Effect of Covid-19 on nasal allergies: A study from hilly regions of Himachal Pradesh

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Abstract

Background: The World Health Organization (WHO) designated SARS-CoV-2 infection as coronavirus disease 2019 (Covid-19).Due to the government implication of Covid-19 specific guideline of using mask, there could be a significant decrease in the allergic rhinitis.

Objective: Present study aims to analyze the changes in the trends of nasal allergies from hilly regions of Himachal Pradesh following Covid-19 pandemic.

Method: The prospective data obtained from January 2022 to November 2022 was compared from the retrospective data available between January 2019 to November 2019. Prospectively, a total of 596 patients were included in the study. All these patients underwent Skin prick tests for common allergens. All these patients also underwent testing for total IgE levels in biochemistry lab of the hospital by chemiluminescence method.The results were compared with retrospective dataof 728 age sex match patients.

Results: A significant difference in the allergen sensitivity was observed. The number of patients who were sensitized during Covid was comparatively less than those during Pre covid period.Dust mite, Cockroach, Peanut and Wheat revealed a non-significant odds ratio indicating that they were not true predictors for sensitization and non-sensitization. Whereas Grass pollen, Mould mix and Pine mix revealed a significant odds ratio. Usage of mask found to have an impact on improvement in symptoms. Majority of the patients who did not use mask had no improvement in symptoms. Majority of the patients had high IgE levels in pre covid period whereas it was normal for majority of them during covid.

Conclusion: In our study, allergic rhinitis incidence decreased throughout the pandemic period. After pandemic, there was a noticeably decreased level of sensitivity to grass pollen, mould, and pine mix. Use of face masks lead to significant decrease in symptoms of allergic rhinitis.

Keywords: Allergic rhinitis, Covid-19, Skin prick test, IgE, SARS-CoV2.

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Introduction

Rhinitis is an inflammation of the nasal mucosa that causes symptoms such rhinorrhea, sneezing, nasal obstruction, and/or nasal itching. The term "allergic rhinitis (AR)" refers to a clinical form that is accompanied by an immunological reaction linked to immunoglobulin E (IgE)(1)Based on the inflammatory mediators released after the process of antigen presentation, T cell differentiation, IgE generation, and mast cell degranulation, AR is defined by a chronic mucosal inflammation caused by an IgE-related type 1 hypersensitivity reaction. Due to constant antigen stimulation, it is a hyperresponsive condition where eosinophils and lymphocytes play the main roles(2).The symptoms of a moderate-to-severe illness negatively affect daily activities such as sleep, job or school, leisure time, or leisure time(1).

Worldwide, both adults and children frequently get AR. It is the 16th most common illness in the USA that is diagnosed in outpatient clinics. In the USA, it is the fifth most common chronic disease in adults and the first most common chronic condition in children(3). Around the world, it is thought that AR impacts more than 500 million people. Adolescents and the first ten years of life are the two time periods where AR is most frequently observed(1). According to reports, the prevalence of AR ranges from 10% to 30% in adults and from 40% in children(4).

The primary signs and symptoms of AR are rhinorrhea, nasal irritation, sneezing, and nasal congestion. Symptoms of the eyes, ears, and throat come together with rhinitis. Rhinorrhea typically has a profuse, serious character. Some patients may show signs of sinusitis. Patients may have purulent nasal and postnasal discharge, pressure on the face, anosmia, headaches, and halitosis in this situation (5). Nasal irritation is typically a symptom of AR. The most recognizable signs of AR are paroxysmal sneeze bouts, which may also be accompanied by nasal discomfort and itching. Nasal congestion is a common complaint among AR patients, and it gets worse at night. While nasal congestion is commonly present in persistent AR, rhinorrhea, nasal itching, and sneezing are mostly only encountered in seasonal AR(1).

