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# Prevalence of long-lasting loss of smell and taste after coronavirus disease 2019 infection in Saudi Arabia

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## Abstract:

**BACKGROUND:** People with coronavirus disease 2019 (COVID-19) who experience symptoms for more than 35 weeks are said to have long COVID. Anosmia can occur on its own or in combination with other COVID-19 symptoms. Anosmia may be a significant differential presentation for the suspicion and diagnosis of COVID-19 in patients with asymptomatic-to-mild COVID-19 disease and may disappear in 3 weeks. This study sought to determine the prevalence of persistent loss of taste and smell following COVID-19 in Saudi Arabia.

**MATERIALS AND METHODS:** A population-based cross-sectional study was conducted among Saudi citizens who had been diagnosed with COVID-19 for more than 2 weeks and had experienced a loss of taste and smell. Data was collected using a questionnaire having questions about demographics, long-lasting loss of taste and smell, whether this related to COVID-19 infection, and whether respondents had received the COVID-19 vaccine. SPSS was used for data analysis; statistical significance was determined using Chi-square test.

**RESULTS:** A total of 383 Saudis who had a history of COVID-19 participated in the study. About 43.3% study participants had experienced persistent loss of taste and smell after COVID-19 infection. A significant association was found between loss of smell and the region, Northern region having highest proportion of study participants who had loss of smell and Western region having the lowest prevalence (34%).

**CONCLUSION:** There were permanent changes in the sense of taste or smell in 34.3% of participants. This might add to the growing weight of long COVID.

## Keywords:

Anosmia, coronavirus disease 2019, long-lasting, prevalence, Saudi

## Introduction

The Middle East respiratory syndrome epidemic in 2012 and the severe acute respiratory syndrome (SARS) epidemic in 2002 are the two most significant coronavirus infections to have occurred in the past 20 years. The first case of coronavirus disease 2019 (COVID-19) was identified in a patient in Wuhan (China), who had severe pneumonia in December 2019.<sup>[1]</sup> The bat origin of the new coronavirus (SARS CoV-2

suspected) led to a quick characterization of the viral genome.<sup>[2,3]</sup>

Angiotensin-converting enzyme 2, which is present in many human tissues but is particularly prevalent in the central nervous system, was found to be the functional receptor for SARS-CoV-2 in January 2020.<sup>[4]</sup> According to the clinical data, coronavirus spreads from person to person through respiratory secretions and drops.<sup>[5]</sup> COVID-19 gradually spread to many European and Asian nations, then to North America, South America, and Africa.

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On March 11, 2020, the WHO declared the illness as a global pandemic.<sup>[4]</sup>

The COVID-19 pandemic has had a significant impact on global financial stability and healthcare systems.<sup>[6]</sup> Malaise, fever, coughing, shortness of breath, sore throat, aching muscles and joints, headache, nausea or vomiting, diarrhea, and a loss of taste and smell are some of the symptoms of COVID-19. As with other upper airway viral infections, such as the common cold or flu, the loss of smell is a common symptom of COVID-19. However, previously asymptomatic COVID-19 patients may experience a sudden, acute, and isolated loss of taste and/or smell.<sup>[4]</sup>

Some of the symptoms of COVID-19 include fatigue, fever, coughing, shortness of breath, sore throat, aching muscles and joints, headache, nausea or vomiting, diarrhea, and a loss of taste and smell. The loss of smell is a typical symptom of COVID-19, just as with other upper airway viral infections (URTIs), such as the common cold or flu. However, patients with COVID-19 who had not previously shown any symptoms may suddenly lose their ability to taste or smell.<sup>[7]</sup> In patients with mild-to-asymptomatic COVID-19 disease, anosmia or the loss of the sense of smell may be a significant differential presentation for the suspicion and diagnosis of COVID-19, and it may resolve within 3 weeks.<sup>[8]</sup>

