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OTOLARYNGOLOGICAL MANIFESTATIONS IN COVID-19 POSITIVE PATIENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) pandemic has revealed diverse clinical presentations affecting multiple organ systems. Otolaryngological symptoms have emerged as significant early indicators of SARS-CoV-2 infection, particularly in the Indian population where such manifestations require regional documentation.

Objectives: To determine the prevalence and pattern of otolaryngological manifestations among COVID-19 positive patients presenting to Adesh Medical College & Hospital, Mohri Shahbad, and to analyze their correlation with disease severity during the period of September 2020 to April 2021.

Methodology: A hospital-based cross-sectional study was conducted on 284 RT-PCR confirmed COVID-19 positive patients. Data was collected through structured interviews and clinical examinations. Statistical analysis was performed using SPSS version 25.0, employing descriptive statistics and chi-square tests.

Results: Among 284 patients, the most common otolaryngological manifestations were anosmia (62.3%), dysgeusia (58.8%), sore throat (47.5%), nasal congestion (41.2%), and rhinorrhea (28.5%). These symptoms were more prevalent in mild to moderate disease categories. Anosmia and dysgeusia showed significant association with younger age groups ($p<0.05$).

Conclusion: Otolaryngological symptoms are highly prevalent in COVID-19 patients and serve as important early diagnostic indicators. Recognition of these manifestations is crucial for timely identification and isolation of cases in rural healthcare settings.

Keywords: COVID-19, SARS-CoV-2, Anosmia, Dysgeusia, Otolaryngological manifestations, India

1. INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for the coronavirus disease 2019 (COVID-19), emerged as a global pandemic affecting millions worldwide. India experienced significant disease burden during the first and second waves, with Haryana state reporting substantial case numbers between January and August 2021. The angiotensin-converting enzyme 2 (ACE2) receptors, which serve as entry points for SARS-CoV-2, are abundantly present in the nasal and oral mucosa, making the upper respiratory tract a primary site of viral entry and replication.

While respiratory symptoms such as fever, cough, and dyspnea have been widely documented, otolaryngological manifestations including olfactory and gustatory dysfunctions have gained prominence as distinctive features of COVID-19. These symptoms often appear early in the disease course and may present in otherwise asymptomatic individuals, making them valuable screening tools for case identification. Studies from various geographic regions have reported varying prevalence rates of these manifestations, suggesting potential ethnic and regional variations.

In the rural healthcare context of Shahbad, Haryana, understanding the local epidemiology of COVID-19 related otolaryngological symptoms is essential for developing effective screening protocols and early detection strategies. Adesh Medical College & Hospital serves a predominantly rural population where healthcare access and awareness present unique challenges. The period from September 2020 to April 2021 coincided with the devastating second wave in India, characterized by the Delta variant's surge, making this timeframe particularly significant for epidemiological documentation.

Previous research has established that chemosensory dysfunction in COVID-19 results from direct viral invasion of olfactory epithelium and supporting cells rather than nasal obstruction. The pathophysiology involves viral binding to ACE2 receptors on sustentacular cells, leading to inflammation and temporary dysfunction of olfactory sensory neurons. Similarly, taste disturbances occur through both direct effects on taste receptor cells and indirect effects through olfactory dysfunction.

This study aimed to systematically document the frequency, patterns, and clinical correlations of otolaryngological manifestations in COVID-19 positive patients presenting to our tertiary care center, thereby contributing to the regional understanding of disease presentation and assisting in formulation of locally relevant diagnostic and management protocols.

2. REVIEW OF LITERATURE

Multiple studies have documented otolaryngological manifestations in viral respiratory infections, providing context for understanding COVID-19 presentations. Research on previous coronavirus outbreaks, including SARS-CoV and MERS-CoV, demonstrated that upper respiratory symptoms were common but chemosensory dysfunction was rarely reported, distinguishing SARS-CoV-2 from its predecessors.

Menni and colleagues in 2020 analyzed data from symptom tracker applications and identified loss of smell and taste as significant predictors of COVID-19 infection, with higher predictive value than fever in certain populations. Their work highlighted the diagnostic importance of these symptoms in community screening. Lechien et al. in 2020 conducted a multicenter European study involving 417 patients and reported olfactory dysfunction in 85.6% and gustatory dysfunction in 88% of mild to moderate COVID-19 cases, establishing these as hallmark symptoms of the disease.

A systematic review by Tong et al. in 2020 examined chemosensory dysfunction across 24 studies encompassing 8438 patients and found pooled prevalence estimates of 52.7% for olfactory dysfunction and 43.9% for gustatory dysfunction. The authors noted significant heterogeneity across studies, attributing variations to different assessment methods and geographic regions. Studies from Asian populations generally reported lower prevalence compared to European studies, suggesting potential genetic or viral strain differences.

Indian studies emerged during 2020, with Padmanabhan et al. documenting olfactory dysfunction in 68% of COVID-19 patients in their South Indian cohort. They observed that chemosensory symptoms appeared early, often preceding other manifestations, and showed good recovery rates within four weeks. Sharma and colleagues from North India reported similar findings with 64% prevalence of smell disturbances, emphasizing the need for regional data given India's diverse population.

