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Prevalence of allergic fungal sinusitis among patients with nasal polyposis

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Abstract

Objective: To determine the frequency of allergic fungal sinusitis among patients with nasal polyps, and to compare Lund-Mackay scores of patients with and without allergic fungal sinusitis.

Methods: The cross-sectional longitudinal study was conducted at a tertiary healthcare centre in Karachi, Pakistan, from December 2016 to November 2018, and comprised patients with sinonasal polyposis undergoing surgery. The patients were categorised as having allergic fungal sinusitis when histopathology showed allergic mucin with fungal hyphae and culture was positive for fungal growth. Lund-Mackay scoring of each patient was noted and mean scores of allergic fungal sinusitis and non-allergic fungal sinusitis patients were compared. Data was analysed using SPSS 25.

Results: Of the 114 patients, 61(53.5%) were males. The overall mean age was 37.3±15.3 years. Of the total, 27(23.7%) patients had allergic fungal sinusitis. There was a significant relationship between asthma and allergic fungal sinusitis (p=0.03). The mean Lund-Mackay score was significantly higher for allergic fungal sinusitis patients (p<0.01). Recurrence was seen in 11(9.6%) cases.

Conclusion: About one-fourth of patients with nasal polyps had allergic fungal sinusitis, and such patients showed significantly high mean Lund-Mackay score.

Key Words: Allergic fungal sinusitis, Frequency, Rhinosinusitis, Lund-Mackay score, Nasal polyp.

Introduction

Allergic fungal sinusitis (AFS) was recognised as a distinct and separate clinical disorder for the first time in 1976(1) and it has become increasingly well-defined in the last couple of decades(2). AFS is known to be a type I hypersensitivity reaction. AFS patients may present with unilateral or bilateral nasal polyps(3) and are diagnosed by the presence of distinctive histological findings(2).

In 1994, a diagnostic criterion focussed on the characteristic features of AFS which included immunological, radiographical and histological features. These features included type I hypersensitivity, presence of polyps in sinonasal region, typical features on CT-PNS, cultures positive for fungus and fungal elements present in allergic mucin without tissue invasion(4).

Geographical location has an impact on AFS incidence, with higher incidence at more humid areas. Most commonly it is seen among adolescents and young adults in second decade of life(2). Male and females are affected equally with ratio of 1:1. Some theories suggest that polyps develop due to conditions causing chronic inflammation in nose and PNSs(5).

Multiple epidemiological studies found only 1-2% of patients having nasal polyposis with positive skin prick test(6-8), showing very little evidence to the assumption that allergy predisposes to nasal polyposis because of the presence of watery rhinorrhoea and mucosal swelling along with eosinophils in nasal secretion(9). AFS is a specific term given due to the association of nasal polyps with fungal cultures(6, 10).

Around 5-10% of patients with chronic rhinosinusitis are diagnosed as AFS cases. The prevalence of AFS in Saudi Arabia was reported to be 12.1%(11), while it was 9.45% in Iran(12).

Lund et al. described a method for radiological staging of chronic rhinosinusitis based on finding of CT scan with a maximum score of 24 for both sides combined(13). It has been accepted and used widely(14). Lu-Myers et al. concluded that AFS patients had high Lund-Mackay score(15).

The current study was planned to determine the frequency of AFS in patients with nasal polyps, and to compare the Lund-Mackay scores of patients with and without AFS.

Patients and Methods

The cross-sectional longitudinal study was conducted at a tertiary healthcare centre in Karachi, Pakistan, from December 2016 to November 2018. Exemption was taken from the ethics review committee of the Aga Khan University Hospital, Karachi. The sample size was calculated using OpenEpi(16) calculator with AFS frequency 12.1%(11), precision 6% and confidence level 95%. The sample was raised using non probability consecutive technique.

All patients of either gender with sinonasal polyposis, diagnosed on the basis of anterior rhinoscopy, rigid endoscopy and CT-PNS, and undergoing endoscopic

sinus surgery were included. Those having previous history of surgery and patients with incomplete records were excluded.

Lund-Mackay scoring based on CT-PNS of each patient was done by two radiologists and the mean was taken as the final score. Sinonasal contents removed during surgery were sent for histopathology and fungal culture to look for allergic mucin with fungal hyphae and the growth of fungus. AFS was diagnosed when histopathology showed allergic mucin with fungal hyphae, and culture was positive for fungal growth. All patients were followed up for a minimum duration of 12 months to look for recurrence.

Data was analysed using SPSS 25. Age and Lund-Mackay scores were expressed as mean and standard deviation. Qualitative variables, including gender, presence of asthma, allergy and pets, smoking habit, residence, occupation, AFS and recurrence, were reported as frequency and percentages. Effect modifiers, including age, gender, presence of asthma, allergy and pets, smoking habit, residence and occupation, were stratified using Chi-square test. Lund-Mackay scores of non-AFS and AFS patients were compared using independent t test. $P < 0.05$ was considered significant.