People with COVID-19 who experience prolonged symptoms for more than 35 weeks are said to have long COVID.<sup>[9]</sup> The creation of a COVID-19 vaccine had to proceed quickly and globally. It is crucial to determine whether SARS-CoV-2 protection will be attained through widespread vaccination campaigns or through recurrent waves of infection over the next few years until roughly 60%–70% of people acquire immunity. Increased herd immunity limits the capacity of viruses to spread to pandemic levels. The consequences of repeated outbreaks will be high mortality, severe economic disruption, and significant changes to our way of life because the human population is unaware of SARS-CoV-2. Therefore, the creation of a potent vaccine was urgently required to stop ongoing or recurrent epidemics.<sup>[10]</sup> “Vaccine hesitancy,” or people’s refusal to receive safe and advised available vaccines, was a major source of concern even before the COVID-19 pandemic.<sup>[11]</sup> The five main individual person-level reasons for vaccine hesitancy, according to a paradigm based on research done in high-income countries, are confidence, complacency, convenience, risk assessment, and collective responsibility.<sup>[12]</sup> Under vaccines, we cover edarePfizer/BNT162b2, Moderna Vaccine/mRNA1273, AstraZeneca/AZD122/ChAdOx1nCoV19, and the Janssen vaccines/Ad26.COV2.S. By May 16, 2021, several

countries had authorized the use of the following vaccines: Pfizer, Moderna, Oxford/AstraZeneca, and Janssen.<sup>[13]</sup>

The purpose of the study was to compare people in Saudi Arabia who had received a COVID-19 vaccination to those who had not to determine the prevalence of long-lasting loss of smell and taste.

## Materials and Methods

In this population-based cross-sectional study, we used a nationwide questionnaire to target all Saudi and non-Saudi residents living in all regions of Saudi Arabia. The study was carried out between February and March 2023. Ethical approval was obtained from the Institutional Ethics Committee of Umm Al-Qura University, Makkah, vide letter No. HAPO-02-K-012-2023-01-1369 dated 01/01/2023, and informed written consent was taken from all participants in the study.

Saudi and non-Saudi residents of Saudi Arabia who had lived with COVID-19 for more than 2 weeks and had lost their sense of smell and taste met the inclusion criteria. In addition, those who had not been diagnosed with COVID-19, who had not been diagnosed with COVID-19 for <2 weeks, or who had lost their sense of smell or taste for <2 weeks were excluded from the study. The study questionnaire inquired of the vaccination status of each participant as well as the type of vaccine and the number of doses received, and its association with long-lasting loss of smell and taste after COVID-19. Open Epi version 3.0 (Atlanta, GA, USA) determined that 385 people would constitute a minimum sample size, with a confidence interval of 95%.

A self-reported valid, trustworthy, and easy-to-understand questionnaire in Arabic which protected participant privacy was created. Google Forms were used to distribute the survey online through social media channels. The items were chosen after a literature review, review by two experts, and the completion of a pilot study of 20 people. The questionnaire items were grouped into six main sections, each of which contained a consent form. The questionnaire began with a question on the exclusion criteria (if diagnosed with COVID-19 in <2 weeks, if undiagnosed if loss of smell or taste occurred <2 weeks). The participants who responded “yes” to any of these questions were removed from the study.

The questionnaire had questions about the participant’s demographics (age, gender, education level, etc.), whether they had experienced a long-lasting loss of smell and taste; whether it was more likely to have been

caused by COVID-19 infection than other conditions, and whether they had received the COVID-19 vaccine.

Before being entered into the Statistical Package for the Social Sciences software version 21 (SPSS, IBM Corporation, NY, USA), the collected data were examined.  $P \leq 0.05$  was considered significant for all two-tailed, 0.05 alpha-level statistical tests. Study variables such as participant personal information and employment were subjected to a descriptive analysis using frequency distribution and percentages. Following the COVID-19 infection, the participant's long-term loss of taste and smell was also graphed. The participant's second loss of taste and smell perception as well as their post-COVID-19 infection vaccination data were also noted. The correlation between COVID-19 vaccinations and postvaccination association with loss of smell and taste, as well as the association between these two factors, using the Pearson Chi-square test for significance and the exact probability test, if frequency distributions were small.

### Results

Of the 1098 respondents, 715 respondents were disqualified for not meeting the inclusion requirements. One hundred and five (27.3%) of the 383 remaining participants with a history of COVID-19 infection were from the central region. Participant's ages ranged from 18 to 50 years with mean age of  $27.6 \pm 12.3$  years. Of the participants, 327 (85.4%) were women, and 366 (95.6%) were Saudis. Regarding occupation, 172 (44.9%) were unemployed or retired, 56 (14.6%) were employed in the healthcare industry, and 112 (70%) were non-healthcare staff [Table 1].

Following COVID-19, 166 (43.3%) study participants experienced persistent loss of taste and smell [Figure 1].