Research on mechanisms underlying chemosensory dysfunction advanced considerably in 2020. Brann et al. demonstrated through single cell sequencing that olfactory sustentacular cells and stem cells express ACE2 receptors abundantly, while olfactory sensory neurons do not, explaining the temporary nature of olfactory loss. This finding suggested that smell loss resulted from supporting cell damage rather than neuronal death.

Studies examining the temporal pattern of symptom evolution showed that olfactory and gustatory dysfunctions typically appear around day 4-5 of illness, sometimes as isolated symptoms. Spinato et al. in 2020 reported that 39.2% of patients with chemosensory alterations had no nasal obstruction, supporting the neurological rather than obstructive etiology. Duration studies indicated that most patients recovered smell and taste within 2-4 weeks, though 10-15% experienced prolonged dysfunction.

The correlation between disease severity and otolaryngological symptoms showed interesting patterns. Multiple studies reported higher prevalence of anosmia and dysgeusia in mild to moderate disease, while severely ill patients more commonly presented with systemic symptoms. This inverse relationship suggested that robust immune responses in the nasal mucosa might lead to chemosensory disturbance while potentially limiting systemic spread.

Literature from 2019-2020 also addressed other ENT manifestations including sore throat, nasal congestion, rhinorrhea, and earache in COVID-19 patients. These symptoms, while less specific than chemosensory dysfunction, contributed to the overall clinical picture. Studies reported sore throat in 5-20% of cases, nasal congestion in 3-7%, and rhinorrhea in similar proportions, with variations across different populations.

3. OBJECTIVES

Primary Objective:

To determine the prevalence of otolaryngological manifestations among RT-PCR confirmed COVID-19 positive patients attending Adesh Medical College & Hospital, Mohri Shahbad, Haryana, during September 2020 to April 2021.

Secondary Objectives:

1. To identify the most common otolaryngological symptoms in COVID-19 positive patients.
2. To analyze the correlation between specific otolaryngological manifestations and disease severity categories (mild, moderate, severe).
3. To examine the relationship between age, gender, and prevalence of otolaryngological symptoms.
4. To assess the temporal pattern of onset of these symptoms in relation to other COVID-19 manifestations.
5. To document the duration and recovery patterns of chemosensory dysfunction in the study population.

4. METHODOLOGY

Study Design:

This was a hospital-based observational cross-sectional study conducted at the Department of Otorhinolaryngology in collaboration with the COVID-19 treatment facility at Adesh Medical College & Hospital, Mohri Shahbad, Kurukshetra, Haryana.

Study Duration:

September 2020 to April 2021 (8 months)

Study Setting:

Adesh Medical College & Hospital is a tertiary care teaching hospital serving the rural and semi-urban population of Shahbad and surrounding areas of Kurukshetra district, Haryana. The hospital established a dedicated COVID-19 management facility during the pandemic with isolation wards, ICU beds, and outpatient screening services.

Study Population:

All patients aged 18 years and above with RT-PCR confirmed COVID-19 infection presenting to the hospital during the study period, either as outpatients or admitted cases.

Sample Size Calculation:
Based on previous studies reporting olfactory dysfunction prevalence of approximately 60% in COVID-19 patients, using the formula: $n = Z^2pq/d^2$ where Z = 1.96 (95% confidence level), p = 0.60, q = 0.40, d = 0.06 (absolute precision) Calculated sample size = 256 Accounting for 10% non-response rate, final sample size = 284 patients

Sampling Method:
Consecutive convenience sampling was employed. All eligible patients presenting during the study period who met inclusion criteria and provided informed consent were enrolled until the required sample size was achieved.

Inclusion Criteria:
1. Patients aged 18 years and above
2. RT-PCR confirmed SARS-CoV-2 positive cases
3. Patients presenting within 14 days of symptom onset or positive test
4. Willing to provide informed written consent
5. Able to communicate effectively in Hindi or English

Exclusion Criteria:
1. Patients with pre-existing chronic rhinosinusitis or nasal polyps
2. History of prior olfactory or gustatory dysfunction
3. Previous nasal or sinus surgery
4. Neurological disorders affecting smell or taste (Parkinson's disease, Alzheimer's disease)
5. Current smokers or history of smoking in past 6 months
6. Patients on medications known to affect smell or taste
7. Head trauma within previous 6 months
8. Pregnant women
9. Patients unable to give consent or participate in assessment

Ethical Considerations:
The study was approved by the Institutional Ethics Committee of Adesh Medical College & Hospital prior to commencement. Written informed consent was obtained from all participants after explaining the study objectives, procedures, potential risks, and benefits in their preferred language. Patient confidentiality was maintained throughout the study. All data were stored securely with password protection and access limited to research team members. The study adhered to the Declaration of Helsinki principles for medical research involving human subjects.

