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OLFACTORY DYSFUNCTION AMONG COVID-19 PATIENTS IN MOSUL, IRAQ

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ABSTRACT

Background: Many human strains of SARS-CoV-2 cause anosmia in infected patients by invading the brain through the neuroepithelium and reaching the olfactory bulb. Olfactory dysfunction is one of the most prevalent COVID-19 symptoms. Most patients restore their olfactory function completely in a month, although a lot of them experience residual olfactory dysfunction. Guidelines for treating COVID-19-related olfactory dysfunction are currently lacking, but many studies have indicated that olfactory training may help individuals with post-viral loss of smell. **Objectives:** Is to determine whether COVID-19 PCR positive individuals had anosmia or hyposmia and how they responded to smell exercise in Mosul City, Iraq. **Methods:** Two hundred COVID-19 (PCR-positive COVID-19) patients with olfactory impairment are included in this case series prospective study. The study was carried out from June 1, 2021, to May 1, 2022, at the Al Jamhoori Teaching Hospital for Surgical Specialties' Department of Ear, Nose, and Throat, Mosul City. The questionnaire includes four sections, section one for socio-demographic information, section two for the patients' olfactory dysfunction with its onset and duration, section three for patients' different COVID-19 related ear, nose and throat symptoms and section four for smell exercise details. **Results:** The study included 200 patients with olfactory dysfunction. Of them; 105 (52.5%) patients were males and 95 (47.5%) patients were females. With male to female ratio of 1.105:1. Moreover: the mean age ± standard deviation of the study participants was 39.23 ± 7.27 years. Anosmia was prevalent among 133 (65.5%) patients while hyposmia was prevalent among 67 (33.5%) patients. Furthermore; 129 (64.5%) patients had sudden onset of olfactory dysfunction versus 71 (35.5%) patients had gradual onset of olfactory dysfunction. Nasal obstruction is reported among 86 (43%) patients, rhinorrhea among 77 (38.5%) patients, headache among 71 (35.5%) patients, sneezing among 55 (27.5%) patients, nasal burn sensation among 51(25.5%) patients, post nasal discharge among 39 (19.5%) patients, congested throat among 35 (17.5%) patients and epistaxis among 12 (6%) patients. Statistically significant difference was found between patients with anosmia and hyposmia regarding patients' number (P value <0.001), recovery state after smell exercise (P value <0.001). **Conclusion:** COVID-19 patients with olfactory dysfunction had a favorable outcome, and most of patients recovering quickly with concomitant smell exercises. In COVID-19 individuals, olfactory impairment was typically self-limiting in younger age groups, indicating a mild illness. Olfactory dysfunction is a significant public health concern that should be addressed in the diagnosis, prognosis, and treatment of COVID-19 patients.

KEYWORDS: Olfactory, Dysfunction, Smell exercise, COVID-19, Mosul, Iraq.

1- INTRODUCTION

Many human strains of SARS-CoV-2 cause anosmia in infected patients by invading the brain through the neuroepithelium and reaching the olfactory bulb.[1] Because of the malfunction of multiple organ systems, COVID-19 is a serious public health issue that causes high morbidity and a considerable death rate.[2] Patients having acute respiratory syndrom suffer from respiratory distress due to alveolar damage, which may result in progressive pneumonia and respiratory failure.[3-4] The patient's capacity to smell is mostly affected by this respiratory affliction, which can lead to anosmia (no smell) or hyposmia (decreased sensitivity to smells).[5-6] Human strains of SARS-CoV-2 cause a significant amount of anosmia in infected patients by invading the brain through the neuroepithelium and up to the olfactory bulb.[7]

Olfactory and gustatory dysfunctions after COVID-19 are significant indicators that could help clinicians treat

the illness.[8] However, anosmia or hyposmia may be present in persons who are asymptomatic or who have modest COVID-19 symptoms.[9]