The COVID-19 vaccine had been administered to all participants who had experienced long-lasting loss

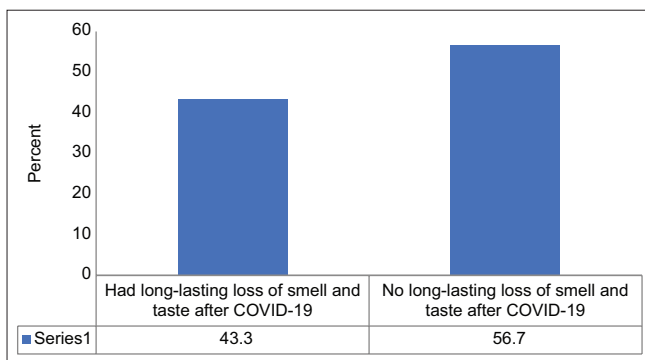


Figure 1: Prevalence of long-lasting loss of smell and taste after coronavirus disease 2019 in Saudi Arabia. COVID-19 = Coronavirus disease 2019

Table 1: Characteristics of patients with coronavirus disease 2019 infection in Saudi Arabia

Personal data	N (%)
Region	
Central	105 (27.4)
Northern	86 (22.5)
Eastern	12 (3.1)
Western	103 (26.9)
Southern	77 (20.1)
Age (years)	
18–29	201 (52.5)
30–50	137 (35.8)
>50	45 (11.7)
Gender	
Male	56 (14.6)
Female	327 (85.4)
Nationality	
Saudi	366 (95.6)
Non-Saudi	17 (4.4)
Profession	
Not working	172 (44.9)
Healthcare staff	56 (14.6)
Others	155 (40.5)
Medical student	5 (3.1)
Student	43 (26.9)
Non-healthcare staff	112 (70.0)

Table 2: Coronavirus disease 2019 vaccination and postvaccination consequences in cases with long-lasting smell and taste loss (n=166)

COVID-19 vaccinations	N (%)
Received COVID-19 vaccine	
Yes	166 (99.4)
Doses of received vaccine (n=166)	
One dose	3 (1.8)
Two doses	58 (34.9)
Three doses	105 (63.3)
Type of received vaccine (n=166)	
Pfizer	138 (83.1)
AstraZeneca	19 (11.4)
Moderna	7 (4.2)
Johnson	2 (1.2)
Had COVID-19 after vaccination (n=166)	
Yes	78 (47.0)
No	88 (53.0)
If yes, did you lose smell and taste sensation again (n=78)	
Yes	61 (78.2)
No	17 (21.8)
If yes, duration (n=61) (weeks)	
<2	14 (23.0)
>2	47 (77.0)
Was the loss of smell and taste as severe as the first time?	
Yes, severe	34 (55.7)
No, less	27 (44.3)

COVID-19=Coronavirus disease 2019

of smell and taste; 105 (63.3%) had received three doses, whereas 58 (34.9%) had received two doses. The Pfizer vaccine was given to 138 (83.1%) of them, the AstraZeneca vaccine to 19, the Moderna vaccine to 7, and the Johnson vaccine to 2 (1.2%). After vaccination, only 78 (47%) people had COVID-19; of these, 61 (78.2%) lost their sense of smell and taste for more than 2 weeks. Thirty-four (55.7%) patients lost their sense of taste and smell to the same extent as the first time, but not to the same extent in 27 (44.3%) [Table 2].

A statistically significant difference was observed in the northern region from the other regions, where 55.8% of participants reported having a long-lasting loss of taste and smell after the COVID-19 ( $P = 0.037$ ). None of the other variables significantly correlated with persistent loss of taste or smell [Table 3].

In comparison to those who received just one dose, approximately 79% of those who received three doses of the vaccine experienced post-COVID-19 long-lasting taste and smell loss ( $P = 0.179$ ). In comparing the recipients of the vaccines, a significantly higher percentage of participants who had received AstraZeneca had postvaccination COVID-19 associated long-lasting loss of smell and taste ( $P = 0.045$ ). In addition, a significantly higher percentage of participants who reported that their loss of smell and taste was as bad as it was the first time associated it with postvaccination COVID-19 [ $P = 0.020$ , Table 4].