In addition to the primary symptoms, people with AR may experience additional symptoms from the systemic consequences of allergic inflammation or coexisting disorders. Patients with AR frequently have dry cough, postnasal leaking, and itching of the palate and/or the ear(6). Problems with taste and smell could also be noticeable.In pollen-related AR, itching and watery eyes, ocular redness, and photophobia are common symptoms. The intensity of the ocular symptoms is exacerbated by nasal congestion obstructing the nasal lacrimal canal. Ocular symptoms are more noticeable in allergic rhinitis than in non-allergic rhinitis(1).

Three different in vivo skin test types are listed below for the detection of AR: (1) Skin prick testing (SPT) is the main test used to identify IgE-mediated allergies. It has frequently been used. Although extremely low, it could cause serious consequences. If done correctly and interpreted, it offers useful information; (2) Intradermal testing (IDT): Used to determine the cause of delayed-type and IgE-mediated hypersensitivity reactions. It requires competence for its technique and interpretation because it has a higher risk of complications when used to diagnose acute, or IgE-mediated, allergy; (3) Patch testing is used to diagnose contact dermatitis and the other types of delayed hypersensitivity. Dermatologists and some immunologists are the ones who execute it most frequently(7).

Acute respiratory distress syndrome (ARDS)-causing SARS-CoV-2 first surfaced in Wuhan City, China in November 2019, and it spread quickly. The WHOdesignated the illness brought on by this new Covid-19 on February 11, 2020. On March 11, 2020, the WHO proclaimed Covid-19 to be a pandemic. One year after the pandemic started, in November 2020, there were 81 million confirmed cases worldwide, and there had been almost 2 million fatalities worldwide(8). RT-PCR-based detection of SARS-CoV-2 in airway patients from suspected cases is the basis for the diagnosis of Covid-19. Fever, cough, tiredness, and dyspnoea are Covid-19 primary

symptoms(9) . The signs of Covid-19, a potentially fatal and contagious illness, have just been identified. On the other hand, allergic rhinitis is a chronic condition that is not communicable, has no chance of becoming fatal, and has well-known symptoms(10).

Following the 2019 Covid-19 outbreak, local governments have urged citizens to take a variety of epidemic prevention measures, such as wearing masks, avoiding close contact with others, improving hand cleanliness, and limiting large crowd gatherings to minimise viral generation. Individuals remained at home more frequently. The amount of outdoor leisure activities was significantly reduced, and the majority of in-person buying was replaced by internet shopping. The majority of schools started later than usual, traditional classroom courses were replaced with online instruction, and working remotely became popular. When compared to years before to the Covid-19 pandemic, changes in people's lifestyles and the environment may have changed the types and frequencies of allergens to which people were exposed. Uncertainty surrounds the Covid-19 pandemic's potential impact on allergy illnesses.

In patients with respiratory allergies, avoiding both indoor and outdoor allergens is seen to be the most effective main preventive approach. Previous researchers hypothesised that Covid-19 lockdowns may reduce allergy populations' exposure to nasal irritants (such as pollen) in heavily industrialised, polluted urban regions(11). Patients with AR, however, might be more exposed to indoor allergens such dust mites or pet hair, as well as pollutants that are linked to human activity (i.e., tobacco, cooking smoke).

Methodology

Study design: This study was conducted in Dept of ENT of Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan between January 2022 to November 2022 as a prospective study and the data was compared retrospectively with data available between January 2019 to November 2019.The consent of Institutional ethics committee was taken.

Study population: All the patients in age group of 18 – 60 years with complaint of nasal allergies and gave consent for the study were included in the study. The exclusion criteria were patients with recent history of anaphylaxis, recent exacerbation of asthma, recent history of severe dermatographism and recent intake of anti-allergy drugs. A total of 596 patients were included in the study. All these patients underwent Skin prick tests for common allergens. Histamine was used as positive control and saline as negative control. Wheal formation of 3 mm or more than negative control was considered as sensitized.The allergens used were of Allvac Pharmaceuticals.