Olfactory dysfunction is one of the most prevalent COVID-19 symptoms. Most patients restore their olfactory function completely in a month, although a lot of them experience residual olfactory dysfunction.[9-10] Guidelines for treating COVID-19-related olfactory dysfunction are currently lacking, but many studies have indicated that olfactory training may help individuals with post-viral loss of smell.[11]

The importance of testing for gustatory and olfactory dysfunctions in diagnosing COVID-19 cannot be overstated. To help with the diagnosis, COVID-19 polymerase chain reaction (PCR) tests have also been performed on patients who have negative results.[12-13] SARS-CoV-2 strains that cause acute clinical symptoms in the respiratory system and other organ systems are prevalent in different parts of Iraq, according to numerous reports.[12-14] Moreover; COVID-19 patients in Iraq and elsewhere may experience anosmia with ageusia (loss of taste) or bitter taste, according to relevant literature.[14-16] Within this context, COVID-19 individuals may experience olfactory and gustatory changes in the early stages of the disease, when fewer symptoms or no nasal discharges are present.[17] As a result, characterizing olfactory impairment in COVID-19 patients adds value to illness diagnosis and prognosis. The aim of this study was to determine whether COVID-19 PCR positive individuals had anosmia or hyposmia and how they responded to smell exercise in Mosul City, Iraq.

2- PATIENT AND METHODS

This case series prospective study included two hundred COVID-19 (PCR-positive COVID-19) patients with olfactory dysfunction. From June 1, 2021, to May 1, 2022, the study was conducted at the Department of Ear, Nose, and Throat at the Al Jamhoori Teaching Hospital for Surgical Specialties in Mosul City. Among those two hundred COVID-19 PCR-positive patients, 105 of whom were males and 95 of whom were females, who satisfied the inclusion requirements were gathered from the outpatient clinic and through referrals from primary healthcare centers.

Nineveh Health Directorate's responsible committee for continuing medical education accepted the study's protocol, which complied with the Declaration of Helsinki's principles. Patients with severe COVID-19, those who were uncooperative during data collection and clinical examination, those who had olfactory and/or gustatory disorders prior to the COVID-19 pandemic in Iraq, those who had previously undergone nasal surgery, and those who had previously experienced a head injury were among the exclusion criteria. The study also excluded patients with nasal masses, those with a history of chronic rhinosinusitis, and those taking any drugs that could impair their ability to smell. A modified questionnaire was used to collect data, including sociodemographic information, Smoking habits, the onset of olfactory dysfunction (anosmia and/or hyposmia), and the duration of smell loss. Recorded signs included nasal obstruction (transient or persistent), sneezing, rhinorrhea, post nasal discharge, as well as any concurrent headache or facial pain. Additionally, the questionnaire includes the presence of any burn sensation, congested throat, unpleasant nasal odors and taste loss.

Each patient underwent an ENT evaluation that included anterior rhinoscopy, Hopkin zero-degree rigid nasal endoscopy, external nasal framework, nasal patency test with a cold spatula, evaluation of paranasal sinus pain, and Cottle's test. Ear and oropharyngeal examinations were also performed as well. The investigators employed an olfactory test developed at the Connecticut Chemosensory Clinical Research Center that includes a composite score for both an n-butanol threshold component and an odor recognition component. Bottle zero, which contained 60 mL of deionized water, had the greatest concentration of n-butanol (4%) whereas bottles one through eight all had diluted n-butanol at a 1:3 ratio. For three to four seconds, the bottle was scented after being brought within two centimeters of the nose. The bottle that smelled the strongest was identified. Four valid responses were used to determine the threshold. The next most concentrated solution was used in case of a mistake. Five common foods were used by the investigators in the odor recognition test for edible stimuli: coffee, lemon, garlic, mint, and banana. Samples were provided to patients in opaque jars, and they were instructed to close the irrelevant nostril and smell to determine the odor.

