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Prevalence of Parosmia among COVID-19 Patients in KSA: A Cross-Sectional Study

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ABSTRACT

Background: Although parosmia is a common problem in the era of the COVID-19 pandemic, few studies assessed the demographic and clinical aspects of this debilitating symptom. We aimed to evaluate the socio-clinical characteristics and outcome of various options of treatment of individuals with parosmia due to COVID-19 infection.

Methods: This was an analytical cross-sectional study to spot light on the relationship between osteoarthritis and endocrine diseases. The study was carried out at universities, hospitals and malls in KSA. Data were collected from patients and general population during a period from March to October 2021.

Results: The study included 1019 participants from different age groups. The most prevalent age group was 20-30 (n=365, 35.8%). Most of study participants were females (n=715, 70.2%) and the rest were males (n=304, 29.8%). The majority of participants were from Saudi Arabia (n=926, 90.9%) while the rest were non-Saudi participants (n=93, 9.1%).

The majority of participants had no comorbidities (n=784, 76.9%). On the other hand, the most prevalent comorbidities were asthma, diabetes, obesity and hypertension. There were 656 participants been infected with COVID-19 (64.4%). Among them, 608 participants suffered from anosmia (92.7%). However, most of them had their sense of smell back (n=481, 79.1%). Participants described also a change in their sense of smell. There were 466 participants reported change in their sense of smell. The change in sense of smell varied among study participants. Strange smells are statistically significant with female gender (P=0.001) and old age (P=0.02).

Conclusion: Parosmia due to COVID-19 infection is a common problem with poor results in the short-term treatment and follow-up. The altered quality of life (AQL) was seen in a greater proportion of patients and strongly associated with the presence of dysgeusia, type, and severity of parosmia.

Key words: Chemosensory, COVID-19, Parosmia, Anosmia, Hyposmia

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INTRODUCTION

The chemosensory function has many advantages. Firstly, it has an important role in detecting and differentiating various types of foods and beverages. Secondly, the olfactory sense acts as an early warning device for determining to threaten objects in the environment like fires, fumes, and spoiled foods. Thirdly, it can help certain jobs which they depend on the normal function of the smell such as housewives, food tasters, professional beverage, cockers, and fire-fighters. Lastly, any olfactory disorder harms the quality of the life [1].

In the early stage of the current COVID-19 pandemic, many studies from various nations reported that smell abnormalities, including anosmia and hyposmia, are frequent features of this disease [2–6]. These symptoms may present alone or with other features of the disease

[6]. As time progressed, parosmia constitutes another feature of the longstanding COVID-19 infection. Abnormalities of the smell are usually not associated with other nasal symptoms like nasal obstruction and rhinorrhea [7].

Olfactory disorders are divided into 2 types quantitative (anosmia and hyposmia) and qualitative (parosmia and phantosmia) [8]. Anosmia is a total loss of the smell, hyposmia is a decrease in the sense of smell, parosmia is a distortion of the smell in the presence of an existing stimulus, and phantosmia is a distortion of the smell in the absence of an existing stimulus [8]. Parosmia can be unpleasant (troposmia) or pleasant (euosmia). Usually, parosmia and phantosmia occur in association with quantitative smell disorders but on rare occasions, they might present alone [9].

Despite olfactory dysfunctions are common, the exact mechanisms are still not yet established. Anyhow, a higher rate of recovery might explain the local inflammation of the olfactory area on the roof of the nose (conductive theory). While persistent anosmia and parosmia might explain the neuronal invasion by the COVID-19 virus (neuronal mechanism) [10].

There is a diverse list of causes of olfactory disorders includes post-viral upper respiratory tract infections, head injuries, intracranial tumors, sinonasal pathologies, and neurodegenerative disorders like Parkinson's and Alzheimer's diseases. However, in certain cases, there is no identified cause [11].

Olfactory disorders before the covid-19 pandemic were largely unrecognized, and often underestimated by researchers. While, during the COVID-19 pandemic, about 52.73% of cases result in loss of smell [12], most of them show excellent recovery rate within a short period (less than 4 weeks) [5]. Parosmia is a debilitation condition in which usual olfaction is distorted and unpleasant. The triggering molecular stimuli for the parosmia are well-known. As well as the possible mechanism is the miswiring of the olfactory neurons [13]. Few numbers of studies are concerned with parosmia due to COVID-19 disease as mentioned in the literature. Parosmia is a common problem as reported a prevalence of parosmia 43.1% [14]. Therefore, we sought to study this topic with large numbers of patients when compared to other studies [8,14,15].