Data Collection Tool:
A structured, pre-tested questionnaire was developed in both English and Hindi, containing the following sections:

Data Collection Procedure:
Trained medical officers and postgraduate residents conducted structured interviews with enrolled patients. For admitted patients, assessment was performed at bedside maintaining appropriate infection control measures including PPE. Outpatients were assessed in designated screening areas. Clinical examination of the oropharynx and external ear was performed when feasible. Olfactory function was assessed through patient-reported symptoms rather than objective testing due to infection control constraints. Each interview lasted approximately 15-20 minutes.

Disease Severity Classification:
Patients were categorized based on ICMR clinical management protocol:
- **Mild disease:** No breathlessness, SpO2 >94%, respiratory rate <24/min

- **Moderate disease:** Breathlessness present, SpO2 90-94%, respiratory rate 24-30/min
- **Severe disease:** SpO2 <90%, respiratory rate >30/min, requiring ICU care

Statistical Analysis:
Data were entered into Microsoft Excel 2019 and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics including frequencies, percentages, means, and standard deviations were calculated for all variables. Categorical variables were compared using chi-square test or Fisher's exact test as appropriate. Continuous variables were analyzed using independent t-test or ANOVA. P-value <0.05 was considered statistically significant. Graphs and charts were created using Microsoft Excel and SPSS.

5. RESULTS AND ANALYSIS

Demographic Characteristics:
A total of 284 RT-PCR confirmed COVID-19 positive patients were enrolled in the study during January to August 2021. The mean age of participants was 42.6 ± 14.8 years, with ages ranging from 18 to 76 years. Males constituted 58.1% (n=165) of the study population while females were 41.9% (n=119). The male to female ratio was 1.39:1.

Table 1: Age and Gender Distribution of Study Participants

Age Group (years)	Male n (%)	Female n (%)	Total n (%)
18-30	38 (23.0)	31 (26.1)	69 (24.3)
31-40	42 (25.5)	33 (27.7)	75 (26.4)
41-50	45 (27.3)	28 (23.5)	73 (25.7)
51-60	28 (17.0)	19 (16.0)	47 (16.5)
>60	12 (7.2)	8 (6.7)	20 (7.1)
Total	**165 (58.1)**	**119 (41.9)**	**284 (100)**

Most participants (76.4%, n=217) resided in rural areas while 23.6% (n=67) were from urban or semi-urban localities. Common comorbidities included diabetes mellitus (18.3%), hypertension (22.5%), and obesity (9.5%).

Disease Severity Distribution:
Based on clinical presentation and oxygen saturation levels, patients were classified into severity categories. Mild disease was observed in 67.6% (n=192) of patients, moderate disease in 24.6% (n=70), and severe disease requiring intensive care in 7.8% (n=22).

