

Prevalence of Olfactory and Gustatory Dysfunction and Its Prognostic Significance among COVID-19-Positive Healthcare Workers in a Tertiary Care Institute

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ABSTRACT

Background: Coronavirus disease-2019 (COVID-19) pandemic has taken a toll on the healthcare system universally. With ongoing research and studies done to know the natural course of the disease along with its symptomatology, we are in urgent need of substantial knowledge for the control of this infection. Along with its specific clinical features, we tend to find more about the olfactory and gustatory dysfunction in these patients.

Aim: To determine the prevalence of anosmia and ageusia and their prognostic significance among COVID-positive healthcare workers in a tertiary care institute.

Materials and methods: An observational prospective study was conducted at VIMSAR, Burla Sambalpur, a tertiary care hospital in western Odisha, for a period of six months. All healthcare workers (HCWs) who were tested positive for COVID-19 infection were followed up. Detailed history regarding the symptoms, onset of anosmia and ageusia and its recovery, oxygen support requirement, and average symptomatic period was noted with the help of questionnaires and telephonic survey. Statistical analysis was done using Chi-square test and *p*-value less than 0.05 was considered significant.

Results: Total 234 COVID-19-positive HCW patients were enrolled in the sample out of which 82.90% were symptomatic. The prevalence of anosmia and ageusia among them was 40.60 and 42.74%, respectively. Both were found to be statistically significant with *p*-value less than 0.05. The loss of smell and taste was temporary with a mean recovery time of 7.15 days. A total of 20 (8.54%) patients required oxygen support, signs of lung involvement, and average symptomatic period of 24.54 days, the majority (85%) of them had no loss of smell and/or taste sensation. Majority (97%) of the COVID-19-positive HCW patients in our study, having symptoms of anosmia and ageusia were fortunately recovered without any grievous complication with an average symptomatic period of 14.53 days, so these symptoms can be considered as a favorable prognostic indicator.

Conclusion: Anosmia and ageusia in COVID-19-positive patients are hence found to be significant clinical symptoms. It can be used to aid early diagnosis and prompt treatment along with quick self-isolation to prevent the spread of the infection. The symptoms of anosmia and ageusia can be taken as a favorable prognostic indicator in COVID-19-positive patients.

Keywords: Anosmia, Ageusia, Coronavirus disease-2019.

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INTRODUCTION

Coronavirus disease-2019 (COVID-19) pandemic is definitely one of the greatest global health crises. The novel coronavirus was first identified in Wuhan city of China on December 31, 2019 which is associated with a severe form of highly contagious human respiratory disease.¹ It spread rapidly throughout continents and has a massive impact on healthcare systems globally with economic crisis.² World Health Organization (WHO) named the disease caused by the novel coronavirus as COVID-19 On February 12, 2020.³ The first laboratory-confirmed case was detected in India on January 30, 2020.⁴ India has witnessed a skyrocketing of cases ever since COVID-19 has a wide variety of clinical manifestations. Usually, the patient presents with a high fever followed by dry cough. Common symptoms include fever, headache, dry cough, myalgia, sore throat, rhinorrhea, chest pain, diarrhea, nausea/vomiting, malaise, conjunctival and nasal congestion, and shortness of breath (dyspnea). Some authors have postulated that the upper respiratory tract, that is, sinonasal tract, throat, trachea may play a significant role in the pathogenesis of this viral infection.⁵ It is likely to be the portal of entry of the virus as well as a site of viral replication.

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There is a reported increase in patients complaining of anosmia. Many reports have described that COVID-19 infection is associated

with a new onset of olfactory and gustatory dysfunction along with other symptoms.⁶ Due to this increasing awareness about olfactory and gustatory dysfunction as potential early symptoms of COVID-19 infection, the CDC recently added “new loss of taste or smell” to its list of symptoms that may appear 2–14 days post-exposure.⁷

Anosmia (loss of smell) and ageusia (impairment of taste) have acquired definite attention as potential symptoms for COVID-19 screening.⁸ Assessment of these symptoms does not require interventions or procedures, making them friendly variables to include in questionnaires. The knowledge regarding their association with COVID-19 is still limited. It is mostly unknown whether smell and taste disorders are frequent symptoms and whether they have any prognostic significance for COVID-19 infection or not. By now, it is evident that the COVID-19 infection spreads like wildfire due to its human-to-human transmission. So it becomes very important to evaluate all the predictive symptoms of the disease to self-isolate oneself and start treatment for the same. To gather evidences and expand information on this, we conducted a study on the COVID-19-positive healthcare providers in our institute, that is, in VIMSAR, Burla; a tertiary care institute.

