

# CHRONOLOGICAL SEQUENCE OF OTORHINOLARYNGOLOGY MANIFESTATIONS IN COVID 19: A STUDY AMONG HEALTH CARE WORKERS

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## ABSTRACT

### INTRODUCTION

Being the first line of defence against the deadly pandemic of COVID 19, healthcare workers are always at an increased risk of acquiring the infection. Olfactory, gustatory, and upper respiratory tract symptoms constitute a significant proportion of the clinical presentation of COVID 19. But the chronology of the appearance of the symptoms is not well documented in the literature.

### MATERIALS AND METHODS

We present a prospective case series of seven healthcare workers of our institution who had contracted SARS-CoV2 infection during the second wave of the COVID 19 pandemic in India. We continued their follow-ups till six months after the onset of symptoms. We collected the data about their clinical presentation and described the chronology of the olfactory, gustatory and upper respiratory tract symptoms.

### RESULTS

All the participants suffered from upper respiratory tract symptoms irrespective of their age, gender and vaccination status. Most of them suffered from olfactory and gustatory disturbances simultaneously that started within the first 4 days and reached maximum severity within the first 5 days. The recovery was complete within 15 days for gustatory symptoms and within three months for olfactory symptoms. Anosmia and ageusia were the most common olfactory and gustatory disorders respectively. Six of them

suffered from sore throat and two participants had rhinorrhoea. They recovered uneventfully.

**Conclusion:** Olfactory and gustatory dysfunctions may be the early presenting symptom of COVID 19 in the majority of the patients. But in absence of smell and taste dysfunctions, a sore throat may be the only presenting feature. A high degree of clinical suspicion is required to diagnose such cases.

### KEYWORDS

COVID-19, SARS-CoV-2, Olfaction disorders, Anosmia, Ageusia, Health personnel

### INTRODUCTION

The first case of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) was reported in Wuhan, China in December 2019 [1]. Since then, the coronavirus disease 2019 (COVID 19) has spread rapidly all-over the world infecting millions of people claiming the lives of more than 5.5 million people[2]. It was declared as global pandemic by the World health organization (WHO) on 11th March 2020 [3], [4]. Being the frontline force to combat the pandemic, healthcare workers are at increased risk of acquiring SARS-CoV2 infection [5].

A significant proportion of the patients with SARS-CoV2 infection suffer from the olfactory and gustatory symptoms including anosmia, phantosmia, ageusia and dysgeusia[6], [7], [8]. But the chronology of appearance of olfactory, gustatory and upper respiratory tract symptoms is not well documented in the world literature.

We present a prospective case series of seven healthcare workers of our institute who developed SARS-CoV2 infection during the second wave of COVID-19 pandemic in India. We intend to describe their olfactory and gustatory symptoms in terms of onset, nature, progression and recovery.

## MATERIALS AND METHODS

During the second wave of the COVID 19 pandemic in India, in-patient and ICU facilities were opened for COVID patients at our institute. Subsequently, the healthcare providers including doctors, nursing staff, and other supporting staff were posted in the COVID ward, ICU, and adjacent areas of the hospital. Some of them developed symptoms of upper respiratory tract infection and were tested for RT-PCR (reverse transcriptase-polymerase chain reaction) for SARS-CoV2.

We conducted a prospective consecutive case-series of seven healthcare providers (one doctor and six nursing staffs) of our institute who tested positive for SARS-CoV2 in RT-PCR (reverse transcriptase-polymerase chain reaction) test. All of them experienced symptoms of COVID-19 while actively managing patients at COVID Ward and ICU. All of them were sent in home-isolation following the positive test result and their symptoms were monitored telephonically. None of them required any hospitalization. We recorded and described their symptoms related to the ear, nose and throat region after getting ethical approval from the institute and informed consent from each of them. The olfactory and gustatory symptoms along with rhinorrhoea and sore-throat were described in terms of onset, nature, progression and recovery. They were followed up to six months after onset of their symptoms.

## RESULTS

During the second wave of COVID 19 pandemic in India (April–June 2021), seven healthcare workers of our institute were infected with SARS-CoV2 (Table 1). Among them six were nursing staffs and one was a doctor. Their ages ranged

between 23 to 35 years with a mean age of 26.57 years. All the infected nursing staffs were female whereas the doctor was male. Two of the nursing staffs were posted in the COVID ICU, two in the Non-COVID area, one in the COVID Ward and triage area and one in the Medical College Block. The doctor was posted in the COVID ICU. None of them had any co-morbidity like diabetes mellitus or hypertension.