In order to complete a self-smell exercise, each patient was given five different materials to use: lemon, clove, mint, vanilla, ground pepper, and garlic. Ground coffee was used as a neutralizing agent. Every substance was put in a different little jar. For 20 seconds, the patient was told to calm down and take rapid, light sniffs that weren't too deep. The patient was then told to take a five-minute rest in between each training session and perform the exercises two to three times for each material. There were two daily repetitions of the workout regimen. Until the patient recovered from olfactory impairment, they were instructed to follow up with the outpatient clinic on a regular basis or by phone every two weeks.

Version 26 of the SPSS (Statistical Package for Social Sciences) program (IBM Corporation, USA) was used to analyze the data. The Kolmogorov–Smirnov test was used to confirm that the distribution of the variables was normal. Frequency data were evaluated using the chi-square test, while non-parametric data were evaluated using the Mann-Whitney U test at a two-tailed probability test.

Statistical significance was defined as p-values less than 0.05.

3- RESULTS

The study included 200 patients with olfactory dysfunction. Of them; 105 (52.5%) patients were males and 95 (47.5%) patients were females. With male to female ratio of 1.105:1. Moreover: the mean age ± standard deviation of the study participants was 39.23 ± 7.27 years. As shown in figure 3.1.

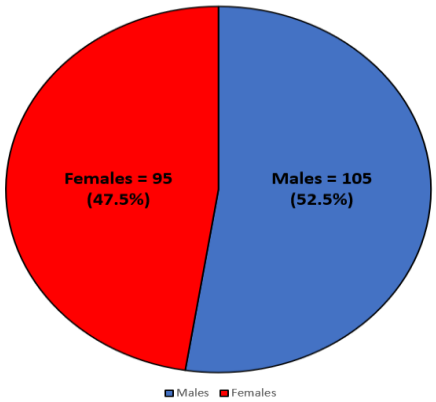

Figure 3.1: Distribution of the study participants according to the gender.

Table 3.1 shows patients' basic description according to their olfactory dysfunction, Anosmia was prevalent among 133 (65.5%) patients while hyposmia was prevalent among 67 (33.5%) patients. Moreover; 129 (64.5%) patients had sudden onset of olfactory dysfunction versus 71 (35.5%) patients had gradual onset of olfactory dysfunction.

Table 3.1: Patients' basic description according to their olfactory dysfunction: (Number = 200 patients).

Variables	Number = 200	Percent
Olfactory dysfunction:		
- Anosmia	133	66.5
- Hyposmia	67	33.5
Onset:		
- Sudden	129	64.5
- Gradual	71	35.5

Figure 3.2 explores distribution of olfactory dysfunction according to their ages. Among 133 patients with anosmia; 52 (39.1%) patients were between 18-30 years old, 53 (39.9%) patients were between 30-40 years old, 14 (10.5%) patients were between 40-50 years old, 9 (6.7%) patients were between 50-60 years old and 5 (3.8%) patients were more than 60 years old. While from 67 patients with hyposmia; 19 (28.4%) patients were between 18-30 years old, 23 (34.4%) patients were between 30-40 years old, 12 (17.9%) patients were between 40-50 years old, 7 (10.4%) patients were between 50-60 years old and 6 (8.9%) patients were more than 60 years old.

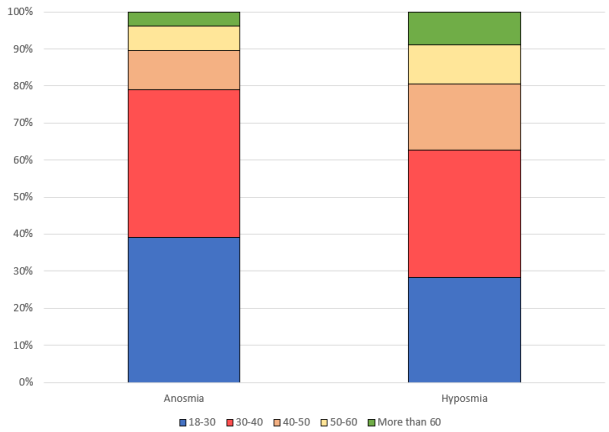

Figure 3.2: Distribution of the olfactory dysfunction according to their ages.

