

# Prevalence of Loss of Smell and Loss of Taste in COVID-19 Infected Patients

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## ABSTRACT

**Background:** The clinical presentations of COVID-19 have been variable, with atypical presentations being reported worldwide. Different studies have shown that olfactory and gustatory symptoms are present in confirmed COVID-19 cases, who may not have had other nasal complaints earlier. The high prevalence of these symptoms, exhibiting olfactory dysfunction before the appearance of others, is a relevant finding to aid for early detection of COVID-19. In this study, we aim to find out about the prevalence of anosmia and ageusia in COVID-19 and its correlation with age, sex, and severity of disease in the Nepalese population.

**Methods:** Patients with laboratory-confirmed COVID-19 infection by reverse transcription-polymerase chain reaction (RT-PCR) done at Shukraraaj Tropical and Infectious Disease Hospital, Kathmandu were recruited. Questionnaires based on loss of taste and loss of smell components including age, sex, ethnicity, comorbidities were prepared, and the patients were interviewed retrospectively by phone contact.

**Results:** A total of 300 patients were enrolled in our study. The mean age of the patients was  $38.36 \pm 14.24$  years. Prevalence of loss of smell was 54% (N=162) and loss of taste was 53% (N=159). Both of the symptoms were present in 45% of patients. The severity of the disease has a statistically significant effect on the loss of smell and taste whereas gender and smoking history has no significant difference over it.

**Conclusions:** More than half of the COVID-19 positive patients in our cohort had either loss of taste or loss of smell with the severity of disease having a significant effect on it.

**Keywords:** Ageusia; anosmia; COVID-19; nepalese population.

## INTRODUCTION

During initial times of COVID-19 pandemic, the symptoms were dry and productive cough, fatigue, shortness of breath, fever, muscle pain, vomiting and diarrhea, headache, sore throat, loss of appetite, dizziness along with palpitation, and chest pain.<sup>1</sup> SARS-COV-2 is believed to invade the olfactory bulb and epithelium, leading to impairment of smell sensation even without nasal obstruction.<sup>2</sup> The new symptoms, loss of smell and loss of taste have been identified later. A multicenter study in Europe concluded that olfactory (85.6%) and gustatory (88%) abnormalities are prevalent symptoms in European confirmed COVID-19 cases, without such symptoms earlier.<sup>3</sup>

This study was conducted with the objective of finding out the prevalence of loss of smell and taste among Nepalese patients with COVID-19 infection together with trying to ascertain the infection's relationship with gender, severity and smoking history.

## METHODS

We conducted a cross-sectional study among patients with proven COVID-19 infection by real-time polymerase chain reaction (PCR) on nasopharyngeal and oropharyngeal swabs in Shukraraaj Tropical and Infectious Disease Hospital, Kathmandu, Nepal. Data collection was done between January 2021 to March 2021.

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The inclusion criteria were set as the patients with proven COVID-19 infection by real-time polymerase chain reaction (PCR) done at Shukraraaj Tropical and Infectious Disease Hospital, Kathmandu. Subjects with incomplete data, previous anosmia or ageusia, psychological disturbances, and those who lost to follow-up (not responding to 3 telephone calls) were excluded from the study.

The study sample was calculated statistically based on the prevalence of anosmia and ageusia as 24.82% found by a similar study conducted by Raid M. et al at Doha, Qatar assuming the level of confidence be 95%, and 5% acceptable margin of error. The sample size for our study came out to be approximately 288. Considering some patient's unwillingness to participate in the study and some not meeting the inclusion criteria, a working sample size of 300 was taken.

A structured questionnaire was developed based on the literature review of similar studies. The questionnaire included the demographic information of patients: age, gender, address, date of diagnosis, smoking history, history of nasal and paranasal diseases. Interviews of the subjects were taken via telephone.

Symptoms of patients were noted and divided into asymptomatic and symptomatic. The severity of symptomatic patients is categorized as below:<sup>4</sup>

Mild: only low-grade fever, mild cough, and slight fatigue

Moderate: high-grade fever and moderate respiratory symptoms. Findings of pneumonitis were seen in the

chest radiograph

Severe: patients had dyspnea, respiratory rate 30/min, blood oxygen saturation 93%, partial pressure of arterial oxygen to fraction of inspired oxygen ratio 300 mm Hg, or CT scans showing at least a 50% increase in infiltrating volume over 24-48 h

Critical: patients had respiratory failure, septic shock, and/or multiple-organ dysfunction or failure.