MATERIALS AND METHODS

Study Design and Population

The study was in accordance with the ethical standards with prior informed consent taken from the participants. This observational prospective study was conducted in VIMSAR, BURLA, a tertiary care center in western Odisha for a period of 6 months from April 2020 to September 2020.

Inclusion Criteria

All healthcare workers (HCW), aged more than 25 years of both genders who tested positive for COVID-19 by real-time polymerase chain reaction (RT-PCR) on nasopharyngeal swab, either asymptomatic or having mild-to-moderate symptoms not admitted to intensive care unit (ICU) were enrolled into the study.

Exclusion Criteria

Consisted of patients with history of allergic rhinitis, sinonasal polyposis, chronic rhinosinusitis, deviated nasal septum, previous nasal surgery, significant head injury, and anosmia prior to diagnosis of COVID-19. Those who lost to follow-up were also excluded. They were given online questionnaires and a telephonic survey was conducted after they tested negative. We had 262 COVID-19-positive HCW, out of which only 234 were taken for study. Data were collected regarding age, gender, symptoms and its severity, and the time taken for recovery of loss of smell and taste. Apart from the primary complaints all were enquired regarding loss of smell or taste.

Statistical Analysis

Data were recorded in an Excel sheet and Chi-square test was used for analysis. If *p*-value is less than 0.05, then it is considered statistically significant.

OBSERVATION

In our study, out of a total 262 HCW patients diagnosed with COVID-19 positive, 234 were enrolled in the study after fulfilling the inclusion criteria. Out of them, 194 were symptomatic having symptoms of mild-to-high-grade fever, dry cough, myalgia, and

Table 1: Overall observation finding

Parameter	Absolute number	Percentage (%)
Total COVID19-positive HCW included in study	234	100
Total symptomatic patients	194	82.90
Total asymptomatic patients	40	17.10
Patients with anosmia	95	40.60
Patients with ageusia	100	42.74
Patients with both anosmia and ageusia	91	38.88
Patients required oxygen support	20	8.54
Total male patients	106	45.30
Total female patients	128	54.78
Total male patients with anosmia	46	48.42
Total female patients with anosmia	49	51.58
Total male patients with ageusia	48	48.00
Total female patients with ageusia	52	52.00

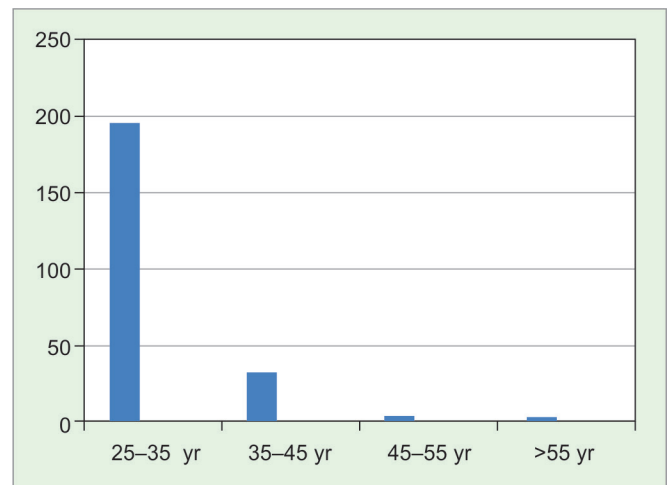


Fig. 1: Age-group distribution

generalized weakness, which constituted 82.90% of the sample and 40 remained asymptomatic which constituted 17.10% of the sample (Table 1).

In our study to find out the age distribution of the disease (Fig. 1), total patients were divided into four age-groups. Maximum belonged to the age-group of 25–35 years. The age of patients ranged from 25 to 65 years with a mean age of 31.56 years. Out of the 234 patients, 106 were males which constituted 45.30% and 128 were female which constituted 54.70% (Fig. 2).

In our study, out of the 234 patients, 95 (40.60%) of them complained of anosmia, out of which 46 (48.42%) were males and 49 (51.57%) were females, having a mean age of 31.23 years. So the prevalence of anosmia in our study was 40.60%, which is statistically significant as of *p*-value of 0.004 suggesting that COVID-19-positive

patients are likely to have anosmia. Ageusia was seen in 100 (42.74%) patients with a prevalence of 42.74%. Out of which, 52 (52%) were male and 48 (48%) female having a mean age of 31.33 years. To study the significance of ageusia in COVID-19-positive patients, a Chi-square test of independence was formed. It was found to be statistically significant, as have a *p*-value of 0.02 (Table 2).