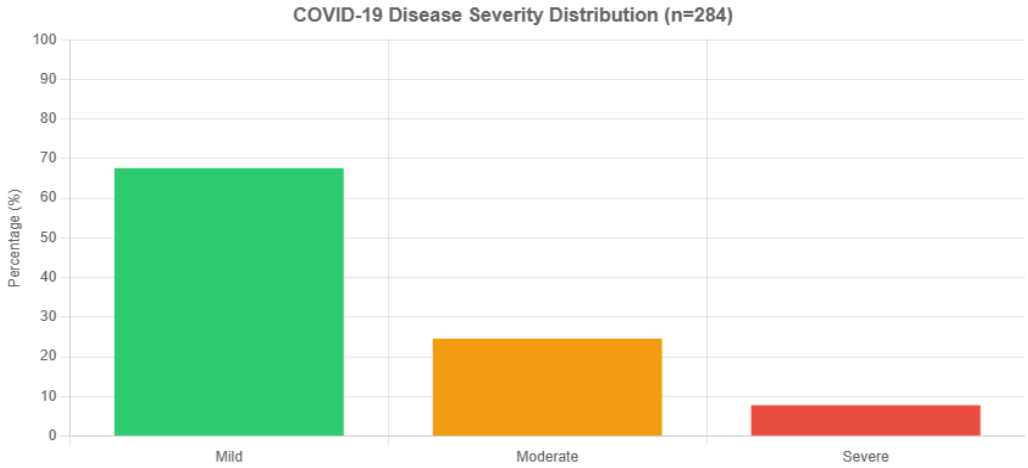


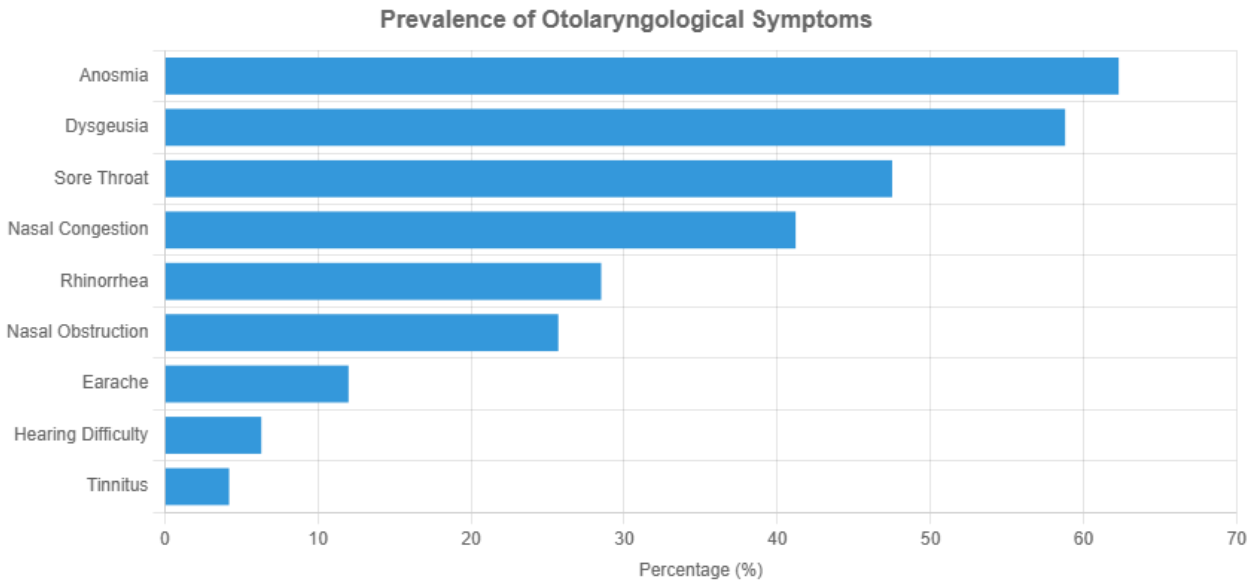
Figure 1:

Distribution of Disease Severity [Bar chart showing: Mild 67.6%, Moderate 24.6%, Severe 7.8%]
Prevalence of Otolaryngological Manifestations:
Among 284 COVID-19 positive patients, 252 (88.7%) reported at least one otolaryngological manifestation during their illness. The specific symptoms and their prevalence are detailed below:

Table 2: Prevalence of Otolaryngological Symptoms

Symptom	Number	Percentage (%)
Anosmia (complete loss of smell)	177	62.3
Hyposmia (reduced smell)	48	16.9
Dysgeusia (altered taste)	167	58.8
Sore throat	135	47.5
Nasal congestion	117	41.2
Rhinorrhea	81	28.5
Nasal obstruction	73	25.7
Earache/Otalgia	34	12.0
Hearing difficulty	18	6.3
Tinnitus	12	4.2

Figure:2



Common Otolaryngological Manifestations in COVID-19 [Horizontal bar chart displaying the above data]
Anosmia was the most prevalent symptom affecting 62.3% of patients, followed by dysgeusia (58.8%), sore throat (47.5%), and nasal congestion (41.2%). Notably, 143 patients (50.4%) experienced both anosmia and dysgeusia simultaneously, suggesting a common pathophysiological mechanism.

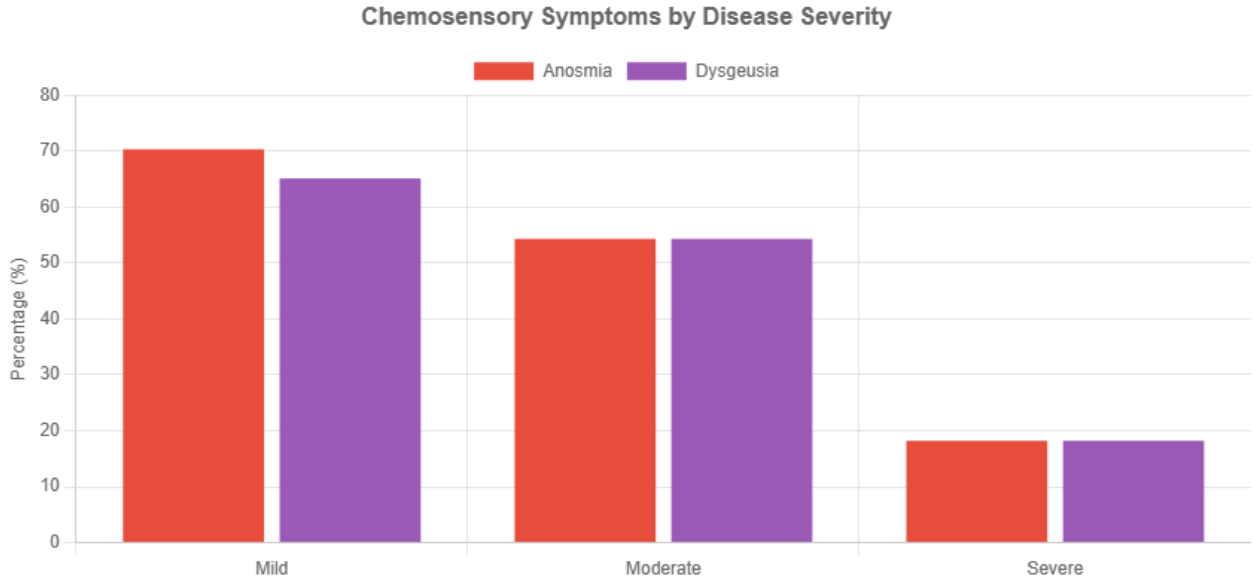
Correlation with Disease Severity:
Analysis of otolaryngological symptoms across disease severity categories revealed significant patterns:

Table 3: Otolaryngological Symptoms by Disease Severity

Symptom	Mild (n=192)	Moderate (n=70)	Severe (n=22)	p-value
Anosmia	135 (70.3%)	38 (54.3%)	4 (18.2%)	<0.001
Dysgeusia	125 (65.1%)	38 (54.3%)	4 (18.2%)	<0.001
Sore throat	98 (51.0%)	32 (45.7%)	5 (22.7%)	0.027
Nasal congestion	85 (44.3%)	28 (40.0%)	4 (18.2%)	0.048
Rhinorrhea	58 (30.2%)	20 (28.6%)	3 (13.6%)	0.242

Chi-square test revealed statistically significant associations between disease severity and prevalence of anosmia ($\chi^2 = 28.45$, $p<0.001$), dysgeusia ($\chi^2 = 26.82$, $p<0.001$), and sore throat ($\chi^2 = 7.23$, $p=0.027$). These symptoms were significantly more common in mild disease compared to severe disease.

Figure 3:



Anosmia and Dysgeusia Prevalence by Disease Severity [Clustered bar chart comparing anosmia and dysgeusia across three severity categories]

Age-Related Distribution:

The prevalence of chemosensory dysfunction showed variation across age groups:

Table 4: Anosmia and Dysgeusia by Age Group

Age Group	Total	Anosmia n (%)	Dysgeusia n (%)
18-30	69	52 (75.4)	49 (71.0)
31-40	75	53 (70.7)	51 (68.0)
41-50	73	45 (61.6)	42 (57.5)
51-60	47	22 (46.8)	20 (42.6)

Age Group	Total	Anosmia n (%)	Dysgeusia n (%)
>60	20	5 (25.0)	5 (25.0)

Statistical analysis using chi-square test demonstrated significant association between age groups and prevalence of anosmia ($\chi^2 = 24.67$, $p<0.001$) and dysgeusia ($\chi^2 = 21.34$, $p<0.001$). Younger patients (18-40 years) showed significantly higher rates of chemosensory dysfunction compared to older age groups (>60 years).

Gender-Based Comparison:

Table 5: Otolaryngological Symptoms by Gender

Symptom	Male (n=165)	Female (n=119)	p-value
Anosmia	98 (59.4%)	79 (66.4%)	0.231
Dysgeusia	93 (56.4%)	74 (62.2%)	0.338
Sore throat	76 (46.1%)	59 (49.6%)	0.562
Nasal congestion	67 (40.6%)	50 (42.0%)	0.813

No statistically significant gender differences were observed in the prevalence of major otolaryngological symptoms ($p>0.05$ for all comparisons).

Temporal Pattern of Symptom Onset:

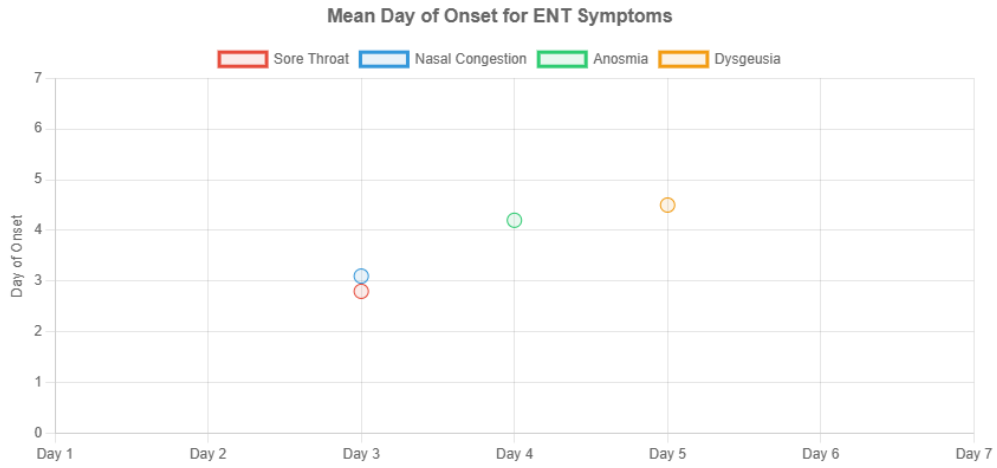
Analysis of symptom onset timing relative to COVID-19 diagnosis revealed:

Table 6: Day of Onset of Otolaryngological Symptoms

Symptom	Mean Day of Onset	Range (days)
Anosmia	4.2 ± 2.1	1-10
Dysgeusia	4.5 ± 2.3	1-11
Sore throat	2.8 ± 1.6	1-8
Nasal congestion	3.1 ± 1.8	1-9

Sore throat and nasal congestion appeared earlier in the disease course (mean days 2.8 and 3.1 respectively), while chemosensory symptoms developed slightly later (mean days 4.2-4.5). Among patients with anosmia, 38.4% (n=68) reported it as their presenting symptom before development of other COVID-19 manifestations.