All these patients also underwent testing for total IgE levels in biochemistry lab of the hospital by chemiluminescence method.Out of these 596 patients, patients who had come for follow up with earlier visit being pre covid period were asked about their habit of wearing face masks. A total of 188 such patients were identified.The results were compared with retrospective results available from pre covid period between January 2019 to November 2019 for the same age group patients. A total result of 728 patients available of pre covid period were analysed.

Assessment tools: The following points were analysed (a) allergen sensitivity and allergen profile among sensitized, (b) total IgE findings among these patients, (c) and impact of face masks on patient symptoms.

Statistical analysis: The data was analysed using descriptive as well as inferential statistics. Descriptive involved the presentation of categorical variables in the form of frequency and percentage. In inferential statistics, the Pearson chi-square test was used with a significance value of <.05. Similar significance level was considered for odds ratio with 95% confidence interval. The software used was SPSS v26.

Results:

The table indicates that the chances of patient to be sensitized is nearly two times more than they are being non-sensitized. (COR= 1.70,

95% confidence interval [C. I]: 0.71-1.13). The chi-square test revealed a significant association (X2 =18.143, p= .001) indicating that period of testing had an influence on allergen sensitivity. The number of patients who were sensitized during Covid was comparatively less than those during Pre covid period (Table 1 and Figure 1).

Period	Total tested	Sensitized	Odds ratio (95% ci)	Odds ratio-p value	Chi-square value
2019 (Pre-covid)	728	568 (78%)	1.00	.001*	X2 =18.143 P= .001*
2022 (Covid)	596	403 (67.6%)	1.7 (0.71-1.13)		

Table 1: Allergen Sensitivity-

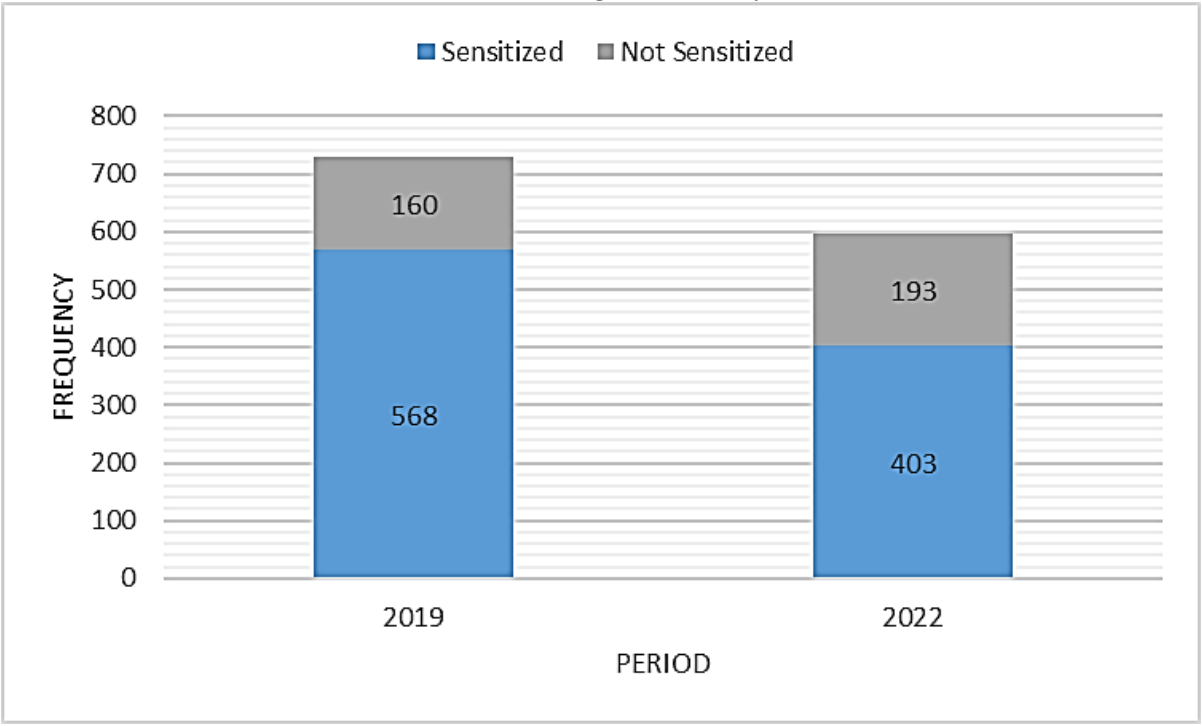

Figure 1: Allergen Sensitivity.