LITERATURE REVIEW

In March 2020, the World Health Organization (WHO) declared that Coronavirus Disease 19 (COVID-19), caused by SARS-CoV-2 infection, had reached pandemic levels. Although the symptoms of COVID-19 are highly variable across infected individuals [1], sudden loss of taste and smell was quickly identified as a hallmark symptom [2–4]. Self-reported smell loss was shown to be useful for both diagnosis [5–7] and population surveillance [8], at least for SARS-CoV-2 variants common in 2020.

Classically, patient complaints of smell loss with the common cold arise from a blocked or stuffy nose that prevents volatile odorants from reaching olfactory receptors near the top of the nasal cavity, and gustation is not affected [9]. However, with COVID-19, sudden smell loss was commonly observed without nasal blockage [10–12], and direct assessment with odor-free tastants (e.g., sugar) indicated taste was also affected [13].

Most individuals (>75-80%) reporting taste and smell impairments due to COVID-19 tend to recover these senses within a few months, but smell impairment is still reported by 25-40% of patients after one or two months [5,14] at 6 months [15,16]. Given the common confusion between taste, smell and flavour, data on taste recovery are less clear, though suggested to recover somewhat faster than smell [16]. Separately, some individuals recover from acute smell loss, only to subsequently report other olfactory dysfunction, such as parosmia (smell distortions) and phantosmia (phantom smells or olfactory hallucinations) [17,18].

Factors associated with persistent smell and taste dysfunction remain unknown. Some early reports suggested smell loss might be associated with a milder disease course [19,20], although smell and taste impairments were also seen in severely ill patients [21,22].

Previously, some speculated smell loss might indicate milder COVID-19 morbidity [20]. Our data do not support this view; rather, we found smell long-haulers had more symptoms than recovered participants. This suggests previous under-reporting of smell dysfunction among severely ill patients may instead reflect a sampling bias; understandably it seems likely that clinicians treating critically ill patients were less focused on anosmia or parosmia as symptoms, and such patients were presumably unavailable for acute chemosensory testing.

There is important practical value in being able to predict which patients may develop long term smell loss. We found a greater reduction in the smell ability during COVID-19 illness in those who later became smell long-haulers compared to those who recovered smell ability, although this difference was numerically small. Whether the rating of smell ability during the disease can be used prognostically to predict the risk of future long-hauling needs additional exploration.

While some studies suggest self-reports may underestimate smell loss prevalence relative to direct assessment [18,23-31], others found correlations between self-reporting and direct assessments [32]. Furthermore, although direct assessments have been proposed very recently [33], self-report remains the current standard of care for assessment of parosmia and phantosmia [34], at least until newly proposed methods can be further validated. The presence of parosmia in nearly 50% of the smell long-haulers in our sample is not surprising for post-viral olfactory dysfunction in general [35]. In other datasets (i.e., UK healthcare workers), parosmia is also emerging as a common sequelae of COVID-19 [36].

METHODS

Study design

This was an analytical cross-sectional study to spot light on the prevalence of parosmia among COVID-19 patients. Since the aim of the study was to determine the prevalence of parosmia among COVID-19 patients, this is the suitable design for this research.

Study setting

The study was carried out at universities, hospitals and malls in KSA. Data were collected from COVID-19 patients and general population during a period from March to October 2021.

Sampling and sample

Participants were chosen via probability simple random sampling technique. Participants were selected from the general population. The final number of sample size was 750 participants. However, the study included 1019 participants.

Inclusion criteria

COVID-19 patients and general population.

Exclusion criteria

None.

Instruments

Data collection tool was self-designed and base on latest literature. It contained the following information: (1) Basic information about participants and (2) Disease related information.

Statistical analysis

Data obtained from questionnaire were entered and analyzed using SPSS program version 23 computer software. Sociodemographic data are presented using descriptive statistics as means, median, percentages and standard deviation.

Independent T test and one-way Anova are used to show statistical significance among patients' characteristics and tool scores. Chi square test is used to show relationship between categorical variables.

Univariate and multivariate analysis will be performed to investigate association between gender of parents, education level and knowledge and prevent of tooth decay. Statistical significance is set at a P value of 0.05 or less.

