Original Article

Prevalence Of Allergic Fungal Rhinosinusitis Among Patients Having Nasal Polyposis

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Abstract

Objective: To assess the prevalence of allergic fungal rhinosinusitis among patients with nasal polyps and associate it with risk factors

Methods: This cross-sectional study design was conducted at the ENT department of Combined Military Hospital Quetta, from January to December 2024. One hundred and sixty-three adult patients presenting with bilateral nasal polyps were enrolled in the study. All the patients underwent functional endoscopic sinus surgery, and the histopathology sample reports were evaluated. Patients were assessed according to the Bent and Kuhn diagnostic criteria for allergic fungal rhinosinusitis, which include the presence of nasal polyps with characteristic double-density CT findings, fungal hyphae on fungal microscopy, and the presence of eosinophilic mucin on histopathology samples, and were labelled as having allergic fungal rhinosinusitis.

Results: Out of 163, there were 76 (46.6%) males and 87 (53.4%) females with a mean age of 49.10±9.4 years. Allergic fungal rhinosinusitis was found in 50 (30.7%) of the patients. Females were more commonly found to have allergic fungal rhinosinusitis as compared to males (34.0% vs 66.0%, p=0.032). A higher percentage of patients with allergic fungal rhinosinusitis were found to have a history of allergy (p<0.001), diabetes (p<0.001) and hypertension (p=0.001) as compared to those without allergic fungal rhinosinusitis.

Conclusion: The frequency of allergic fungal rhinosinusitis was reported to be 30.7% among patients presenting with nasal polyps, where the mean nasal score was higher among such patients, along with various risk factors, including gender, history of allergy, diabetes and hypertension.

Keywords: Nasal polyps, allergic fungal sinusitis, risk factors, allergy, fungal infection

Introduction

Nasal polyps are among the most commonly reported conditions in otorhinolaryngology clinics in Pakistan.[1] These glistening, edematous, non-bleeding masses result from chronic inflammation of the paranasal sinuses, leading to polypoidal mucosal growth. Nasal polyps can manifest unilaterally or bilaterally and are often associated with comorbid conditions such as asthma and allergic rhinitis. Notably, allergic fungal rhinosinusitis is frequently observed in conjunction with nasal polyps and is the primary focus of this study.[2]

The initial treatment for nasal polyps, with or without allergic fungal rhinosinusitis, typically involves medical management using topical corticosteroid nasal sprays, systemic steroids, and courses of antibiotics, all aimed at reducing inflammation and polyp size. Literature reported that among patients with nasal polyps, undergoing functional endoscopic sinus surgery (FESS), 23.7% of these were found to have allergic fungal rhinosinusitis.[3] Local studies have reported the prevalence of allergic fungal rhinosinusitis among patients with nasal polyps ranging from 20.8% to 40.7%.[3,4] Furthermore, two independent studies involving 216 patients identified allergic fungal rhinosinusitis in 20.8% of cases, demonstrating the utility of plain CT scans of the nose and paranasal sinuses in detecting heterogeneous densities caused by fungal presence.[4-6]

Risk factors for the development of nasal polyps and their association with allergic fungal rhinosinusitis include conditions such as nasal allergies, a familial predisposition to the disease, and asthma.[7] These factors contribute to a heightened immunological response, predisposing individuals to chronic inflammation of the sinonasal mucosa. Allergic fungal rhinosinusitis represents an exaggerated allergic reaction to fungal antigens, which leads to the formation of sinonasal polyposis. This condition is characterised by the presence of eosinophilic mucin containing distinctive microscopic features, such as Charcot-Leyden crystals, eosinophils, and fungal hyphae, observable through detailed histopathological and fungal microscopic examinations.[8-9]

Allergic fungal rhinosinusitis frequently involves bilateral sinuses and is associated with the involvement of multiple paranasal sinuses, leading to structural and functional impairments in affected individuals. Computed tomography (CT) imaging of the nasal and paranasal sinuses often reveals heterogeneous densities, attributed to the accumulation of eosinophilic mucin and fungal elements. This imaging modality plays a critical role in identifying the extent of sinus involvement and detecting features indicative of allergic fungal rhinosinusitis.[10]

