell identification kits of Pennsylvania which categorized the loss of smell sensation according to the grades patient had in the test as **table (1).**

Table 1: loss of smell categories according to patients' grades

Score	Olfactory diagnosis
0-5	**Probable Malingering**
6-18	**Total Anosmia**
19-25	Severe Microsmia
26-29	Moderate Microsmia (Males)
26-30	Moderate Microsmia (Females)
30-33	Mild Microsmia (Males)
31-34	Mild Microsmia (Females)
34-40	Normosmia (Males)
35-40	Normosmia (Females)

Gustatory function was assessed using a standardized and validated test to evaluate the ability to perceive the four primary tastes: sweet, salty, sour, and bitter. Deionized water was used as a control. During the trial, 1 mL of each solution was dropped onto the center of the patient's tongue using different cotton swabs for each solution, which were then disposed of. Patients indicated whether the perceived flavor was sweet, salty, bitter, sour, or neutral. The solutions were presented in random order, with the bitter taste always presented last to prevent alteration of subsequent tastes. Responses were recorded as either correct or incorrect, resulting in a taste score ranging from 0 to 4. This scoring system classified patients into categories as **table (2).**

Table 2: loss of taste categories according to patients' grades

score	Gustatory function
0	Agusia
1	Sever hypogusia
2	Moderate hypogusia
3	Mild hypogusia
4	normal

Patients were followed up for recovery of smell and taste sensations at discharge and again after fifteen, thirty-, and ninety-days post-discharge. Data were analyzed, particularly focusing on otorhinolaryngeal symptoms such as anosmia and ageusia.

Statistical analysis involved revising, coding, and tabulating data using Microsoft Excel, with analysis performed using R version 4.1.1. Descriptive statistics included mean, standard deviation, median, range, and interquartile range for numerical data, and frequency and percentage for categorical data. Analytical statistics included the Chi^2 test for categorical variables, Spearman correlation for continuous and ordinal data, and Repeated Measure-ANOVA for comparing measurements over time or under different conditions. Post hoc comparisons were performed after data collection to identify significant differences. A p-value < 0.05 was considered statistically significant.

Participants confidentialities were strictly maintained, with no names disclosed in reports or publications. The study's purpose, nature, risks, and benefits were clearly explained, and participants provided informed consent, understanding their right to withdraw without affecting their healthcare. Signed consent forms were retained as permanent study records.

RESULTS

The demographics data of the included participants by group are reported in Table 3. Out of the 80 included patients, 40 (50%) were male and 40 (50%) were female, with mean age ±SD 53.45 ±14.38 years with range (25-85). **Table 3.**

Table 3: Baseline characteristics

		N (%) Mean (SD)	Median (IQR) [Min- Max]
Gender	Male	40 (50%)	
	Female	40 (50%)	

Age		53.45 (14.38)	57 [43- 65] (25-85)
Age by gender	Male	55.1 (13.6)	57 (47.5- 64.2) [28- 85]
	Female	51.8 (15.1)	56 (40.5- 65.2) [25-75]

N: sample size, SD: Standard deviation, IQR: Interquartile range.

Table 4 shows symptoms of the included patients at admission. Out of the 80 included participants, 90 % had Rhinorrhea, and 83.8% had fever, 65% of patients had taste dysfunctions and 90 % of patients had smell dysfunctions.

Table 4: Symptoms of included participants at admission

Symptoms	N (%)
Rhinorrhea	72 (90 %)
Fever	67 (83.8%)
Cough	60 (75 %)
Sore throat	44 (55 %)
taste dysfunction	65 (81%)
Smell dysfunction	72 (90%)

Table 5 shows the categories of Smell Identification Test at each follow up time, the table shows that at admission number of normal patients were 10%, and it tend to increase by the end of the follow up to reach 60% of them with normal smell. The same for the smell impairment, the patients improve by time, and number of total anosmia changed from 45% at admission into 16% after 90 Days

Table 5: Categories of smell identification test at follow up

	Normosmia	Mild	Moderate	Severe	Total Anosmia
At Admission	8 (10 %)	5 (6.2 %)	20 (25 %)	11 (14 %)	36 (45 %)
After 15 days	14 (17.5 %)	13 (16 %)	14 (18 %)	15 (19 %)	24 (30 %)
After 30 Days	38 (47.5 %)	6 (7.5 %)	15 (19 %)	7 (8.7 %)	14 (17.5 %)
After 90 Days	49 (61.3 %)	8 (10 %)	8 (10 %)	2 (2.5 %)	13 (16.3 %)

Table 6 shows the average of smell Identification test at each follow up. The table shows that the mean increase from 19 at admission into 30 after 90 Days.