Data were entered in IBM SPSS version 20 and chi square test were applied for the comparison between the groups whenever applied. Informed verbal consent for the enrollment in the study was taken for all the subjects before the study. Ethical clearance for conducting the study was taken from Nepal Health and Research Council (Reg no. 833/2020 P).

## RESULTS

A total of 300 patients were included in our study. The mean age of the patients was  $38.36 \pm 14.24$  years. The prevalence of loss of smell is 54 % (N=162) and loss of taste is 53 % (N=159). Both losses of smell and taste are present in 46.33% (N=139). The mean duration of loss of smell and loss of taste is  $8.60 \pm 7.33$  and  $8.15 \pm 5.04$  days respectively.

The detailed characteristics of the patients on gender, severity, and smoking history along with a comparison with the loss of smell and taste are given in table 1 and table 2 respectively.

**Table 1. Comparison of patient characteristics with loss of smell.**

Characteristics	All patients	Loss of smell		p-value
		Yes	No	
Gender				0.432
Male	194	108	86	
Female	106	54	52	
Severity				0.00
Asymptomatic	48	0	48	
Mild	206	126	80	
Moderate	29	23	6	
Severe	14	10	4	
Critical	3	3	0	
Smoking history				0.426
Smoker	49	29	20	
Non-smoker	251	133	118	

**Table 2. Comparison of patient characteristics with loss of taste.**

Characteristics	All patients	Loss of taste		p-value
		Yes	No	
<b>Gender</b>				
Male	194	107	87	0.312
Female	106	52	54	
<b>Severity</b>				
Asymptomatic	48	0	48	0.00
Mild	206	121	85	
Moderate	29	23	6	
Severe	14	12	2	
Critical	3	3	0	
<b>Smoking history</b>				
Smoker	49	29	20	0.343
Non-smoker	251	130	121	

## DISCUSSION

Initially, anosmia and ageusia were not observed as principal symptoms of COVID-19. Olfactory and gustatory dysfunctions are amongst the foremost under recorded symptoms in COVID-19 and might sometimes be the only symptoms in these patients. Walker et al. have noted a rise in Internet searches for smell-related information in several countries and hypothesize that smell dysfunction may be an under recognized symptom of COVID-19 infection.<sup>5</sup>

Our study showed the prevalence of loss of smell and loss of taste was 54% and 53% respectively. The prevalence of both losses of smell and taste was among 46.33% of patients. A study reported the prevalence of loss of smell, loss of taste, or both as 11.35%, 8.51%, and 4.96% respectively done at Al-Wajbah Primary Health Center, Doha, Qatar during May and June 2020.<sup>4</sup> A multi-centric case series study by Qiu et al. found that 41% of the COVID-19 patients complained of Olfactory and Gustatory dysfunctions.<sup>6</sup> Paderno et al. showed that the olfactory and gustatory dysfunctions were seen in 83% and 89% of patients, respectively.<sup>7</sup> Speth et al. reported that the prevalence rate of olfactory dysfunction was 61.2%.<sup>8</sup> In a systematic review and meta-analysis reporting the pooled prevalence of olfactory and gustatory dysfunction among patients with COVID-19 infection as 52.73% (95% CI, 29.64% to 75.23%) and 43.93% (95% CI, 20.46% to 68.95%), respectively, their analysis was based on 10 studies and involved around 1700 patients.<sup>9</sup> Also, another systematic review and meta-analysis by

Ibekwe et al. estimated the global pooled prevalence of loss of smell among 19,424 COVID-19 patients from 27 published articles as 48.47% (95% CI, 33.78%-63.29%) and that of loss of taste as 41.47% (95% CI, 31.13%-51.03%).<sup>10</sup> The explanation for the disparities in results between studies could be related to changes in the sample size, ethnicity, and characteristics of the study's sample such as age groups, the severity of disease, and presence of nasal symptoms.