The only doctor of our study and two of the nursing staffs were fully vaccinated (two doses) against SARS-CoV2 by the time they acquired the infection (Table 1). Two nursing staffs received partial vaccination (one dose). But two of the nursing staffs were still unvaccinated during their course of COVID infection. Figure 1 shows the symptomatology of all the patients.

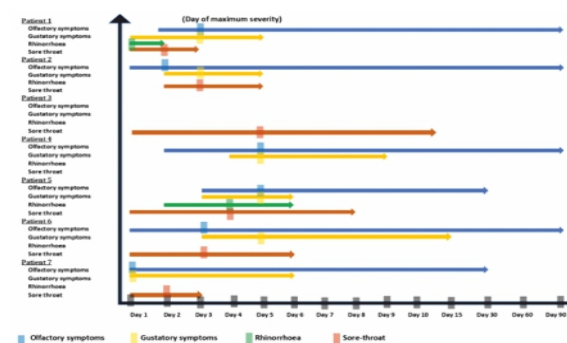
	Designation	Age (Year)	Demographic profile			Co-morbidity
			Gender	Area of posting in hospital		
Patient 1	Nursing staff	23	Female	COVID ICU		Nil
Patient 2	Nursing staff	25	Female	Non COVID area		Nil
Patient 3	Nursing staff	24	Female	COVID Ward and Triage		Nil
Patient 4	Nursing staff	25	Female	Medical College Block		Nil
Patient 5	Nursing staff	26	Female	COVID ICU		Nil
Patient 6	Doctor	35	Male	COVID ICU		Nil
Patient 7	Nursing staff	28	Female	Non COVID area		Nil

COVID 19 Vaccination status		
Vaccination status	Type of vaccine received	
Patient 1	Fully Vaccinated (2 doses)	Covaxin*
Patient 2	Not vaccinated	Not vaccinated
Patient 3	Not vaccinated	Not vaccinated
Patient 4	Fully Vaccinated (2 doses)	Covishield**
Patient 5	Partially vaccinated (1 dose)	Covishield
Patient 6	Fully Vaccinated (2 doses)	Covishield
Patient 7	Partially vaccinated (1 dose)	Covishield

\*Covaxin (Bharat BioTech – ICMR)  
 \*\* Covishield (The AstraZeneca - Oxford vaccine, manufactured by the Serum Institute, Pune, India)

**Table 1:** demographic profile and COVID 19 vaccination status of patients



**Fig 1-** Day-wise distribution of symptomatology

Six of the healthcare workers in our study (one doctor and five nursing staffs) had fever as their initial presenting symptom. The third patient, a

nursing staff did not have any febrile episode; rather suffered only from sore throat during her entire course of illness. Her sore throat attained maximum severity on fifth day, lasted for thirteen days and then recovered completely. She did not suffer from any olfactory or gustatory symptoms. All other healthcare workers suffered from disturbances of smell and taste. Three of them had anosmia, two had parosmia and one had hyposmia. The olfactory symptoms emerged within first three days and attained maximum severity within 5 days after the onset of fever. At one month follow up only two healthcare workers had complete restoration of their olfaction. But after three months all of them had regained their smell completely (Table 2).

Table 2: Description of olfactory symptoms

Olfactory symptoms	Present/absent	Type	Day of onset	Day of maximal dysfunction	After 1 month, status of recovery	After 3 months, status of recovery
Patient 1	Yes	Parosmia	2	3	Partial	Complete
Patient 2	Yes	Anosmia	1	2	Partial	Complete
Patient 3	No					
Patient 4	Yes	Anosmia	2	5	Partial	Complete
Patient 5	Yes	Hyposmia	3	5	Complete	Complete
Patient 6	Yes	Parosmia	1	3	Partial	Complete
Patient 7	Yes	Anosmia	1	1	Complete	Complete

Day of onset of fever is considered as Day 0

Regarding taste sensation, three healthcare workers had ageusia, two had hypogeusia and one had dysgeusia (Table 3). The gustatory symptoms appeared within first 4 days and reached maximum severity within 5 days after the appearance of fever. Taste sensation recovered completely in all the patients within 15 days. In most of the cases, sour and salty tastes were involved first and sweet taste recovered last.

