

Smell and Taste Disturbances among COVID-19 Patients: Our Experiences

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Abstract

Background: Coronavirus disease 2019 (COVID-19) infection is caused by a novel coronal virus called severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). The common symptoms of the COVID-19 patients include cough, fever, dyspnea, and myalgia. However, the disturbances of the smell and taste are the important clinical presentations of the COVID-19 patients. **Objectives:** The objective of this study is to assess the olfactory dysfunction among COVID-19 patients. **Materials and Methods:** This is a retrospective study, which included COVID-19 patients between March 2020 and August 2020. There were 192 COVID-19 patients evaluated to find out loss of smell and taste. The diagnosis was done from nasopharyngeal swab with laboratory confirmed reverse transcription polymerase chain reaction positive for COVID-19. All the participating patients were undergoing proper otorhinolaryngological examinations, including anterior rhinoscopy, cold spatula tests, and diagnostic nasal endoscopy for proper evaluation of the nose, nasopharynx, and paranasal sinuses. **Results:** There were 112 patients (58.33%) olfactory dysfunction and 86 patients had taste disturbances out of the 192 COVID-19 patients. The mean age of the 112 patients was 52.42 years. Out of the 112 patients, 74 (66.07%) were male and 38 (33.92%) were female. Out of the 112 patients, 32 were presented with pneumonia during their hospitalization. Olfactory dysfunction began 5.4 (4–12) days. The mean duration of the anosmia was 9.2 (4–22) days and 96% of the cases recovered within 26 days. **Conclusion:** Smell and taste disturbances are the important clinical markers for SARS-CoV-2 infection. Testing the smell and taste in this COVID-19 pandemic may be helpful for the early identification of the COVID-19 patients and initiate early treatment or quarantine.

Keywords: Coronavirus disease 2019 infection, dysgeusia, olfactory dysfunction, severe acute respiratory syndrome coronavirus-2

INTRODUCTION

The coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and currently threatening the world. The infection appeared in the Wuhan, Hubei province of China in late 2019 and rapidly spread worldwide and became a pandemic.^[1] There is an explosive increase in new patients and the shortage of the hospital beds are great challenges to the health-care system in the world.^[1] COVID-19 infection can cause a severe respiratory failure and even death and rapidly spread to other person with mild or no symptoms in the majority of the patients. The most efficient method for preventing spread of the COVID-19 infection is the early identification and isolation of the patient. There are varieties of clinical presentations of COVID-19 patients. Conventionally, they present with high fever, dry cough, shortness of breath, myalgia, headache, sore throat, rhinorrhea, diarrhea, and nasal congestion.^[2] Anosmia

or ageusia are two important and peculiar presentations which are helpful to diagnose the COVID-19 patients in the earlier period.^[3] Anosmia due to postviral infections is the leading cause of loss of smell which accounts for approximately 40% cases of the anosmia.^[4] Viruses those give rise to common cold are also well known etiology for postinfectious anosmia. Previously documented coronaviruses are responsible for anosmia in 10%–15% cases.^[5] The coronavirus strains in human have been describing the invasion of the central nervous system through neuroepithelium and reach to the olfactory bulb.^[6] The exact pathophysiology of these chemosensitive

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disorders has not been clarified. However, the mechanism can be understood by knowing the way of the spread of this SARS CoV-2.^[6] The olfactory and taste dysfunctions are the key clinical presentations among COVID-19 patients, which often pose a challenge for general practitioners, otolaryngologists, and neurologists.^[7] In this study, we assessed the smell and taste disturbances among COVID-19 patients.

MATERIALS AND METHODS

Study design and patients

This retrospective study was conducted at a tertiary care teaching hospital (Institute of Medical Sciences and SUM Hospital, Siksha “O” Anusandhan University, Bhubaneswar, India) which attached to a COVID-19 hospital. The study was done during the period between March 2020 and August 2020. The COVID-19 patients with olfactory and taste dysfunction were participated in this study. The patient details were collected from the patient files of the hospital. Informed consents were obtained from the patients those participated in this study. The smell and taste disturbances were searched from 192 COVID-19 patient files and the 112 of them presented with smell and taste disturbances. The eligible candidates were presented with olfactory and taste abnormalities. All the patients underwent a diagnostic endoscopic examination of the nasal cavity and nasopharynx. All the COVID-19 patients those complained disturbances in smell and taste sensation were evaluated by the otolaryngologists. Those patients discharged from the COVID hospital with a history of loss of smell and taste confirmed with investigations were also included in this study.