On a systemic level, allergic fungal rhinosinusitis is associated with marked immunological abnormalities. Approximately 90% of patients exhibit elevated serum eosinophil counts and increased serum immunoglobulin E (IgE) levels, reflecting the underlying allergic and inflammatory processes driving the disease. These findings underscore the importance of immunological markers in both diagnosing and monitoring the

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condition.[11] The most definitive diagnostic criterion for allergic fungal rhinosinusitis is the identification of eosinophilic mucin within nasal secretions or polypoidal tissue, as confirmed by histopathological analysis. This hallmark finding, combined with clinical, radiological, and serological data, establishes the diagnosis and informs targeted treatment strategies for affected patients. Treatment strategies for allergic fungal rhinosinusitis include medical therapy, such as steroid nasal sprays, antihistamines, and antibiotics. The surgical approach of choice is functional endoscopic sinus surgery (FESS), although open surgical procedures like Caldwell-Luc operations, external ethmoidectomy, or front ethmoidectomy have also been employed in past years.[12]

This study aimed to assess the prevalence of allergic fungal rhinosinusitis among patients with nasal polyps and associate it with risk factors. The findings of this research will inform resource allocation and guide the development of strategies for regular screening of high-risk patients. Early diagnosis and timely intervention are expected to reduce morbidity and improve the quality of life for affected individuals.

Materials And Methods

We conducted this descriptive cross-sectional study at the ENT of Combined Military Hospital Quetta, from January to December 2024. Before starting the participant enrollment, the study proposal was submitted for ethics approval to the ethics committee of the institution, and the synopsis was approved by the College of Physicians and Surgeons, Pakistan, as well. The minimum required sample size was 163, calculated by using the WHO sample size calculator, where parameters included 12.1%,[13] prevalence of allergic fungal rhinosinusitis among patients with sinonasal polyps, 95% level of confidence, 80% study power and 5% margin of error. The eligible participants were enrolled in the study using a non-probability consecutive sampling technique. All adult patients more than 18 years of age, of either gender, presenting with bilateral nasal polyps assessed on examination by anterior rhinoscopy using the Lung and Kennedy scoring method,[11] were enrolled in the study. Patients were excluded from the study if they were unfit for general anaesthesia or surgery, immunocompromised, pregnant or lactating, or had malignancies of the nose and paranasal sinuses. Additionally, individuals with nasal obstruction caused by conditions other than nasal polyps, such as a deviated nasal septum, turbinate hypertrophy, nasal mass, malignancy, or foreign body, were also excluded.

Before data collection, the enrolled participants were briefed about the purpose, procedure, risks and benefits of the study, followed by taking informed consent from each participant. Following informed consent, all the participants were examined in detail, and data were collected. The demographic data, including patient age and gender, was collected, followed by clinical data including duration of symptoms and history of comorbidities. All the patients underwent functional endoscopic sinus surgery (FESS), and the histopathology sample reports were evaluated. Patients were evaluated according to Bent and Kuhn diagnostic criteria for allergic fungal rhinosinusitis, which includes the presence of nasal polyps with characteristic double density CT findings, fungal hyphae on fungal microscopy and presence of eosinophilic mucin on histopathology sample, were labelled as allergic fungal rhinosinusitis. A pre-designed questionnaire was used to collect all the information.

Data was managed by using the SPSS (version 23.0) software. Normality of quantitative data was assessed by the Kolmogorov-Smirnov test, and the data were found to be normally distributed. For continuous variables, including age, nasal polyp score and duration of disease, means and standard deviations were reported. For categorical variables, including gender, history of diabetes, hypertension, CT scan double density finding, microscopic finding of hyphae, eosinophilic mucin on histopathology and allergic fungal rhinosinusitis frequency and percentages were reported. Comparison of risk factors, including gender, history of allergy and comorbidities, was done among patients with or without allergic fungal rhinosinusitis. An independent samples T-test was used to compare mean age, duration of symptoms and nasal polyp score between those with or without allergic fungal rhinosinusitis, while Chi chi-squared test was applied to compare the categorical variables between those with or without allergic fungal rhinosinusitis. A p-value of less than or equal to 0.05 was considered significant.