In our study, there were 4 patients who suffered from anosmia alone, 9 patients had loss of taste alone and 91 patients had both loss of smell and taste. Most of the patients reported the loss of smell and taste early in the course of illness. The HCW patients were contacted regularly for enquiring about their recovery. All of them had recovered their olfactory and gustatory functions. It usually took 6–15 days to recover the senses with an average of 7.15 days; however, other symptoms like myalgia, fatigability, headache, weakness, and dry cough persist for few days. There was a gradual onset of recovery of the functions as experienced by the patients subjectively. Total 20 (8.54%) patients had required oxygen support and CT Scan findings of lung involvement having an average symptomatic period of 24.54 days, out of which 17 (85%) had no loss of taste and/or smell sensation. The majority (97%) of patients with loss of smell and/or taste sensation fortunately recovered without any grievous complication with an average symptomatic period of 14.53 days. So the symptoms of anosmia and ageusia have definitive prognostic significance (Table 3).

DISCUSSION

The COVID-19 pandemic has significantly altered the healthcare scenario. This study was done to focus on the otorhinolaryngological symptoms as complained by the patients in a tertiary care institute.

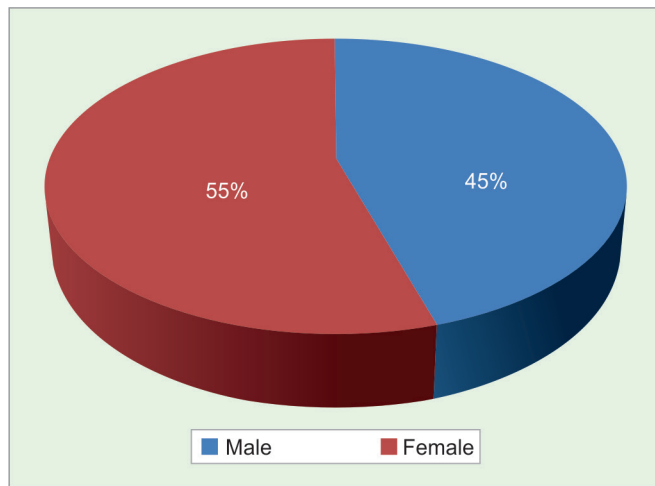


Fig. 2: Showing sex distribution

The prevalence of loss of smell and taste in these patients will provide an understanding of the symptomatology of the disease. Smell and taste disorders are related to a wide variety of viral illnesses. Influenza A, herpes, poliovirus, rabies, parainfluenza, Japanese encephalitis, and adenoviruses are commonly associated with chemosensory dysfunction.^{9,10}

Preliminary studies by Gane et al. reveal that sudden onset of loss of smell might be the only presenting symptom in COVID-19 patients.⁸ Mao et al. studied the prevalence of decreased smell sensation, that is, hyposmia and decrease taste sensation, that is, hypogeusia in 214 hospitalized patients in Wuhan with incidence of 5.1 and 5.6%, respectively.¹¹ After some of these initial reports, the American Academy of Otolaryngology, Head and Neck Surgery, Otolaryngology Society UK, and the British Rhinological Society published guidelines regarding symptoms of anosmia, hyposmia, and dysgeusia in assessing patients suspected to have COVID-19.¹²

Lechien et al. reported 357 COVID-positive patients with olfactory dysfunction with a prevalence of 86%.¹³ In our study, we found the prevalence of anosmia and ageusia was 40.60% and 42.74%, respectively which is similar to a study conducted by Klopfenstein et al. where the prevalence was 47%¹⁴ and Qiu et al. where prevalence is 41%.¹⁵ Prevalence rate of olfactory dysfunction was found to be 61.2%, as reported by Speth et al.¹⁶ The prevalence rate of olfactory and gustatory dysfunction in patients with COVID-19 disease was found to be 52.73 and 43.93%, respectively was found in a systematic review and meta-analysis study by Tong et al.¹⁷ The first such study done in the Indian population by Mishra et al. showed a prevalence of 14.8% with a sample size of 74 patients.¹⁸ The variability among different studies may be attributed to variation in the ethnicity, sample size, and type of sample. Since our study involved only the healthcare providers, it gives an edge over other studies as the data collected is reliable and the follow-up of patients was easier.

Table 2: Prevalence and significance of anosmia and ageusia

Category	Hypothesis	Actual value	Expected value	<i>p</i> -value
Total HCW patients		234		
Patients with anosmia	0.5	95	177	0.000402779
Patients without anosmia	0.5	139	177	
Patients with ageusia	0.5	100	177	0.026239441
Patients without ageusia	0.5	134	177	

**p*-value < 0.05 is statistically significant

Table 3: Prognostic significance of anosmia and ageusia

Group	Required oxygen support	Stable	Total	<i>p</i> -value (Chi-square test)	Average symptomatic period	<i>p</i> -value (Chi-square test)
Symptomatic patient without anosmia and/or ageusia	17	77	94	0.0012	14.53 ≈ 15 day	0.00001
Symptomatic patient with anosmia and/or ageusia	3	97	100		24.54 ≈ 15 day	
Total	20	174	194			