Figure 3.3 illustrate distribution of the study participants according to their smoking state. It's evident that 27 (20.3%) patients of anosmia groups were smokers and 106 (79.7%) patients were not smokers. From the other hand; 10 (14.9%) patients of hyposmia group were smokers and 57 (85.1%) patients were not smokers.

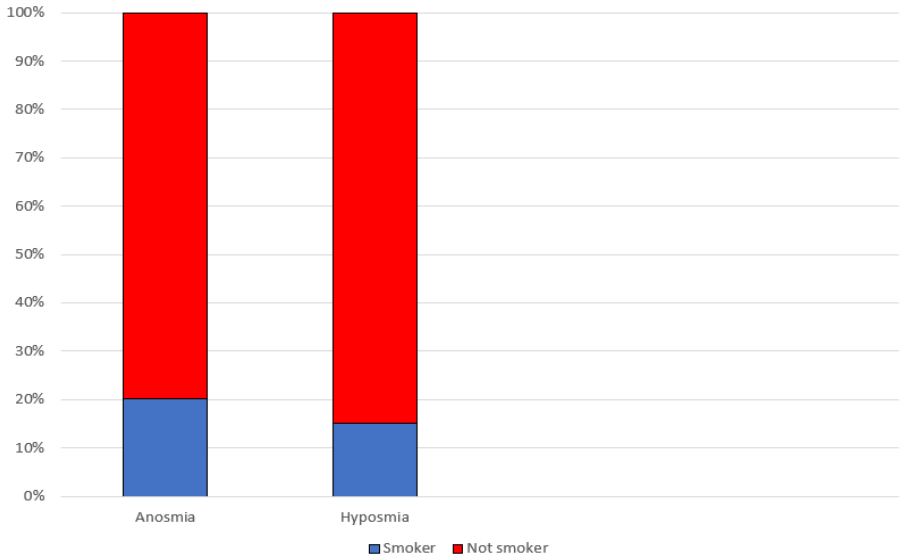

Figure 3.3: Distribution of the olfactory dysfunction according to their smoking state.

Table 3.2 explores patients' different ear, nose and throat symptoms. Nasal obstruction is reported among 86 (43%) patients, rhinorrhea among 77 (38.5%) patients, headache among 71 (35.5%) patients, sneezing among 55 (27.5%) patients, nasal burn sensation among 51(25.5%) patients, post nasal discharge among 39 (19.5%) patients, congested throat among 35 (17.5%) patients and epistaxis among 12 (6%) patients.

Table 3.2: Patients' different ear, nose and throat symptoms (Number = 200 patients).

Variable	Number = 200	Percent
Nasal obstruction	86	43
Rhinorrhea	77	38.5
Headache	71	35.5
Sneezing	55	27.5
Nasal burning sensation	51	25.5
Post nasal discharge	39	19.5
Congested throat	35	17.5
Epistaxis	12	6

Table 3.3 shows comparison between patients who had anosmia and those with hyposmia. Statistically significant difference was found between the groups regarding patients' number (P value <0.001), recovery state after smell exercise (P value <0.001). From the other hand; no statistically significant difference was found regarding patients' gender (P value = 0.782), mean of patients' age (P value = 0.171), mean ± standard deviation of recovery time (P value = 0.092) and median ± interquartile range of recovery time (P value = 0.387).

Table 3.3: Comparison between recovered and died patients regarding different demographic and clinical manifestations (Number = 200 patients).