Results

There were 163 patients with nasal polyps enrolled in the study. There were 76 (46.6%) males and 87 (53.4%) females with a mean age of 49.10±9.4 years. The mean duration of symptoms was 12.1±6.9 months. Allergic fungal rhinosinusitis was found among 50 (30.7%) patients out of a total of 163 patients, as shown in Figure 1. Among patients with allergic fungal rhinosinusitis, the mean duration of symptoms was longer as compared to those with no allergic fungal rhinosinusitis (14.2±7.2 vs 11.3±6.6, p=0.013). The mean polyp score was significantly higher in patients with allergic fungal rhinosinusitis as compared to those without allergic fungal rhinosinusitis (2.2±0.75 vs 1.75±0.73, p<0.001). Regarding age, the patients with allergic fungal rhinosinusitis were older as compared to those without allergic fungal rhinosinusitis (55.86±7.8 vs 46.12±8.5, p<0.001).

Table 1: Comparison of allergic fungal rhinosinusitis parameters

	Overall	Allergic fungal rhinosinusitis		
		Yes (n=50)	No (n=113)	p
Double density on CT PNS				
Yes	74 (21.2%)	50 (100%)	24 (21.2%)	<0.001
No	89 (78.8%)	0 (0%)	89 (78.8%)	
Fungal hyphae				
Yes	75 (46.0%)	50 (100%)	25 (22.1%)	<0.001
No	88 (54.0%)	0 (0%)	88 (77.9%)	
Eosinophilia mucin on histopathology				
Yes	83 (50.9%)	50 (100%)	33 (29.2%)	<0.001
No	80 (49.1%)	0 (0%)	80 (70.8%)	

Regarding gender, it was found that females were significantly more likely to have allergic fungal rhinosinusitis as compared to males. Out of 87 females, allergic fungal rhinosinusitis was found in 54 (37.9%), while among 76 males, it was reported in only 17 (22.4%), p=0.032). Double density on CT scan paranasal sinuses was observed among 74 (45.4%) patients, fungal hyphae were observed in 75 (46.0%) patients, and eosinophilic mucin on histopathology was found among 83 (50.9%) of the patients. These parameters are compared among those with and without allergic fungal rhinosinusitis in Table 1. In terms of risk factors, overall, the history of allergy was reported in 117 (71.8%) of the patients with nasal polyps, whereas 64 (39.3%) had diabetes and 88 (54.0%) had hypertension. The risk factors are compared among those with and without allergic fungal rhinosinusitis in Table 2. The higher percentage of patients with allergic fungal rhinosinusitis was found to have a history of allergy (p<0.001), diabetes (p<0.001) and hypertension (p=0.001) as compared to those without allergic fungal rhinosinusitis.

Table 2: Comparison of risk factors with the presence of allergic fungal rhinosinusitis

Risk factors	Overall	Allergic fungal rhinosinusitis		p
		Yes (n=50)	No (n=113)	
Gender				
Male	76 (46.6%)	17 (34.0%)	59 (52.2%)	0.032
Female	87 (53.4%)	33 (66.0%)	54 (47.8%)	
History of allergy				
Yes	117 (71.8%)	50 (100%)	67 (59.3%)	<0.001
No	46 (28.2%)	0 (0%)	46 (40.7%)	
History of diabetes				
Yes	64 (39.3%)	34 (68.0%)	30 (26.5%)	<0.001
No	99 (60.7%)	16 (32.0%)	83 (73.5%)	
History of hypertension				
Yes	88 (54.0%)	37 (74.0%)	51 (45.1%)	0.001
No	75 (46.0%)	13 (26.0%)	62 (54.9%)	