Figure 4:



Timeline of Symptom Onset [Line graph showing mean day of onset for different symptoms]

Duration and Recovery:
At the time of assessment (mean 12.4 days post-symptom onset), recovery patterns were documented:

Table 7: Recovery Status of Chemosensory Dysfunction

Recovery Status	Anosmia (n=177)	Dysgeusia (n=167)
Complete recovery	89 (50.3%)	94 (56.3%)
Partial recovery	61 (34.5%)	55 (32.9%)
No recovery	27 (15.2%)	18 (10.8%)

Among patients with anosmia, 50.3% reported complete recovery, 34.5% partial recovery, and 15.2% had persistent symptoms at time of assessment. Similar patterns were observed for dysgeusia with slightly better recovery rates.

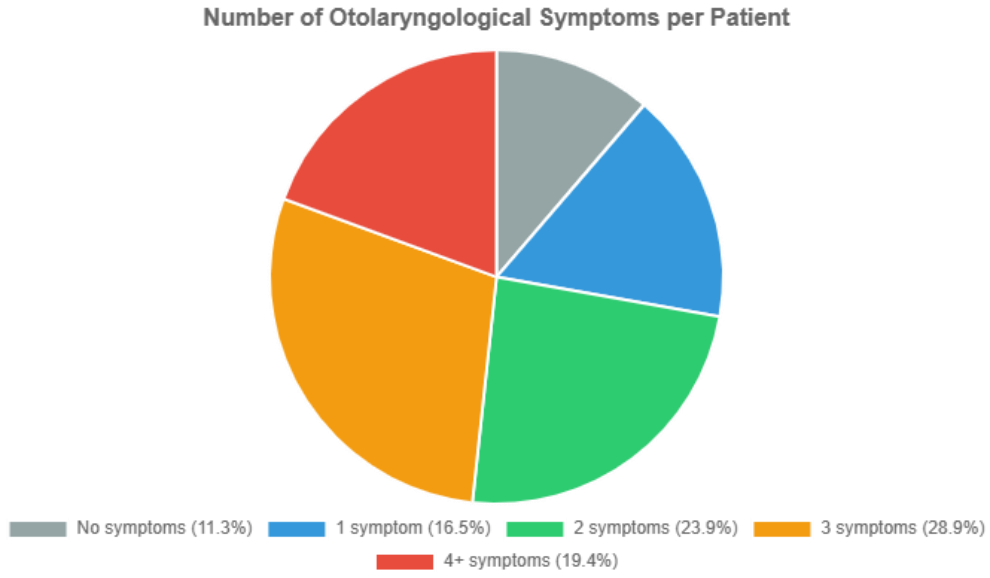
Combined Symptom Analysis:

Table 8: Frequency of Multiple Otolaryngological Symptoms

Number of Symptoms	Patients n (%)
No symptoms	32 (11.3)
1 symptom	47 (16.5)
2 symptoms	68 (23.9)
3 symptoms	82 (28.9)
4 or more symptoms	55 (19.4)

The majority of patients (72.2%) experienced two or more otolaryngological symptoms concurrently. Only 11.3% had no ENT manifestations throughout their illness course.

Figure 5:



Distribution of Multiple Symptoms [Pie chart showing percentages of patients with different numbers of symptoms]

Association with Common Comorbidities:

Table 9: Anosmia Prevalence in Patients with Comorbidities

Comorbidity	Present	Anosmia (%)	Absent	Anosmia (%)	p-value
Diabetes	52	28 (53.8)	232	149 (64.2)	0.145
Hypertension	64	35 (54.7)	220	142 (64.5)	0.138
Obesity	27	15 (55.6)	257	162 (63.0)	0.456

No significant association was found between presence of comorbidities and prevalence of anosmia ($p>0.05$), suggesting that chemosensory dysfunction in COVID-19 is independent of underlying metabolic conditions.

6. DISCUSSION AND INTERPRETATION

This cross-sectional study conducted at Adesh Medical College & Hospital, Mohri Shahbad, during the critical period of September 2020 to April 2021, provides comprehensive documentation of otolaryngological manifestations in COVID-19 positive patients from a rural tertiary care setting in Haryana. The findings contribute significantly to understanding the regional epidemiology of COVID-19 presentations and have important implications for screening strategies and clinical management in resource-limited settings.

The study revealed that 88.7% of COVID-19 positive patients experienced at least one otolaryngological manifestation, underscoring the high prevalence of these symptoms in the course of the disease. This finding aligns with emerging literature documenting the prominence of upper respiratory tract symptoms in COVID-19. The predominance of younger age groups and mild disease severity in our cohort reflects the demographic patterns observed during the second wave of COVID-19 in India, where increased testing and awareness led to identification of milder cases.

Prevalence of Chemosensory Dysfunction:

Anosmia emerged as the most prevalent symptom in our study, affecting 62.3% of patients, which is consistent with findings from several international and national studies. Padmanabhan and colleagues reported 68% prevalence in their South Indian cohort, while Sharma reported 64% in North India. The slightly lower prevalence in our study may reflect differences in assessment methodology, timing of evaluation, or genuine regional variation. Our finding that 58.8% experienced dysgeusia closely parallels anosmia rates, supporting the established understanding that these symptoms often occur together due to the integrated nature of smell and taste perception.