Variable	Anosmia (Number =133)		Hyposmia (Number =67)		P value
	Number	Percent	Number	Percent	
Gender:					
Male	71	53.4	34	50.7	0.782
Female	62	46.6	33	49.3	
Age (years), mean ± standard deviation	38.093 ± 7.51		36.07 ± 7.03		0.171
Recovery state after smelling exercise	88	66.2	17	25.3	**<0.001**
Recovery time (months), mean ± standard deviation	1.55 ± 2.15		1.75 ± 2.05		0.092
Recovery time (months), median ± interquartile range	1 (1-4)		1 (1-5)		0.387

4- DISCUSSION

Major impact on personal safety and quality of life due to olfactory deficiencies seen in COVID-19 individuals. olfactory dysfunction may cause serious psychiatric problems which might threaten personal safety.[18-19]

This study found that male gender was slightly predominant over female gender with mean age of 39 years old which is comparable to Jerome R. Lechien et al study findings (40 years)[20] Although the exact cause of gender-based COVID-19 olfactory impairment is unknown, it may be connected to the innate gender differences in how each gender reacts to an infectious inflammatory response.

Moreover; the majority of cases founded in the study to be from young and middle age group. As the study excluded patients with severe COVID-19. This is runs with Mohamed A. Amer et al study findings.[21] Anyhow; COVID-19 related olfactory dysfunction can affect older patients as well.[22]

Regarding the main study findings; about two third of the study participants had anosmia and about one third had hyposmia, as these symptoms are noticeable indicators of SARS-CoV-2 infection-related olfactory impairment. However, in people with COVID-19, olfactory impairment may strike unexpectedly without any other obvious serious illness complications.[23-24] However; Disruptions to peripheral (nasal cavity) and central (olfactory centers) neuronal pathways involved in olfactory processes are the pathophysiology of COVID-19-induced olfactory dysfunction.[25-26] Additionally; the current study explored different ear, nose and throat presenting symptoms; nasal obstruction with underlying inflammatory edema may be an early source of olfactory impairment in COVID-19 individuals.[27] In this study, nasal obstruction occurred in 43 % of the patients with additional severe ENT symptoms that ranged between 6% and 38.5 %. Which is consistent with Mohammad F. Kasim et al study results.[28]

Olfactory dysfunction was not linked to smoking among the COVID-19 patients in this study. Olfactory affection with or without smoking and the course of the disease are yet unknown, despite earlier reports of comparable findings among COVID-19 patients.[29-30]

In the current study, the majority of COVID-19 patients with olfactory dysfunction recovered in an average of 1.5 months. Clinically speaking, it should be noted that early resolution of olfactory impairment is typically not anticipated in COVID-19 patients.[31] The study's COVID-19 participants showed a statistically significant association between smell exercise and recovery from anosmia. This finding, which is consistent with earlier findings, seems to have clinical significance since smell exercises, which have few negative effects, may help patients by enhancing their ability to discriminate and use their senses.[32-33]

When assessing study findings, it is critical to consider their limitations. First; the study did not include all COVID-19 patients, regardless of illness severity or olfactory dysfunction. Second; the study did not look at the association between olfactory dysfunction and various SARS-CoV-2 genotypes. Third; the study emphasizes the need of including olfactory impairment while determining COVID-19 prognosis. However; longer follow-up periods are required to assess olfactory features in such prognosis.

5- CONCLUSION AND RECOMMENDATION

COVID-19 patients with olfactory dysfunction had a favorable outcome, and most of patients recovering quickly with concomitant smell exercises. In COVID-19 individuals, olfactory impairment was typically self-limiting in younger age groups, indicating a mild illness. Olfactory dysfunction is a significant public health concern that should be addressed in the diagnosis, prognosis, and treatment of COVID-19 patients. Additional studies are needed to evaluate olfactory and gustatory dysfunctions in patients with severe COVID-19 and/or chronic anosmia.

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Conflict of intertest

The authors of this study report no conflicts of interest.

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