Gustatory symptom	Present/absent	Nature	Day of onset	Day of maximum severity	Taste sensation involved first	Involved Taste Sensations	Recovery after 1 month	Day of recovery	Taste sensation recovered last
Patient 1	Yes	Ageusia	1	3	Salt	Salt, Sour, Bitter, Sweet	Complete	5	Salt
Patient 2	Yes	Hypogeusia	2	3	Sour	Salt, Sour, Bitter, Sweet	Complete	5	Sweet
Patient 3	No								
Patient 4	Yes	Ageusia	4	5	Sour	Salt, Sour, Bitter, Sweet	Complete	9	Sweet
Patient 5	Yes	Hypogeusia	3	5	Sour	Salt, Sour, Bitter, Sweet	Complete	6	Bitter
Patient 6	Yes	Dysgeusia	3	5	Sweet	Salt, Sour, Bitter, Sweet	Complete	15	Sweet
Patient 7	Yes	Ageusia	1	1	Salt	Salt, Sour, Bitter, Sweet	Complete	6	Salt

Day of onset of fever is considered as Day 0

Table 3: Description of gustatory symptoms

Only two patients suffered from rhinorrhoea with a day of onset ranging between 1 to 3 days and maximum severity ranging between 1 to 4 days. There was complete recovery in both of them after one week (Table 4). Six of the HCWs suffered from sore throat within the first 2 days of onset of illness. It was the sole presenting symptom in one nursing staff (patient 3). Severity was maximum between 2 to 5 days and complete recovery was attained within 13 days (Table 5).

Rhinorrhoea	Present/absent	Nature of discharge	Day of onset	Day of maximum severity	Duration (days)	Day of recovery
Patient 1	Yes	Serous	1	1	2	2
Patient 2	No					
Patient 3	No					
Patient 4	No					
Patient 5	Yes	Serous	2	4	5	6
Patient 6	No					
Patient 7	No					

Day of onset of fever is considered as Day 0

Table 4: description of nasal discharge

Sore-throat	Present/absent	Day of onset	Day of maximum severity	Duration (days)	Recovery complete/ partial	Day of recovery
Patient 1	Yes	1	2	3	Complete	3
Patient 2	Yes	2	3	5	Complete	5
Patient 3	Yes	No fever	5	13	Complete	13
Patient 4	No					
Patient 5	Yes	1	4	8	Complete	8
Patient 6	Yes	1	3	6	Complete	6
Patient 7	Yes	1	2	3	Complete	3

Day of onset of fever/ illness is considered as Day 0

Table 5: description of sore throat

## DISCUSSION

We found that seven healthcare workers from our institute tested positive for SARS-CoV2 during the second wave of the COVID 19 pandemic in India. Being healthcare workers, they were well aware of their clinical symptoms in terms of onset, progression, and recovery. All of them suffered from variable grades of upper respiratory tract symptoms irrespective of their age, gender and vaccination status.

By the end of 2019, reports emerged from Wuhan, China regarding the human transmission of a novel strain of Coronavirus namely SARS-CoV2 [1]. Since then, it has claimed the lives of more than 5.5 million individuals globally [2]. Considering its widespread impact on human lives, WHO declared SARS-CoV2 as a global pandemic [3], [4]. From the very beginning, healthcare workers have been the frontline force worldwide to combat the pandemic. Subsequently, they have

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an increased risk of acquiring SARS-CoV2 infection thereby exposing their families and colleagues. The meta-analysis conducted by Gómez-Ochoa SA et al showed that every tenth of the healthcare worker in the screened hospitals have contracted SARS-CoV2 infection [5]. Interestingly half of them are nurses making them the most vulnerable section of HCW. In our case series of seven healthcare workers, six were nursing staff and one was a doctor. They were posted at different areas of the hospital including the COVID ward, ICU and Medical College. So, the SARS-CoV2 infection may have spread from all the areas of the hospital.