## Discussion

The infectious disease COVID-19 spreads from person to person through respiratory secretions. Long COVID, the loss of taste and smell lasting longer than 2 weeks, makes it more difficult. The current study comprising 383 participants in total with a history of COVID-19 infection discovered that 166 (43.3%) of the study participants had persistent loss of taste and smell following COVID-19. According to a 2020 study carried out in Daegu, Korea, in the early stages of COVID-19, 15.3% (488/3191) patients reported losing their sense of taste and smell.<sup>[8]</sup> The majority of patients who experience these symptoms recover in 3 weeks, but the median time to recovery was 7 days for both symptoms. Patients who experience these symptoms are more likely to be female and younger.<sup>[8]</sup>

According to another study completed in 2020 at the ESIC Medical College and Hospital in Faridabad, 40 patients out of 141 had olfactory or taste dysfunction, 34 (24.1%) had olfactory dysfunction, 34 (24.1%) had taste dysfunction and 28 patients (19.8%) had both olfactory and taste dysfunction.<sup>[14]</sup> We only mention two studies because, until the end of our study, not many studies had looked at the loss of taste and smell.

**Table 3: Factors associated with long-lasting loss of smell and taste after coronavirus disease 2019 infection, Saudi Arabia**

Factors	Long-lasting loss of smell and taste after COVID-19		P-value
	Yes N (%)	No N (%)	
Region			
Central	50 (47.6)	55 (52.4)	0.037* <sup>s</sup>
Northern	33 (38.4)	53 (61.6)	
Eastern	5 (41.7)	7 (58.3)	
Western	35 (34.0)	68 (66.0)	
Northern	43 (55.8)	34 (44.2)	
Age (years)			
18–29	80 (39.8)	121 (60.2)	0.217
30–50	62 (45.3)	75 (54.7)	
>50	24 (53.3)	21 (46.7)	
Gender			
Male	24 (42.9)	32 (57.1)	0.937
Female	142 (43.4)	185 (56.6)	
Nationality			
Saudi	159 (43.4)	207 (56.6)	0.854
Non-Saudi	7 (41.2)	10 (58.8)	
Work category			
Not working/retired	77 (44.8)	95 (55.2)	0.435
Healthcare staff	23 (41.1)	33 (58.9)	
Non-healthcare staff	52 (46.4)	60 (53.6)	
Student	14 (32.6)	29 (67.4)	

\* $P < 0.05$  (significant), <sup>s</sup>Exact probability test.  $P$ =Pearson Chi-square test, COVID-19=Coronavirus disease 2019

**Table 4: Association between coronavirus disease 2019 vaccinations and postvaccination coronavirus disease 2019 associated with loss of smell and taste**

Vaccination	Postvaccination COVID-19 associated with loss of smell and taste		P-value
	<2 weeks N (%)	>2 weeks N (%)	
Doses of received vaccine			
One dose	1 (100.0)	0	0.179
Two doses	5 (22.7)	17 (77.3)	
Three doses	8 (21.1)	30 (78.9)	
Type of received vaccine			
Pfizer	13 (25.5)	38 (74.5)	0.045*
AstraZeneca	0	9 (100.0)	
Moderna	1 (100.0)	0	
Was the loss of smell and taste as severe as the first time?			
Yes, severe	4 (11.8)	30 (88.2)	0.020*
No, less	10 (37.0)	17 (63.0)	

\* $P < 0.05$  (significant).  $P$ =Exact probability test, COVID-19=Coronavirus disease 2019

In a cohort study, Boscolo-Rizz *et al.*, 2022, found that 88.2% of patients with smell or taste dysfunction brought on by COVID-19 fully recovered within 2 years, but 10.9% of patients experienced delayed recovery. These results should be interpreted cautiously owing to the

study's limitations (e.g., self-reported data based on a cross-sectional survey; outcomes used without being specifically validated for olfactory loss; no psychophysical evaluation of the chemosensory function performed; and the relatively small geographically restricted sample).<sup>[15]</sup>

Limitations include the restriction of this study to Saudi Arabia that preclude extrapolation of the findings to other populations. In addition, other potential causes of long-lasting loss of smell and taste with COVID-19 were not examined.

## Conclusion

A contagious illness called COVID-19 that spreads from person to person through respiratory secretions can be complicated by the loss of taste and smell that could last longer than 2 weeks, hence the term "long COVID." About 43% of the study participants who had previously contracted COVID-19 had loss of taste and smell. Participants who took AstraZeneca experienced a significantly higher percentage of postvaccination COVID-19 long-term loss of smell and taste than participants who did not receive the vaccine. There was no correlation between the COVID-19 vaccine doses. The exact cause of long-lasting loss of smell and taste after COVID-19 and its relation to vaccination status is still unclear and requires more studies.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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