Table 6: Improvement of Smell Identification Test by follow up

	Mean (SD)	Median (IQR) [Min- Max]
At admission	18.98 (9.21)	22.5 (12- 28) [6 -38]
After 15 Days	22.61 (9.23)	26.5 (16- 32) [8 -40]
After 30 Days	27.44 (8.99)	33 (25- 36) [8 -40]
After 90 Days	30.79 (8.94)	37 (28- 39) [9 -40]

SD: Standard deviation, IQR: Interquartile range.

Table 7 shows that there was very highly statistically significant difference between the Smell Identification Test scale measures at follow up, using Repeated measure ANOVA, p-value < 0.001.

Table 7: RM-ANOVA of duration from COVID-19 at follow up time associated with improvement in smell

	Mean [95% CI]	Repeated Measure ANOVA
At admission	21.02 (18.98- 23.07)	p-value= <0.001
After 15 Days	24.66 (22.61- 26.72)	
After 30 Days	29.44 (27.44- 31.44)	
After 90 Days	32.77 (30.79- 34.76)	

RM- ANOVA: repeated measure Analysis of Variance, very highly statistically significant

Table 8 shows that the difference between each follow up decrease by about 4, p-value < 0.001.

Table 8: post-hoc results

Comparison	Mean Difference	p-value
Day 15- Day 0	3.64	< 0.001
Day 30 - Day 15	4.78	< 0.001
Day 90 - Day 30	3.34	< 0.001

very highly statistically significant

Table 9 shows the categories of taste at each follow up time, the table shows that at admission number of patients with normal taste were about 20%, and it tend to increase by time and reach 65% after 90 Days. For ageusia, the patients improve by time, and number of patients with ageusia changed from 40% at admission into 4% after 90 Days. These changes were very highly statistically significant when tested by Chi^2 test, p-value <0.001.

Table 9: Categories of taste identification test at follow up

	Normal	Mild hypogeusia	Moderate hypogeusia	Severe hypogeusia	Ageusia	p-value
At Admission	15 (1 9%)	8 (10 %)	17 (21 %)	9 (11.2 %)	31 (39 %)	< 0.001
After 15 days	24 (30 %)	13 (16.3 %)	17 (21 %)	15 (18.8 %)	11 (14 %)	
After 30 Days	36 (45 %)	22 (27.5 %)	8 (10 %)	9 (11.2 %)	5 (6.2 %)	
After 90 Days	52 (65%)	14 (17.5 %)	6 (7.5 %)	5 (6.25 %)	3 (3.7 %)	

very highly statistically significant

Table 10 shows that smell identification test is strongly correlated with taste at each follow up time. The correlation between both is very highly statistically significant, p-value < 0.001, with Rho range from [0.72 to 0.8].

Table 10: correlation between Smell Identification Test and taste scale

Day	Test	Rho [95% CI]	p-value
At admission	Spearman's rank correlation	0.72 [0.59, 0.81]	< 0.001
After 15 Days		0.8 [0.70, 0.87]	< 0.001
After 30 Days		0.77 [0.66, 0.85]	< 0.001
After 90 Days		0.7 [0.56, 0.80]	< 0.001

DISCUSSION

Our investigation, encompassing 80 COVID-19 patients, revealed a fever prevalence of 83.8%, aligning with **Grant et al.** [9] at 78% and **Lovato & de Filippis** [10] at 85.6%, although surpassing **Salepci et al.** [11] at 50.7%. A another study indicated a fever prevalence of 98% [12]. Although fever is frequently observed, its absence at first screening does not rule out COVID-19, according to our study results.

Our research indicated a cough prevalence of 75%. **Huang et al.** [12] showed comparable rates of 76% and 79%, respectively. Our investigation identified a prevalence of sore throat at 55%, in contrast to the findings of **Grant et al.** [9] at 12% and **Salepci et al.** [11] at 26%. Our research identified the prevalence of rhinorrhea in COVID-19 patients to be 10%, aligning with **Salepci et al.** [11] at 11.7% and **Sayin, Yaşar, & Yazici** [13] at 17.2%. **Chen et al.** [14] reported a prevalence of rhinorrhea at 4%.