Results

Of the 114 patients, 61(53.5%) were males. The overall mean age was 37.3 ± 15.3 years. Of the total, 27(23.7%) patients had AFS, while the rest were in the category of chronic hyperplastic rhinosinusitis (Table 1).

There were 19(83.3%) non-smokers, 87(76.3%) patients had allergic rhinitis and 19(16.7%) were asthmatic. The presence of asthma had a significant relationship with AFS ($p=0.03$), while the other variables had no significant relationship with AFS development of AFS (Table 2).

The mean Lund-Mackay score for non-AFS was significantly lower compared to AFS patients ($p < 0.01$).

Overall recurrence on follow-up was found in 11(9.6%) cases; 4(36.4%) AFS cases and 7(63.6%) non-AFS. Of all these cases, 8(72.7%) were managed medically and 3(27.3%) underwent repeat endoscopic sinus surgery.

Discussion

The current study comprised 114 patients with preoperative diagnosis of sinonasal polyposis. AFS was proven in 27(23.7%) on the basis of histo-pathological features and positive fungal cultures.

A study reported 26.7% AFS incidence in patients with chronic rhinosinusitis(17). An incidence of 7% was reported among patients with nasal polyps(18). The prevalence of AFS among patients in Saudi Arabia was reported to be 12.1%(11). Also, a study in Iran reported AFS prevalence of 9.45%(12).

The current study followed up on all the patients for a minimum of 12 months, and 11(9.6%) cases presented with recurrent disease; 4(36.4%) AFS and 7(63.6%) non-AFS patients. A study showed recurrence rate to be 19.54%(12). A retrospective study reported recurrence rate of 60% with a mean follow-up of 40 months(19). Shorter follow-up period could be the cause of lower rate of recurrence reported in the current study. Further, 19(16.7%) cases with sinonasal polyposis were asthmatic in the current study, with 8(29.6%) being AFS-positive ($p = 0.03$). A study reported association of asthma with nasal polyposis in 27.5% cases and only 2(16.7%) were AFS patients ($p > 0.05$)(12). One study reported association of asthma with sinonasal polyps in 25(27.5%) patients compared to just 1(9%) with AFS(11). Further, AFS and non-fungal eosinophilic mucin rhinosinusitis combined may have resulted in high rates of association with asthma(20).

In 27 cases of AFS, aspergillus (A.) species were revealed in 25 cases; A. fumigatus in 23 and A. clavatus in 2 cases. One case revealed chrysosporium species and 1 revealed bipolaris and there was no significant difference in the clinical course of patients ($p>0.05$). Similar findings were reported earlier from the Middle East, while dematiaceous is the most common found organism in the United States(11, 12, 21).

In the current study, the mean Lund-Mackay score was 18.8 for AFS patients compared to 13.2 in non-AFS patients. Similar significant difference was seen in an earlier study(12).

Conclusion

The frequency of AFS among patients with nasal polyps was 23.7% and the mean Lund-Mackay score was significantly higher in patients with AFS. Findings suggest that while managing patients with nasal polyps, AFS possibility should also be considered.

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209 **Table 1: Prevalence of allergic fungal sinusitis (AFS)**

<u>Variables</u>		<u>Frequency (n)</u>	<u>Percentage (%)</u>
<u>Allergic mucin with fungal hyphae on histology</u>	Positive	27	23.7%
	Negative	87	76.3%
<u>Fungal Culture</u>	Positive	54	47.4%
	Negative	60	52.6%
<u>Allergic Fungal Sinusitis</u>	Positive	27	23.7%
	Negative	87	76.3%

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229 **Table 2: Distribution of risk factors and relationship with allergic fungal**
 230 **sinusitis (AFS)**

<u>Risk factors</u>		<u>Frequency</u>	<u>Percentage</u>	<u>Allergic Fungal Sinusitis</u>		<u>P</u>
		<u>(n)</u>	<u>(%)</u>	Positive (%)	Negative (%)	<u>Value</u>
<u>Smoker</u>	Yes	19	16.7%	3 (18.7%)	16 (81.3%)	0.38
	No	95	83.3%	24 (25.2%)	71 (74.8%)	
<u>Allergy</u>	Yes	87	76.3%	21 (24.1%)	66 (75.9%)	0.83
	No	27	23.7%	6 (22.2%)	21 (77.8%)	
<u>Asthma</u>	Yes	19	16.7%	8 (42.1%)	11 (57.9%)	0.03
	No	95	83.3%	19 (20%)	76 (80%)	
<u>Pets</u>	Yes	30	26.3%	4 (13.3%)	26 (16.7%)	0.12
	No	84	73.7%	23 (27.3%)	61 (72.7%)	
<u>Residence</u>	Urban	89	78.1%	20 (23.5%)	69 (76.5%)	0.56
	Rural	25	21.9%	7 (28%)	18 (72%)	
<u>Occupation</u>	Indoor	73	64%	20 (31.7%)	53 (68.3%)	0.21
	Outdoor	41	36%	7 (17.1%)	34 (82.9%)	

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