It is now well documented that SARS-CoV2 can lead to impairment of smell and taste sensations [6], [7], [8]. Some researchers have opined that olfactory and gustatory symptoms may be the early indicators of SARS-CoV2 infection [9]. A recent loss of smell may even serve as the best indicator among the symptoms of respiratory illness [10]. These chemosensory disturbances can significantly impair the quality of life [11]. The exact mechanism of the impairment of smell and taste by SARS-CoV2 is unknown. It may be due to the selective expression of ACE2 (Angiotensin-converting enzyme 2) in the sustentacular cells of the olfactory epithelium and oral mucosa [12], [13], [14]. Interestingly the ACE2 receptor is maximally found on the surface of the tongue acting as a conduit for the SARS-CoV2 to enter the host cell [14]. This may be the possible reason for the gustatory dysfunction. But it may also be secondary to olfactory dysfunction. Genetic factors may also play a role in the loss of smell and taste sensations. In a genome-wide association study (GWAS), Shelton, J.F et al [15] described the expression of at least two genes, UGT2A1 and UGT2A2 in the olfactory epithelium that is involved in metabolizing the odorants leading to the olfactory dysfunction.

Although the coexistence of impairments of olfaction and gustation are quite common in SARS-CoV2 infection, they can also develop independently [16]. In our case series, except for one nursing staff all other healthcare workers

suffered from olfactory and gustatory disturbances simultaneously. The onset of both smell and taste disturbances ranged between 1 to 4 days and maximum dysfunction occurred between 1 to 5 days. The recovery of gustatory symptoms was complete within 15 days but it took nearly three months (90 days) for the olfactory symptoms to recover completely. Anosmia and ageusia were the most common olfactory and gustatory disorders respectively. The delay in recovery of the olfactory symptoms may be due to the damage in the olfactory neuro-epithelium and subsequent regeneration [17]. All our study participants with taste disturbances reported impairment of all the four taste sensations, sweet, sour, bitter, and salty. This finding was contrary to the findings of Asadi MM et al [18] who found an increased threshold for sweet, sour, and bitter taste, but a decreased threshold for the salty taste. Sour was the first involved taste sensation in most of the participants of our study. But during recovery sweet taste was recovered last in maximum participants.

Six of the healthcare workers of our study also suffered from sore throat. Five of them had simultaneous olfactory and gustatory symptoms. It started after the first day of onset of fever, reached the peak within 5 days, and then gradually recovered. The third patient of our case series, a nursing staff, did not suffer from any febrile episode; rather suffered only from a sore throat during her entire course of illness. Her sore throat attained maximum severity on the fifth day, lasted for thirteen days, and then recovered completely. She did not suffer from any olfactory or gustatory symptoms. Thus, sore throat may be the sole presenting feature of the patient in COVID 19 and other related symptoms may only remain subclinical. Only two participants of our study suffered from rhinorrhoea. All our COVID-infected healthcare workers had an uneventful recovery with no evidence of any sequelae even after six months of follow-up.

There is a paucity of research in the world literature focussing on the chronological sequence of the olfactory and gustatory



dysfunctions and upper respiratory tract symptoms in COVID 19. In India, Sagar P et al conducted a prospective case series on six Otolaryngologists infected with SARS-CoV2 [19]. In their study, all the participants suffered from olfactory and gustatory disturbances. In another study from the Republic of Korea, Lee Y and colleagues reported a large case series with 3191 patients [16]. But only 15% of them suffered from smell and taste disturbances. In a multicentre European study, over 85% of the patients suffered from disorders of olfaction and gustation [6]. So, there may be a possible influence of the geographic distribution and ethnicity over the occurrence of these disorders. This aspect of the symptomatology of COVID 19 can be explored in future research.

Lastly, being a case series of only seven participants, we couldn't apply the statistical tests in our study. We could not apply any quantitative assessment method for the chemosensory functions like olfaction and gustation. The assessment was solely dependent upon the responses from the participants and hence not free from the bias associated with individual perception of symptoms. A larger study population with quantitative assessment methods for olfaction and gustation may yield more concrete results in the future.

## CONCLUSION

Our case series focuses on the magnitude of upper respiratory tract symptoms among the healthcare workers working in contact with COVID patients. Although impairment of the chemosensory functions like olfaction and gustation like anosmia, hyposmia, ageusia, and hypogeusia may be the early presenting symptom of COVID 19 in the majority of the patients, it may be absent in some cases. A sore throat may be the only presenting feature in such patients. A high degree of clinical suspicion is required to identify such patients. Recovery from these symptoms in most of the patients usually remains uneventful.

Author contribution: -

Both the authors have contributed equally for the planning and execution of this study.

## CONFLICT OF INTEREST

- The authors declare that there is no conflict of interest.
- Source of funding
- No funding was received from any source for conducting this study.

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