Permission and ethical considerations

Administrative approval will be sought from the unit of biomedical ethics research committee Ethical approval was sought from the ethical committee of the faculty of medicine, King Abdul-Aziz University. An informed consent was sought from the participants.

RESULTS

The study included 1019 participants from different age groups. The most prevalent age group was 20-30 (n=365, 35.8%).

Figure 1 shows the distribution of study participants according to age group. Most of study participants were females (n=715, 70.2%) and the rest were males (n=304, 29.8%).

The majority of participants were from Saudi Arabia (n=926, 90.9%) while the rest were non-Saudi participants (n=93, 9.1%).

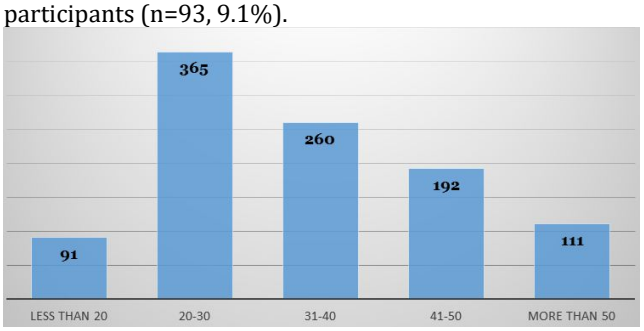

Figure 1: Distribution of age group among study participants.

Participants were asked about their smoking status. There were 861 participants who are not smoking at all (84.5%) while 123 participants are currently smoking (12.1%).

On the other hand, there were 35 participants ex-smokers (3.4%).

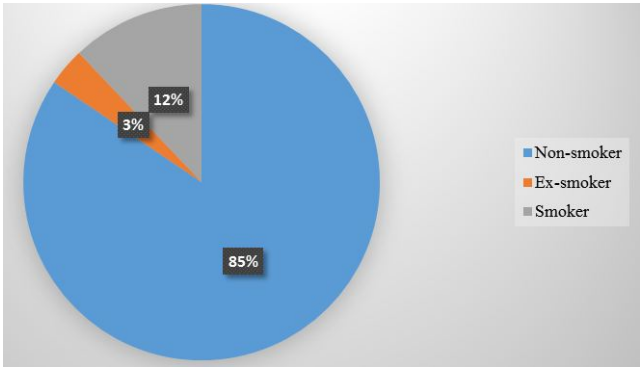

Figure 2: Smoking status.

Participants were asked if they had any comorbid diseases. The majority of participants had no comorbidities (n=784, 76.9%).

On the other hand, the most prevalent comorbidities were asthma, diabetes, obesity and hypertension. Participants' responses are presented in Table 1.

Table 1: Prevalence of comorbidities among study participants.

Comorbidity	Frequency	Percentage
Asthma and other respiratory disease	64	6.3
Diabetes mellitus	25	2.5
Diabetes mellitus and hypertension	10	1
Hypertension	31	3
Obesity	36	3.5
Psychiatric disease	18	1.8
No comorbidity	784	76.9
Other comorbidity (cardiac, kidney)	51	5

There were 656 participants been infected with COVID-19 (64.4%). Among them, 608 participants suffered from anosmia (92.7%). However, most of them had their sense of smell back (n=481, 79.1%). Participants described also a change in their sense of smell. There were 466 participants reported change in their sense of smell. The change in sense of smell varied among study participants. Participants' responses are presented in Table 2.

Table 2: Changes in sense of smell among participants who suffered from anosmia (N=608).

Change in sense of smell	Frequency	Percentage
After losing sense of smell for a period more than one month	173	28.5
After losing sense of smell for a period more than three month	131	21.5
Begins immediately after losing sense of smell	162	26.6
No change in sense of smell	142	23.4

Other participants reported smelling strange odors. Participants reported smelling chemical substances, must, smell of fire, smell of fish, and other weird smells.

Participants were asked to describe if they had any weight loss after losing their smell of sense. There were 204 participants who described significant weight loss after losing their sense of smell (20%). Strange smells are statistically significant with female gender (P=0.001) and old age (P=0.02).

DISCUSSION

Loss of smell is a well-established symptom of the COVID-19 disease, so much so that it can be used to diagnose the illness. While most people who suffer from olfactory dysfunction due to COVID-19 recover it quickly within four weeks for 79% of people [16]. Nevertheless, some with long COVID-19 smell disorders are detected unpleasant odors months after catching the virus [14]. Patients with the COVID-19 disease across my country and the world are reporting unpleasant changes to their sense of smell after a COVID-19 diagnosis.