We see that Dust mite, Cockroach, Peanut and Wheat revealed a non-significant odds ratio indicating that they were not true predictors for sensitization and non-sensitization. Whereas Grass pollen, Mould mix and Pine mix revealed a significant odds ratio. It indicates that the patients who were allergic to grass pollen had nearly three times more chances of being non-sensitized whereas their chances of being sensitized is 0.35 (COR= 0.35, 95% confidence interval [C.I]: 0.24-0.51). Those with mould mix and pine mix as allergens had twice (COR= 0.42, 95% confidence interval [C.I]: 0.29-0.59) and four times (COR= 0.17, 95% confidence interval [C.I]: 0.12-0.24) more chances respectively of being non sensitized. Our study also saw that sensitization to indoor allergens like Dust mite, Cockroach and Food allergens like Peanut and Wheat was increased or remained the same as compared to pre covid era. Whereas the sensitization to outdoor allergens like Grass pollen, Mould mix, Pine mix was significantly reduced (Table 2 and Figure 2).

Allergen	Total sensitized (% of total sensitized) 2019	Total sensitized (% of total sensitized) 2022	Odds ratio (95% ci)	Odds ratio –p value
Dust mite	380 (67%)	289 (72%)	1.25 (0.95-1.66)	.111
Cockroach	318 (56%)	217 (54%)	0.92 (0.71-1.19)	.509

Grass pollen	136 (24%)	40 (10%)	0.35 (0.24-0.51)	.001*
Mould mix	142 (25%)	49 (12%)	0.42 (0.29-0.59)	.001*
Peanut	85 (15%)	44 (11%)	0.70 (0.47-1.03)	.068
Wheat	11 (2%)	8 (2%)	1.03 (0.41-2.57)	.957
Pine mix	231 (42%)	41(10%)	0.17 (0.12-0.24)	.001*

Table 2: Allergen Distribution.