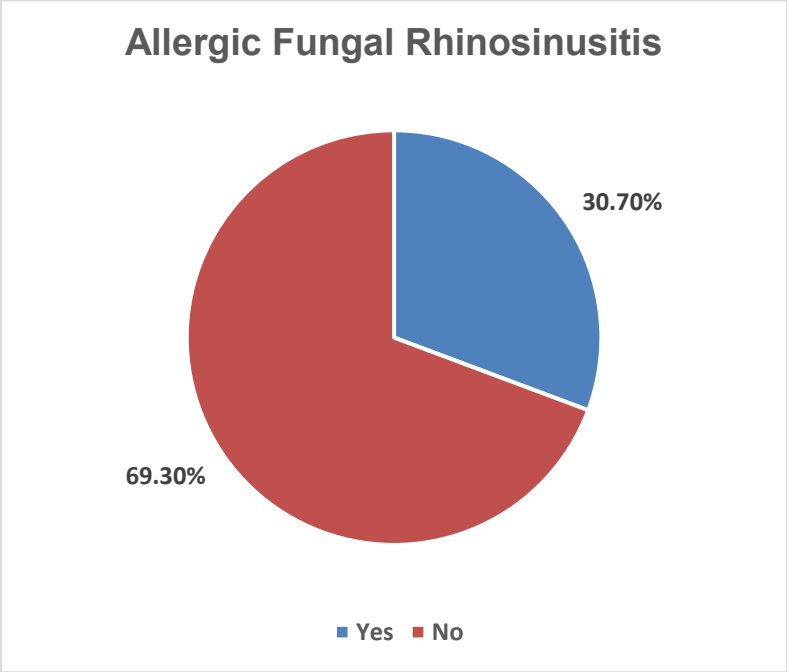

Figure 1: Frequency of allergic fungal rhinosinusitis among patients with nasal polyps (n=163)

Discussion

Our study included 163 patients with nasal polyps, of whom 50 out of 113 patients were found to have allergic fungal rhinosinusitis, and the prevalence was calculated to be 30.7%. Allergic fungal rhinosinusitis was diagnosed based on Bent and Kuhn diagnostic criteria, including the presence of nasal polyps with characteristic double density CT findings, fungal hyphae on fungal microscopy and the presence of eosinophilic mucin on histopathology. In terms of risk factors, a significant relationship was found between allergic fungal rhinosinusitis and age, gender, history of allergy, and comorbidities.

A study conducted by Dhanani et al reported a 23.7% prevalence of allergic fungal rhinosinusitis among 114 patients presenting with nasal polyps.[3] The prevalence reported by the authors is slightly lower than what was reported in our study, i.e., 30.7%. This can be due to differences in techniques used to diagnose allergic fungal rhinosinusitis. The authors reported a significant association of allergic fungal rhinosinusitis with various risk factors, including smoking, allergy, asthma and other comorbidities.[3] Similarly, in the current study, we reported a significant association of allergic fungal rhinosinusitis with a history of allergy and comorbidities, including diabetes and hypertension.

Qureshi SR et al reported similar results in their study, including 115 patients with nasal polyps, showing 22.0% prevalence of allergic fungal rhinosinusitis.[14] The prevalence reported by authors is slightly lower than what was reported in the current study. Querishi et al also reported a significant association with gender, where more females were found to be diagnosed with allergic fungal rhinosinusitis. Similarly, in the current study, more females were found to have allergic fungal rhinosinusitis as compared to males (p=0.032).

It was reported by Shafick PB et al that 13.9% of the patients included in their study were found to have allergic fungal rhinosinusitis, 80% of whom were found to have Aspergillus fumigatus, while 20% had Candida Albicans on fungal culture test.[15] The prevalence reported by authors was quite lower than what was reported in the current study, the reason for which can be that a limited number of participants were included in the study by Shafick PB et al, while fungal culture was not performed in the present study due to resource limitations.

Similarly, Hussein et al also conducted a study to explore the prevalence of allergic fungal rhinosinusitis among patients with nasal polyps. The authors reported that 45% of patients with nasal polyps were diagnosed with allergic fungal rhinosinusitis.[16] The reported prevalence is a bit higher than what was reported in the current study. The authors reported that patients with allergic fungal rhinosinusitis were found to have a younger age group, low socioeconomic status, exposure to dust, living in crowded places, smokers and comorbidities.[16] In the current study, we observed a similar association in patients with allergic fungal rhinosinusitis to have risk factors including allergic history, diabetes and hypertension.

Conclusions

The frequency of allergic fungal rhinosinusitis was reported to be 30.7% among patients presenting with nasal polyps, where the mean nasal score was higher among such patients, along with various risk factors including gender, history of allergy, diabetes and hypertension.

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