All the patients those participated in this study were tested positive reverse transcription polymerase chain reaction (RT-PCR) for SARS-CoV-2 before admission to the COVID-19 hospital. COVID-19 patients with previous history of loss of smell and taste and any association such as the history of the head injury and associated established neurological diseases were excluded from this study. COVID-19 patients with a history of oral hydroxychloroquine taken previously were excluded from this study. Proper history taking and otorhinolaryngological examinations including the nose and sinuses were done in all participating patients. All the participating patients were undergoing proper otorhinolaryngological examinations, including anterior rhinoscopy, cold spatula tests, and diagnostic nasal endoscopy for the proper evaluation of the nose, nasopharynx, and paranasal sinuses. The smell disturbances were classified into anosmia (loss of smell), parosmia (perverted smell), cacosmia (feeling of bad smell), hyposmia (decreased sensation of smell), and hyperosmia (increased sense of smell). All the examinations were performed with all safety protocols for COVID-19 pandemic. Diagnostic nasal endoscopy was done with 0° rigid nasal endoscope. Sense of the smell was tested by asking the patient to smell of the lemon, peppermint, rose, cloves, and garlic for each side of the nose separately with eyes closed. The taste sensation of the study patients was tested

by using table sugar (for sweet), table salt (for salt), citric acid (lemon juice) for sour, and coffee for bitter test.

Ethical consideration

This study was approved by the Institutional Ethical Committee (IEC) with reference number IEC/IMS/SOA/22/17. 3. 2020. This study was conducted at Institute of Medical Sciences and SUM Hospital, Siksha “O” Anusandhan University, Bhubaneswar, India.

Statistical analysis

In this study, all the data were recorded and analyzed using the Statistical Package for the Social Science (SPSS) software, version 20 (IBM company, Armonk, New York, USA).

RESULTS

In this study, 192 COVID-19 patients evaluated to find out loss of smell and taste. Out of 192 patients, 112 patients diagnosed with olfactory dysfunction and taste disturbances. All these patients underwent smell and taste assessment of the otolaryngology department. All the 112 patients diagnosed with olfactory and taste disturbances after confirmation with different tests. Out of the 112 patients, 74 (66.07%) were male and 38 (33.92%) were female with a male-to-female ratio of 1.9:1. The age ranges of the participating patients were 22–72 years of the age with a mean age of the study patients was 52.42 years. There were 44 patients (39.28%) in the age range of 22–50 years and 68 patients (60.71%) in the age range of 51–72 years [Table 1]. All of these patients were positive by RT-PCR for SARS-CoV-2. There were 53 patients (47.32%) presented with throat pain, cough, rhinorrhea, smell, and taste disturbance. There were 26 patients (23.21%) presented with fever, cough, throat pain, myalgia, and loss of smell. Out of 112 patients, 33 (29.46%) were presented with no respiratory symptoms, but with only smell and taste disturbances [Table 2]. Out of the 112 patients, 32 (28.57%) were presented with pneumonia during their hospitalization. Out of 112 COVID-19 patients, there was complete loss of smell in 67 patients (59.82%) and partial loss of smell in 45 patients (40.17%). In this study, 48 patients (42.85%) presented with complete loss of taste, whereas 38 (33.92%) presented with partial loss of taste sensation [Table 3].