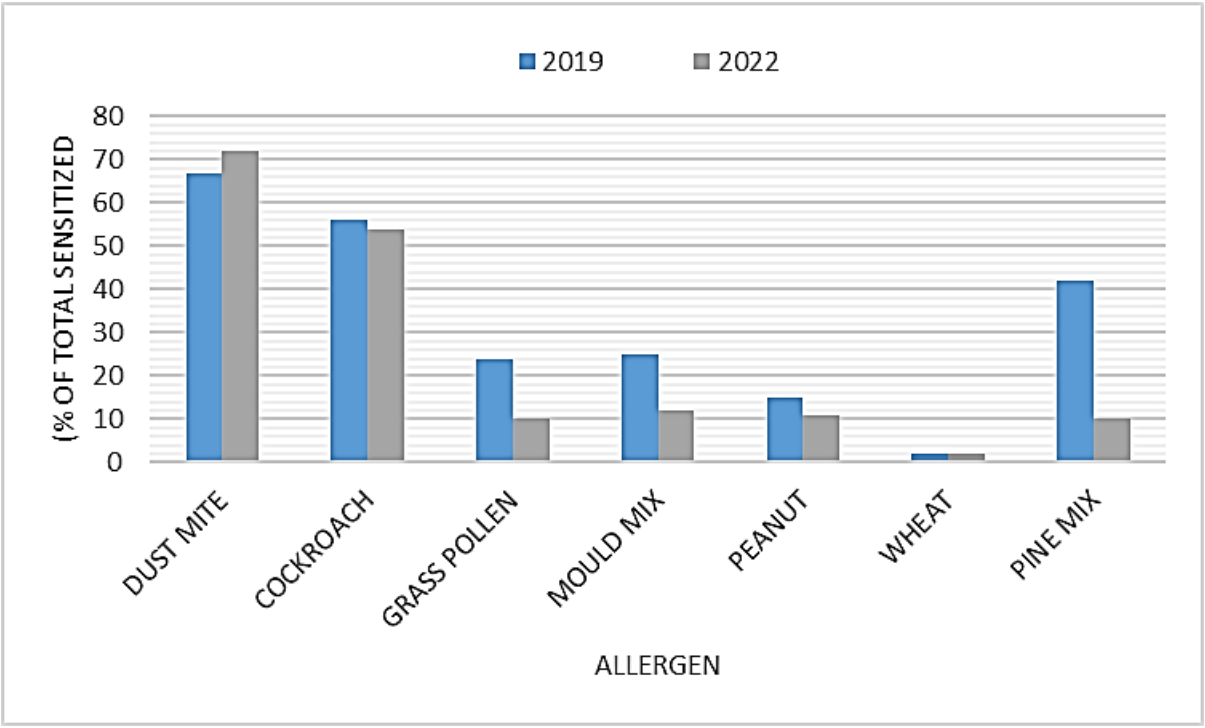

Figure 2: Allergen Distribution

The table 3 indicates that the chances of patient to exhibit improvements in symptoms is 3.74 times more than they not exhibiting them. (COR= 3.74, 95% confidence interval [C. I]: 1.66-8.39). The chi-square test revealed a significant association (X2 =11.061, p= .001) indicating that usage of mask had an impact on improvement in symptoms. Majority of the patients who did not use mask had no improvement in symptoms (Table 3 and Figure 3).

Face mask usage	**Symptoms improved**		**Total**	**Odds ratio (95% ci)**	**Odds ratio-p value**	**Chi-square value**
	Yes	**No**				
Yes	31	71	102	1.00		X2 = 11.061
No	9	77	86	3.74 (1.66-8.39)	.001*	P= .001*
Total	40	148	188			

Table 3: Face mask usage and impact among follow up patients.