This differs from the loss of sense of smell and taste, which is a pretty common COVID-19 symptom. This study represented a large case series of COVID-19 patients with anosmia (608 patients) within a short period (3 months).

The daily perception of parosmia was unpleasant for the majority of our patients and was typically described as chemical substances, must, smell of fire, smell of fish, and other weird smells. All patients could identify the triggering stimuli eliciting parosmia. The study revealed a single or multiple triggering stimuli in all patients. While the response to these stimuli in all cases was single. This finding (single response to single or multiple triggering stimuli) was consistent with the previous study [1]. It is of utmost importance to consider this observation in a future study to understand the exact pathogenesis of the parosmia.

It is often to see patients suffering from parosmia in the early phases of resolution from quantitative olfactory dysfunction (anosmia and hyposmia), 2 to 3 months from the onset of COVID-19 disease [13]. The mean duration of parosmia from the point of disappearance of anosmia or hyposmia in our study was 1.434 ± 0.4886 months, which is slightly higher than another study (2.5 months) [14].

Quality of life was considered as altered if the patient reported a decrease in appetite or body weight or a change in mood. Alteration of the smell can affect the quality of life badly or may be a sign of more serious health problems. Other studies [17–21] reported a highly statistically significant difference between the altered quality of life and the dysgeusia, type, and severity of parosmia. However, there was no significant association between the quality of life and other studied variables.

The mean age of the patients with olfactory disorders was ranged from 35.91 to 57 years [15, 14, 22, 23]. Other studies' result reported a lower mean of age than the above-mentioned studies. This may be attributed to the difference in the geographical area, ethnicity, and the

cause of olfactory dysfunction. Besides, the current study revealed that about 70.2% of the cases were females, which was similar to other investigations [14], but in contrast to the prior study [5]. However, there was no significant difference (p value > 0.05) between the age and gender and the state of the quality of life due to parosmia.

The job might be a risk factor for acquiring olfactory disorders [24] from Korea reported a higher prevalence rate of olfactory disorders in certain jobs, automobile repair (45.1%), printing (69.7%), and shoemaking and plating (88.9%) workers in comparison to the offices' workers (21.2%). It is well-known that there is no one immune against the COVID-19 disease, but healthcare workers are more vulnerable [25].

The prior study reported a high prevalence rate (26%) of persistent olfactory dysfunction for more than one month among healthcare workers with COVID-19 infection [26], other study revealed that there were 3 (1.1%) cases of the healthcare workers with parosmia. The study didn't find an explanation for this contradiction. The highest occupation affected in the present study was a housewife (n = 150, 56%). This may be attributed to the highest proportion of our patients were females (70.2%). Moreover, this occupation carried a difficulty in cooking and difficulty in detecting the order of baby nappy.

Another study used the rat as a model for the assessment of the olfactory epithelium after exposure to tobacco smoke for 12 weeks, smoke and ethanol for the final 5 weeks, or no exposure to both of them (control group). Positive staining on the Immunohistochemical analysis of the olfactory epithelium for the caspase-3 enzyme indicates the olfactory cells undergoing apoptotic proteolysis. They concluded that the loss of smell is higher in smokers than non-smoker owing to the increment in the death of the olfactory sensory neurons by cigarette smoke [27]. Hummel et al. reported a significant negative impact of smoking on the recovery of smell disorders [28]. However, our study didn't find a significant effect of smoking on the severity of parosmia, quality of life alteration, and recovery rate.

Despite, the present study represented the largest case series study, there are limitations to this study. Firstly, the present study depends on the self-reported acquisition of the parosmia from the participants. Short-term follow-up of the cases is a second limitation; therefore we cannot determine the actual recovery rate of the parosmia in patients with the COVID-19 disease.

CONCLUSION

In conclusion, the current study revealed a large number of parosmia in patients with COVID-19 disease in a short period in comparison with other studies of the case series that involved the parosmia due to causes other than COVID-19. The majority of our cases were a young age group. All cases were preceded by anosmia or hyposmia. The majority of the cases were also suffering from dysgeusia. The altered quality of life was significantly affected by the presence of dysgeusia, type, and severity of parosmia, while it was not affected by other factors (age, gender, occupation, smoking habit, duration of the parosmia, and whether the parosmia was preceded by quantitive olfactory disorders or associated with nasal symptoms).

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