Our research employed the Arabic variant of the 40-item University of Pennsylvania Smell Identification Test (UPSIT) to objectively assess olfaction. Total anosmia decreased from 45% at admission to 16.3% after 90 days, and severe hyposmia reduced from 13.5% to 2.5%. Moderate hyposmia diminished from 25% upon admission to 10% after 90 days. Conversely, mild hyposmia increased from 6.5% at admission to 10% after 90 Days, but normal scent sense rose to 61.3% after 90 Days from 10% at admission, showing significant clinical improvement. We noted a substantial statistical significance in the enhancement of olfactory perception among participants over time. The average olfactory sense score shown a substantial rise over time: at admission, it was 21.02 (95% CI 18.98-23.07), and after 15 days, it rose to 24.66 (95% CI 22.61-26.72).

After 30 days, the value was 29.44 (95% CI 27.44-31.44), and after 90 days, it was 32.77 (95% CI 30.79-34.76), with a p-value < 0.001.

A post-hoc analysis indicated significant changes throughout the days: Day 15 compared to Day 0 (mean difference = 3.64, p < 0.001); Day 30 compared to Day 15 (mean difference = 4.78, p < 0.001); and Day 90 compared to Day 30 (mean difference = 3.34, p < 0.001). These data underscore the significant impact of COVID-19 on olfactory function, with marked improvement over time.

Our study findings aligned with those of **Bagheri et al.** [15] in Iran, who documented an olfactory impairment prevalence of 87% upon admission. Likewise, **Joaquim et al.** [16] reported an olfactory impairment prevalence of 5% to 85% among patients in China, aligning with our findings. In contrast, **Albaharna et al.** [17] observed a lower estimated prevalence of abnormal olfactory tests at 13.6%, attributing this to delayed testing of severely ill patients. **Makaronidis et al.** [18] found greater prevalence rates, with total loss at 70% and partial loss at 23%. Conversely, **Mutiawati et al.** [19] showed an estimated prevalence of abnormal olfactory tests of 38%. These collective data underline that smell impairment is a key clinical manifestation of COVID-19, warranting scrutiny even in circumstances when it might be the lone symptom observed in patients.

The prevalence of taste dysfunction varied in our study: mild hypogeusia (10%), ageusia (38.8%), severe hypogeusia (11.2%), moderate hypogeusia (21.2%), and normal taste (18.8%). After three months, ageusia reduced from 40% to 4%, severe hypogeusia from 11% to 6%, and mild hypogeusia from 21% to 7.5%. On the other hand, normal taste perception went from 20% to 65%, showing great clinical improvement, although moderate hypogeusia increased from 10% to 18%. Over time, there was a very statistically significant variation in taste test categories (p < 0.001).

Our findings were comparable with **Lechien et al.** [20], reporting gustatory impairment prevalence at 88.8%. **Agyeman et al.** [21] revealed prevalence ranging from 38% to 49%. We also identified a strong link between fragrance and taste. At admission, the correlation was extremely significant (p-value < 0.001, Rho = 0.72 [95% CI 0.59-0.81]). After 15 days, the association between the enhancement of taste and smell was quite high (p-value < 0.001, Rho = 0.8 [95% CI 0.70-0.87]). At 30 days, taste improvement highly linked with smell improvement (p-value < 0.001, Rho = 0.77 [95% CI 0.66, 0.85]). Similarly, after 90 days, taste improvement was substantially linked with smell improvement (p-value < 0.001, Rho = 0.70 [95% CI 0.56, 0.80]).

CONCLUSION

COVID-19 is a pandemic, presented various otorhinolaryngeal symptoms. Fever and cough were common symptoms that may not be presented initially, not excluding infection. Sore throat, rhinorrhea, dizziness, and hearing loss are nonspecific. Loss of smell and taste, specific to COVID-19, typically recovered within three months, although some may have permanent loss. The Pennsylvania Smell Identification Test aided in screening olfactory dysfunction, essential for early detection, especially as some patients presented solely with this symptom. Awareness among primary physicians and otolaryngologists is crucial.

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Author Consent and Conflict of interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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