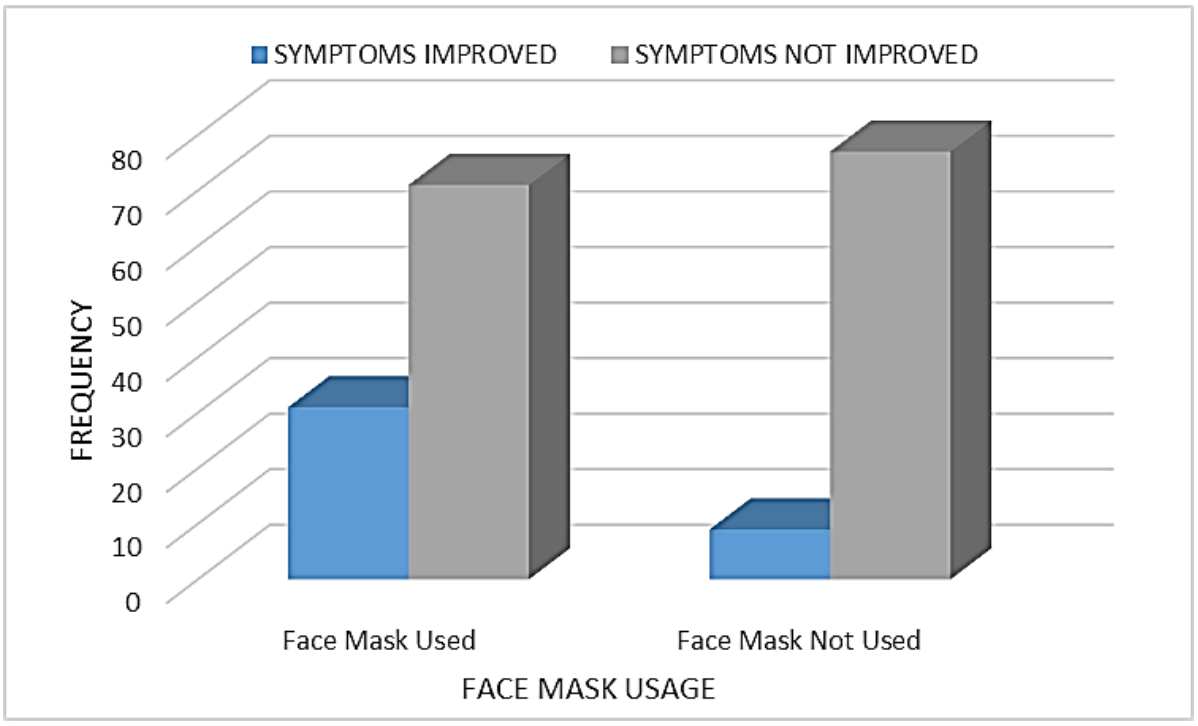

Figure 3: Face mask usage and impact among follow up patients.

We see that the chances of patients having normal IgE level are nearly twice more than they are having high IgE levels (COR= 0.57, 95% confidence interval [C.I]: 0.46-0.71). Further the chi-square test revealed a significant association (X2 =26.053, p= .001) indicating that majority of the patients had high IgE levels in pre covid period whereas it was normal for majority of them during covid.

Total IgE level	2019	2022	Odds ratio (95% CI)	Odds ratio-p value	X2
High	408 (56%)	250 (42%)	0.57 (0.46-0.71)	.001*	X2 = 26.053 P= .001*

Table 4: Total IgE levels.

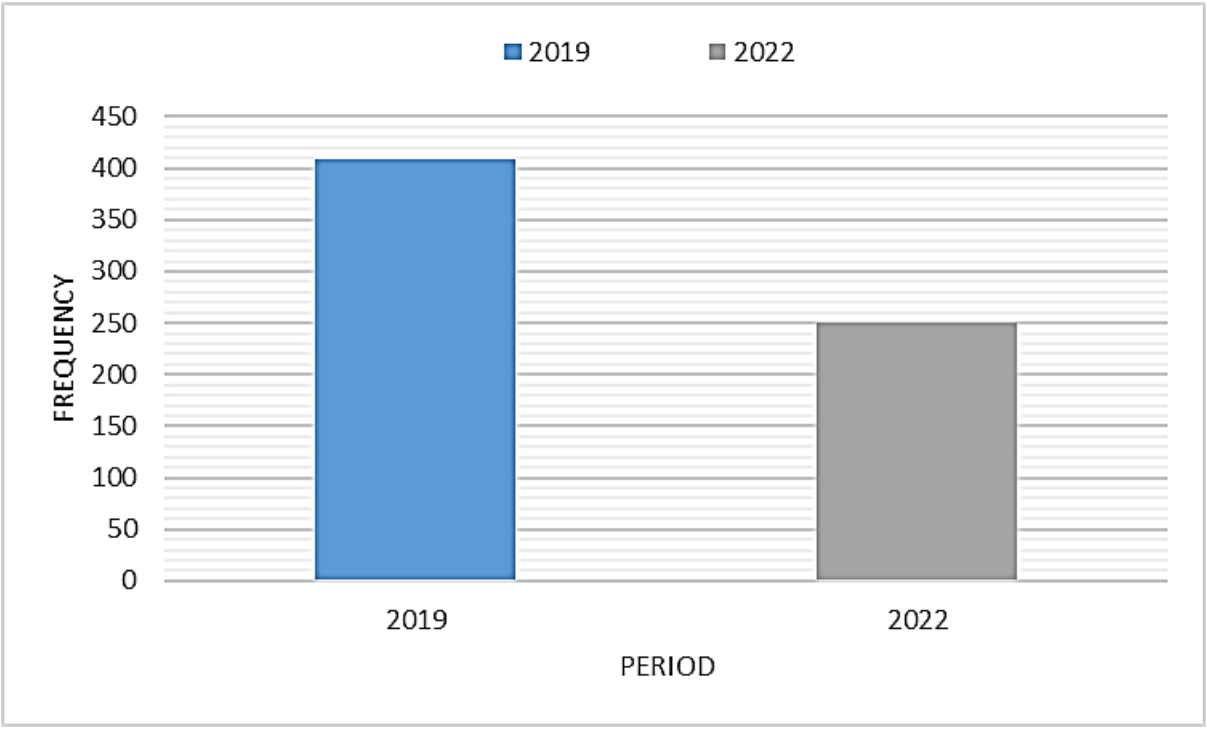

Figure 4: Total IgE levels.