Table 1: Demographic and clinical characteristics of coronavirus disease-2019 patients with smell and taste disturbances

Characteristics	n=11, n (%)
Gender	
Male	74 (66.07)
Female	38 (33.92)
Age group	
22-50	44 (39.28)
51-72	68 (60.71)
Disturbance in smell	112 (100)
Disturbance in taste	86 (76.78)

Table 2: Clinical presentations of the coronavirus disease-2019 patients with smell and taste disturbances during hospital stay

Clinical manifestations	Number of patients (n=112), n (%)
Throat pain, cough, rhinorrhea, smell, and taste disturbance	53 (47.32)
Fever, cough, throat pain, myalgia, and loss of smell	26 (23.21)
No respiratory symptoms but with only smell and taste disturbances	33 (29.46)

Table 3: Smell and taste disturbances of the coronavirus disease-2019 patients

Parameters	Number of the patients (n=112), n (%)
Smell disturbances	
Complete loss	67 (59.82)
Partial loss	45 (40.17)
Taste disturbances	
Complete loss	48 (42.85)
Partial loss	38 (33.92)

Olfactory dysfunction began 5.4 (4–12) days and taste or gustatory dysfunction began at 5.8 days (4–13 days). The mean duration of the olfactory dysfunction was 9.2 (4–22) days and 108 (96.42%) of the cases recovered within 26 days. The mean duration of taste disturbances/gustatory dysfunction was 9.4 (4–24) days and 84 patients (97.67%) out of the 86 COVID-19 patients with taste disturbances recovered within 27 days. There was no special treatment for smell and taste disturbances among COVID-19 patients except saline nasal irrigation to all patients with smell problem.

DISCUSSION

Currently rapid spread of the COVID-19 infection has made an unprecedented strain on the health-care system worldwide.^[7] Approximately 4 million people globally across 215 countries were positive with SARS CoV-2.^[8] The health-care system urgently needs to develop strategies for predicting early symptoms and the disease trajectory along with biomarkers and prognostic factors.^[9] Hence, a cost-effective technique of early identification of risk factor of COVID-19 infection can improve the decision making and timely intervention and also facilitate the proper allocation of the limited medical resources.

COVID-19 patients often present with wide ranges of the symptoms with additional smell and taste disturbances. The smell and taste disturbances are new and interesting description in the medical literature of COVID-19 patient.^[10] The olfactory dysfunction or disturbance in smell sensation is impairment in the smell of the lemon, peppermint, rose, cloves, and garlic for each side of the nose separately with eyes closed. The disturbances of taste or dysgeusia are defined as impairment of salty, sweet, bitter, and sour taste. The COVID-19 infection can affect all age groups and ranging from asymptomatic to fatal respiratory failure.^[11] The risk factors for smell and taste disturbances in COVID-19 patients are age and male gender. There are significant risks for the olfactory and gustatory dysfunction in increasing with age and in the male gender.^[12]

Older persons with olfactory dysfunction are three times more likely to die in comparison to the normal sense of smell.^[13] In this study, 60.71% cases of the COVID-19 infection above the age of the 50 years presented with smell and taste disturbances and male are more predominant than female. The viral infections by rhinoviruses, parainfluenza virus, Epstein-Barr virus, and some coronaviruses have been found to cause upper respiratory tract infections and manifests nasal congestions, rhinorrhea, loss of smell, and loss of taste. Although the exact pathophysiology for loss of smell and taste by these viruses are not clear and have been thought to be due to damage to the olfactory epithelium or spread of the viruses into the central nervous system,^[14] however the loss of smell and taste by SARS-CoV-2 is increasingly reported in medical literatures in a current COVID-19 pandemic. SARS-CoV-2 is causing loss of smell and taste without nasal discharge or nasal congestion or even without any other clinical symptoms in some patients unlike other viral infections of the upper airway.^[15] In this study, 33% of the COVID-19 patients presented with smell and taste disturbances without any respiratory symptoms. Postviral olfactory dysfunction and taste abnormalities are well-established key symptoms among COVID-19 patients. Loss of smell or olfactory dysfunction may be a harbinger of a several neurological diseases. The exact mechanism for the olfactory dysfunction is not clear. Some suggest that virus spread through the neuro-epithelium of the olfactory cleft with consequent invasion into the olfactory bulb and the central nervous system. During invasions and multiplication of the SARS-CoV-2 virus may damage the olfactory nerve and cause anosmia which found in the early stage of COVID-19 infection. The angiotensin-converting enzyme 2 receptor is the main host cell receptor for SARS-CoV-2 for binding the virus. These receptor cells are also widely expressed in the mucosal lining of the oral cavity. Damage of the mucosal lining of the oral cavity by this virus may explain the ageusia. Hence, ageusia may be associated with anosmia. Netland *et al.* documented the transgenic mice expressing the receptor for the SARS-CoV receptor which may enter into the brain through the olfactory bulb, causing transneural spread.^[16] Spreading of the virus in the central nervous system may cause respiratory failure by affecting the medullary cardiorespiratory center.^[17] The neurotropism of the SARS-CoV-2 is not a new pathophysiology, but transmitting to the brain through olfactory epithelium and leading to respiratory failure is newer pathway for causing respiratory failure.^[17] The patterns of olfactory and gustatory recoveries may be explained by selective neurological involvement.^[3] However, the gustatory outcomes, the loss of taste sensation may not be as retro-olfactory disorder