**p*-value < 0.05 is statistically significant

SARS-CoV-2 belongs to the family Coronaviridae, which is an enveloped virus having single-stranded RNA. It penetrates host cell by binding to host's angiotensin-converting enzyme (ACE2) by the N-terminal end of the viral spike protein (S1), which results in a conformational change in S protein; leading to proteolytic division of the S protein by TMPRSS2 and the C-terminal end forms a core structure by the fusion of six-helix bundle.^{19–21} The virus is thought to cause anosmia by conductive olfactory dysfunction initially. The rhinitis, pharyngitis, and laryngitis caused by the virus result in nasal blockage and an impaired smell sensation. Supporting evidence was provided by Lechien et al.¹³ and Spinato et al.²² They also mentioned that this impaired olfactory function was temporary, which recovers within 8 days in most COVID-19 patients. An international team of researchers along with neuroscientists at Harvard Medical School have identified that infection of the nonneuronal cell types may be the cause for anosmia in COVID-19 patients. It was supported by Brann et al. who suggested the same mechanism for chemosensory dysfunction.²³ As most of the patients are of the mild-severity and have their olfactory and gustatory abnormalities recover within a short period, it turned out to be the most acceptable mechanism. The variability in expression of this ACE2 in different tissues in different ethnic groups may be the cause of differences in symptomatology, severity, and prevalence of olfactory and gustatory dysfunction across the world.

In our study, both males and females were almost equally affected with chemosensory dysfunction with no significant difference between the two. However, many studies have revealed a female preponderance when it comes to the prevalence of olfactory and gustatory malfunction. This difference in our study as compared with previous studies may be due to the differences in social, cultural behavior and geographical niche.

Anosmia and ageusia turned out to be of significance among the symptoms experienced by COVID-positive HCW patients. Hence, they can be used as a clinical parameter for diagnosis of the infection and isolating the patient even before the laboratory test results. Olfactory dysfunction may be the initial presenting symptom in many patients. In the AAO-HNS study, Olfactory dysfunction was seen in 26.6% of patients and the presence of olfactory dysfunction recommended a laboratory COVID-19 testing in 40% of patients.²⁴ Similarly, Beltrán-Corbellini et al.²⁵ reported olfactory and gustatory dysfunction as the initial symptom in 35.5% of COVID-19 patients. The onset of anosmia in the absence of other symptoms⁸ or early within onset of the illness is supported by many reports.^{26–30}

The olfactory and gustatory dysfunction co-relation in COVID-19 patients is still lacking the strong evidence and in the process of being explored. Hence, there is a chance of underestimation of the overall prevalence of the symptoms. Our study consisted of HCWs only which has its own pros and cons, being a HCW in times of a pandemic, they are aware of the new emerging symptomatology and thus can give details of the time of onset, severity, and recovery. Since it was a prospective study, we followed them in their disease course and this helped us in improving our knowledge regarding the true prevalence. On the other hand, as the study focussed on a specific sub-population, we might have missed out the larger perspective in terms of the true prevalence of the symptoms among all COVID-positive patients in our set-up.

In our study, majority (97%) of patients with olfactory dysfunction and/or taste sensation fortunately recovered without

oxygen support or any grievous complication with an average less symptomatic period of 14.53 days. So the symptoms of anosmia and ageusia have definitive prognostic significance. All the patients fortunately recovered without any grievous complications. So it may be assumed that COVID-19-positive patients having loss of smell and taste sensation are less prone for the development of any serious complication, it may be due to the fact that the strain of COVID-19, which causes anosmia and ageusia may be less virulent and patients early awareness and prompt treatment may further limit the disease progression. So the symptoms of anosmia and ageusia may be considered as a favorable prognostic factor in COVID-19 patients.

CONCLUSION

Prevalence of olfactory and gustatory dysfunction in COVID-19-positive HCWs is around 41 and 43%, respectively. They were seen mostly in the age-group 25–35 years with an average of 31 years having an almost equal gender distribution. The symptoms appeared early in the course of illness and recovery was seen in 100% of the patients. This temporary loss of smell and taste took an average of 7.15 days to recover. Increased awareness and knowledge regarding these symptoms may lead to prompt diagnosis, laboratory testing, and early treatment of COVID-19. The symptoms of anosmia and ageusia can be considered as a favorable prognostic indicator in COVID-19 patients.

Limitation of Our Study

Our study is based on questionnaire assessment with lack of an objective assessment of olfactory and gustatory dysfunction.

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Declaration

Ethical committee approval and consent of the patients has been taken.

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