Discussion

It has been estimated that the prevalence of allergies rise up to 20% of the global population (12). Most people throughout the world suffer from allergic rhinitis, which lowers quality of life. In the world, up to 40% of the population suffers from nasal disorders, such as allergic rhinitis and chronic rhinosinusitis(13). Sneezing, rhinorrhoea, and congestion of the nose are symptoms of allergic rhinitis, a type I allergic illness. It is a typical chronic illness with an incidence of about 16.7% and frequently co-occurs with combined airway disease(14). Doctors should combine the clinical history, measurement of serum IgE antibodies, skin reaction test, nasal eosinophil staining of nasal discharge, and nasal mucosa provocation test to diagnose allergic rhinitis precisely(13). As an epidemiologic test, the skin prick test (48.7%) has a higher positive predictive value than the RAST Ig E test(38.6%)(15). Pollens from trees (Alder, Birch, Cider, Pinus), grass, and weeds are the main causes of hay sickness. Due to their small weight, these pollens, which are wind-pollinated, linger in the air for a longer period(15). The WHO designated SARS-CoV-2 infection as Covid-19 (16). The Covid-19 pandemic has had a significant impact on several clinical otolaryngology issues, including infection control and patient treatment for both inpatients and outpatients(17).

In our study Dust mite, Cockroach, Peanut and Wheat revealed a non-significant odds ratio indicating that they were not true predictors for sensitization and non-sensitization. Whereas Grass pollen, Mould mix and Pine mix revealed a significant odds ratio. To stop the spread of Covid-19, isolation, travel restrictions, and national lockdowns—measures that involved extensive physical separation—were used(18).Lockdowns may thereby increase indoor allergen exposure for people with chronic illnesses like AR or asthma and disrupt their allergen treatment. The best primary preventive measure for people with respiratory allergies is to avoid both indoor and outdoor allergens(19,20).

In our study the number of patients sensitized during Covid period was comparatively less than those during pre-covid period. This could be a result of use of mask usage and decrease in air pollutants level owing to lockdown. Also in our study, usage of mask had an impact in improvement in symptoms. Patients who

were not using masks had no significant improvement of symptoms. According to research by Korsgaard et al., air pollution and allergic rhinitis are related. They identified air pollution as a significant factor in allergic rhinitis(21).Similarly in a study by Dayal et al., since the start of the epidemic and the application of lockdown, there has been an almost 25% decrease in the number of patients with allergic rhinitis(15).According to Gelardi et al., quarantine at home for weeks increased dust mite exposure and significantly exacerbated nasal symptoms in Italian individuals with dust mite allergies(19). In contrast, Geraldi et al. observed that in a comparable trial involving patients with pollen allergies, these patients displayed a significant reduction in allergy symptoms during the lockdown, likely as a result of lesser allergen exposure(22).

Conclusion

The use of face masks by our community as a form of SARS CoV 2 protection has undergone a significant behavioural change. Regular mask wear has prevented all allergens from entering and reacting with nasal mucosa, aside from the drop in pollution levels. Hence, pandemic induced facemask habits and indoor activities have significantly reduced the incidence of hay fever incidents. However, people with AR may be more sensitive to indoor allergens such dust mites or pet hair, as well as pollution associated with human activity (i.e., tobacco, cooking smoke). Our study also shows that the sensitization to outdoor allergens like Grass pollen, Pine mix and Mould mix has significantly reduced as compared to indoor allergens like Dust mite, Cockroach and Food allergens during Covid period.

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