The pathophysiology supporting loss of smell and taste is still unknown. The study by Zhou et al. has shown that COVID-19 uses the same receptor [cellular angiotensin-converting enzyme 2 (ACE2)] as SARS-CoV.<sup>11</sup> The enzyme is found in the mouth particularly on the tongue. Therefore, the COVID-19 may cause taste dysfunction same as the ACE2 inhibitors.<sup>12</sup> Secondly, the taste disturbance in the presence of smell abnormality is that both chemosensory senses are intimately correlated.<sup>13</sup> The study by Brann et al. suggested that the COVID-19 virus affects the non-neuronal olfactory epithelium causing anosmia and the associated taste dysfunctions.<sup>14</sup>

There are three possible mechanisms by which viruses affect smell. First, a viral infection of the nasal mucosa could trigger inflammation of both respiratory and olfactory mucosa to create a barrier to odor chemicals (inhaled aromatic particles in the air) between the dendritic cells of the olfactory sensory neurons and olfactory mucosa, thereby leading to disruption in odor detection.<sup>15</sup> The second mechanism is by direct virus attack on the olfactory receptors, causing their

damage with resultant inhibition of transmission of odor signals. This leads to either temporal or permanent loss of smell.<sup>16, 17</sup> The third mechanism is that the virus, being neurotropic, could penetrate through the cribriform plate to infect the olfactory bulb and follow the olfactory pathway to attack the olfactory cortex of the temporal lobe of the brain responsible for the smell. Coronavirus has been isolated in the cerebrospinal fluid and brain of COVID-19 patients, thereby verifying viral encephalitis.<sup>18</sup> Any or all of these could be a potential mechanism(s) for COVID-19's loss of smell and, by extension, taste; however, more research is needed to find out the exact mechanism.

There was no statistically significant difference among males and females regarding loss anosmia and ageusia from our study (p-value >0.05) which is in contrast to the study done by Al-Ani et al. where a significant association with gender has been found.<sup>4</sup>

According to our study, the mean duration of loss of smell and loss of taste are  $8.60 \pm 7.33$  and  $8.15 \pm 5.04$  days respectively. It is comparable to that in the study by Klopfenstein et al. in which the mean duration of anosmia was  $8.9 (\pm 6.3 [1-21])$  days.<sup>19</sup> However, in a study by Speth et al., most of the patients had been experiencing symptoms for less than 2 weeks and were thus likely still amid the infection. For this reason, they did not study the resolution of olfactory dysfunction.<sup>8</sup>

It was found that among the COVID positive cases with loss of taste and/or loss of smell, the majority were mild in severity. In a study by Aziz et al., "loss of smell" had a lower association with severe COVID-19 compared to COVID-19 patients without "loss of smell".<sup>20</sup> Similarly, in a study by Klopfenstein et al, patients with anosmia had less often pneumonia (10/37 vs 17/33,  $p=0.036$ ), were less often hospitalized (13/37 vs 20/33,  $p=0.033$ ), and needed less often oxygen therapy (6/37 vs 17/33,  $p=0.002$ ) than patients without anosmia.<sup>19</sup> The study by Yan et al. reported that the mild disease had a statistically significant association with anosmia and ageusia rather than severe disease.<sup>21</sup> As a result, anosmia and ageusia may be important determinants in the prognosis of COVID-19 disease. This might be because critical patients are not able to give interviews.<sup>22</sup> As a result, loss of smell appears to be linked to the disease's prognosis, and meticulous screening should be carried out to identify prospective COVID-19 patients. This will aid in the prevention of the virus's spread. However, the study by Speth et al. showed that the participants who experienced olfactory and gustatory dysfunctions generally had more severe symptoms. But, only shortness of breath was significantly ( $P = .011$ ) more severe in patients with olfactory dysfunction compared

to patients without olfactory and gustatory dysfunction.<sup>8</sup>

Smoking history is not significantly associated with loss of smell and loss of taste as per our study. No significant association in these variables is seen in many other studies as well, including one by Klopfenstein et al.<sup>19</sup>

A very important limitations of our study was failure to record the onset of anosmia and ageusia, including severity, during the initial evaluation. This retrospective data capture is well known to suffer from recall bias. However in our context such data as we have presented are not recorded and could serve as an important documentation during this pandemic for our part of the world.

## CONCLUSIONS

More than half of the patients have either loss of smell or taste among the COVID-19 patients attending the infectious disease hospital of Nepal. The severity of the disease has a statistically significant effect on the loss of smell and taste as more severe cases are likely to have olfactory and gustatory dysfunctions. In our study, gender and smoking history have no significant association with anosmia and ageusia. Both symptoms lasted for around eight days on average with loss of smell is slightly more than a loss of taste.

More research is required in finding the relationship between these two symptoms and other parameters of the COVID-19 infection.

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## CONFLICT OF INTEREST

None.

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