in few patients. Further clinical and experimental studies are required for better understanding of the pathophysiology for the development of the olfactory and gustatory dysfunctions.

Smell and taste dysfunctions are uncommonly reported by Chinese authors during the COVID-19 infection. One author analyzed neurological presentations and documented 5.1% cases showed anosmia and 5.6% cases of COVID-19 patients showed ageusia.^[18] However, the European data showed a very high frequency of chemosensitive dysfunctions in COVID-19 patients ranges from 19.4% to 88%.^[19,20] This leads to suspecting a different pathogenesis for olfactory dysfunction. In our study, there was complete loss of smell in 59.82% and partial loss of smell in 40.17%, whereas 42.85% presented with complete loss of taste and 33.92% presented with partial loss of taste sensation. The development of the olfactory dysfunction after viral infection is called as postinfectious or postviral olfactory loss. The identification of the anosmia and ageusia is an important clinical presentation of the COVID-19 patients for the early diagnosis and isolation of the patient. In case of asymptomatic to mild symptoms, smell and taste disturbances act as biomarker for the diagnosis of the COVID-19 patient. These symptoms may recover from 3 weeks.^[21] There is a high rate of recovery of the olfactory function within 1–2 weeks after the development of the olfactory and taste disturbances.^[22] One study showed that approximately 25% of the central nervous system symptoms are associated with COVID-19 patients which is lower than olfactory and taste dysfunctions.^[18] In our study, the mean duration of the olfactory dysfunction was 9.2 (4–22) day and 108 (96.42%) out of the 112 COVID-19 patients recovered within 26 days. The mean duration of taste disturbances/gustatory dysfunction was 9.4 (4–24) days and 84 patients (97.67%) out of the 86 COVID-19 patients with taste disturbances recovered within 27 days.

Hence, it is reasonable to hypothesize that the smell and taste disorders are not directly associated with direct viral damage of the neuronal cells. Conversely, the focus of the virus may not be the neuronal cells but other nonneuronal cells, which express ACE2 receptors such as the olfactory epithelium sustentacular cells, Bowman's gland cells, microvillar cells, horizontal basal cells, and olfactory bulb pericytes.^[23] (Early diagnosis of the COVID-19 infection can be done by recognizing the early signs such as anosmia and ageusia, which may be helpful for isolation of the patient and treatment also).

CONCLUSION

Anosmia and ageusia are the important clinical presentations and clues for the diagnosis of COVID-19 infections, particularly in the early stage of the disease. These two clinical symptoms should be considered as the important presentations of the COVID-19 infections. There are some degrees of loss of smell found in nearly all COVID-19 patients at the end of the acute recovery period. However, the complete loss of smell such as anosmia is found in 25% of the COVID-19 patients in this study.

Olfactory dysfunction is truly acting as a biomarker for early diagnosis, early treatment, and also help to isolate or quarantine the COVID-19 patient earliest. Patients with smell and taste disturbances are useful for the screening tests which will facilitate the struggle to diagnose the surveillance of the disease.

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Conflicts of interest

There are no conflicts of interest.

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