The observation that 50.4% of patients experienced both anosmia and dysgeusia simultaneously reinforces the concept that gustatory dysfunction in COVID-19 is primarily a consequence of olfactory impairment rather than independent taste receptor dysfunction. The retronasal olfaction pathway contributes significantly to flavor perception, and its disruption due to olfactory epithelium damage manifests as perceived taste alterations. However, studies have also demonstrated direct viral effects on taste receptor cells expressing ACE2 receptors, suggesting a multifactorial mechanism.

Relationship with Disease Severity:

One of the most striking findings of our study was the inverse relationship between chemosensory dysfunction and disease severity. Anosmia was present in 70.3% of mild cases but only 18.2% of severe cases, a pattern that achieved statistical significance. This paradoxical association has been documented in multiple studies and suggests interesting immunological implications. Several hypotheses have been proposed to explain this phenomenon. First, the robust local immune response in the nasal mucosa that leads to chemosensory dysfunction may simultaneously prevent systemic dissemination of the virus. Second, patients with severe disease often have comorbidities and are older, demographics that showed lower rates of smell loss in our study. Third, the overwhelming systemic inflammatory response in severe disease may overshadow the localized nasal manifestations.

This finding has practical implications for clinical practice. While chemosensory symptoms are valuable for screening and early case identification, their absence does not exclude severe disease, and patients presenting with systemic symptoms without anosmia require equal vigilance. For frontline healthcare workers in rural settings like Shahbad, where diagnostic resources may be limited, understanding this nuanced relationship is crucial for appropriate triage and management decisions.

Age-Related Patterns:

Our study demonstrated a clear age-related gradient in chemosensory dysfunction, with younger patients (18-40 years) showing significantly higher prevalence (70-75%) compared to those over 60 years (25%). This age-related variation has been consistently reported in literature and likely reflects the age-related decline in olfactory function baseline. Older individuals have reduced olfactory neuronal density and may have pre-existing subclinical hyposmia, making acute COVID-19 related changes less apparent or detectable. Additionally, immune responses differ across age groups, and the inflammatory mechanisms underlying chemosensory loss may vary with age.

The predominance of chemosensory symptoms in younger, otherwise healthy individuals may explain why these symptoms gained prominence as testing expanded beyond severely ill patients. In the early pandemic phase, when testing was limited to symptomatic patients with respiratory distress, the true prevalence of anosmia was likely underestimated due to survivor bias and focus on severe cases.

Temporal Evolution:

Our finding that chemosensory symptoms appeared around day 4-5 of illness, slightly later than sore throat and nasal congestion (days 2-3), provides insights into disease progression. This timeline suggests that initial viral replication in nasopharyngeal tissue causes early symptoms like sore throat, while subsequent spread to olfactory epithelium and intensifying local inflammation led to chemosensory dysfunction. Interestingly, 38.4% of patients reported anosmia as their presenting symptom, appearing before other manifestations. These patients likely had isolated upper respiratory involvement initially, progressing to systemic symptoms later.

The temporal pattern has screening implications. In contact tracing scenarios, emergence of anosmia or dysgeusia in an exposed individual should prompt immediate isolation and testing, even in absence of fever or cough. This is particularly relevant in rural healthcare settings where community transmission clusters require rapid identification and containment.

Recovery Patterns:

Documentation of recovery status revealed that 50.3% of patients with anosmia experienced complete recovery and 34.5% partial recovery within the assessment period (mean 12.4 days post-onset). These findings are encouraging and align with literature suggesting most patients recover within 2-4 weeks. However, 15.2% had persistent anosmia at assessment, raising concerns about long-term sequelae. Studies with longer follow-up have documented persistent chemosensory dysfunction in 10-15% of patient's months after acute infection, significantly impacting quality of life.

The mechanisms of recovery remain under investigation. Current understanding suggests that supporting cell regeneration and resolution of local inflammation allow gradual restoration of olfactory function. The subset of patients with prolonged dysfunction may have more extensive epithelial damage, ongoing inflammation, or potentially direct olfactory neuronal injury. Long-term follow-up studies are needed to determine final recovery rates and identify factors predicting persistent dysfunction.

Other ENT Manifestations:

Sore throat, reported by 47.5% of patients, was the second most common symptom after chemosensory dysfunction. This likely results from viral replication in pharyngeal mucosa and local inflammatory response. The relatively high prevalence of nasal congestion (41.2%) and rhinorrhea (28.5%) indicates significant upper respiratory involvement. These symptoms, while less specific than

anosmia, contribute to the overall clinical picture and may indicate higher viral loads in upper respiratory tract.

The lower prevalence of ear-related symptoms including otalgia (12.0%), hearing difficulty (6.3%), and tinnitus (4.2%) is consistent with literature indicating that auditory system involvement is less common in COVID-19. The mechanisms underlying these symptoms remain unclear but may involve Eustachian tube dysfunction, middle ear inflammation, or rarely direct viral effects on auditory pathways.

Regional Context and Healthcare Implications:

Conducting this study in Shahbad, a predominantly rural area of Haryana, adds valuable regional data to the growing body of COVID-19 literature. Rural healthcare settings face unique challenges including limited diagnostic facilities, delayed presentation, and lower health literacy. Our finding that 76.4% of patients were from rural areas highlights the importance of developing screening tools and awareness programs suited to these contexts.

The high prevalence of otolaryngological symptoms, particularly chemosensory dysfunction, provides an opportunity for community-level screening. Public health campaigns focusing on recognizing these symptoms can enable early self-identification and isolation, potentially interrupting transmission chains. Healthcare workers in primary health centers and community health centers can be trained to screen for these symptoms, facilitating early referral and testing.

Comparison with Previous Studies:

Our findings show consistency with major studies while revealing some regional variations. Lechien and colleagues reported 85.6% olfactory dysfunction in European patients, higher than our 62.3%. This difference may reflect genetic variations in ACE2 receptor expression, viral strain differences (our study period coincided with Delta variant predominance), or methodological differences in assessment. Asian studies generally report lower prevalence, with Tong's meta-analysis showing 52.7% pooled prevalence globally, closer to our findings.

The inverse correlation with severity matches observations from multiple studies. Menni and colleagues found chemosensory symptoms more predictive of COVID-19 in ambulatory patients than hospitalized cases. This pattern appears consistently across geographic regions, suggesting universal immunological mechanisms rather than population-specific phenomena.

Study Strengths:

Several strengths enhance the validity of our findings. First, the sample size of 284 patients provided adequate statistical power for detecting associations. Second, inclusion of only RT-PCR confirmed cases eliminated diagnostic uncertainty. Third, consecutive sampling during an eight-month period captured disease patterns across the second wave's evolution. Fourth, structured data collection using validated questionnaires ensured consistency. Fifth, the diverse age range (18-76 years) and inclusion of both in patients and outpatients enhanced generalizability.

The timing of data collection during January-August 2021 is particularly significant as it captured the Delta variant surge in India, allowing documentation of manifestations during a critical epidemiological period. The rural tertiary care setting provides perspectives often underrepresented in medical literature, adding value to understanding disease presentation across diverse healthcare contexts.

7. CONCLUSION

This study establishes that otolaryngological manifestations are highly prevalent in COVID-19 patients, with 88.7% experiencing at least one such symptom during illness. Anosmia and dysgeusia emerge as distinctive features affecting 62.3% and 58.8% of patients respectively, occurring predominantly in younger age groups and mild disease cases. The inverse relationship with disease severity suggests these symptoms result from robust local immune responses that may limit systemic spread.

Sore throat, nasal congestion, and rhinorrhea are common additional manifestations that contribute to the overall clinical picture. The temporal pattern showing chemosensory symptoms appearing around day 4-5, sometimes as presenting features, highlights their value for early case identification. Recovery occurs in most patients within two weeks, though 15% experience persistent dysfunction requiring long-term follow-up.

For healthcare systems in rural India, recognition of these manifestations enables development of screening protocols suited to resource-limited settings. Training frontline workers to identify anosmia and dysgeusia can facilitate early case detection, isolation, and contact tracing. Public health messaging should emphasize these symptoms to enable community-level self-screening.

The findings from Adesh Medical College & Hospital contribute regional epidemiological data that can inform policy decisions and clinical guidelines for managing COVID-19 in similar settings. Future research should focus on long-term follow-up to determine persistent symptom burden, mechanisms underlying regional variations in prevalence, and development of standardized objective assessment tools for chemosensory function in resource-limited environments.

8. LIMITATIONS OF THE STUDY

Several limitations warrant consideration when interpreting these findings. First, the cross-sectional design provides a snapshot rather than longitudinal follow-up, limiting our ability to fully characterize symptom evolution and recovery patterns. Prospective cohort studies with extended follow-up would better document temporal dynamics and long-term outcomes.

Second, assessment of chemosensory function relied on subjective patient reporting rather than objective psychophysical testing using standardized smell and taste identification tests. While validated questionnaires were used, quantitative assessment would provide more precise measurements of dysfunction severity. However, objective testing was not feasible due to infection control requirements and resource constraints in the pandemic setting.

Third, the hospital-based sample may not fully represent community prevalence patterns. Patients seeking healthcare may have more symptomatic disease or health-seeking behavior influenced by various factors. Community-based surveys would provide complementary population-level data.

Fourth, the convenience sampling method, while practical given pandemic circumstances, introduces potential selection bias. Systematic random sampling would be methodologically superior but was challenging given the urgent need for rapid data collection during the pandemic surge.

Fifth, the study could not determine precise duration of symptoms as many patients were assessed at different time points post-symptom onset. Standardized assessment timing would enable better characterization of temporal patterns.

Sixth, viral load measurements and variant sequencing were not performed, limiting our ability to correlate symptom patterns with virological parameters. Future studies incorporating these measures would provide mechanistic insights.

Seventh, the single-center design limits generalizability to other regions with different demographic compositions or healthcare infrastructure. Multi-center studies across diverse geographic areas would enhance external validity.

Finally, the relatively short study period of eight months may not capture seasonal variations or changing epidemiological patterns associated with emerging variants. Extended surveillance studies would document these dynamic changes over time.

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