International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-07-256*

Prevalence of Allergic Fungal Rhinosinusitis in Patients with Sinonasal Polyposis: A Prospective Cross-Sectional Study.

Dr. Megha Annigeri[1], Dr. Swathi Radhakrishna[2*], Dr. Aishwarya S.P.[3].

[1]Assistant Professor, Department of ENT, Karnataka Medical College and Research Institute (KMCRI), Hubballi, Karnataka, India.
[2]General Senior Resident Medical Officer, Department of General Medicine & ED, Ryde Hospital, NSW, Sydney.
[3]Senior Resident, ESIC Hospital, Chennai, Tamil Nadu, India.

Correspondence:
Dr. Swathi Radhakrishna.
General Senior Resident Medical Officer, Department of General Medicine & ED, Ryde Hospital, NSW, Sydney.

Received: 21-05-2026
Revised: 19-06-2026
Accepted: 27-07-2026
Published: 31-07-2026

Abstract

Background: Sinonasal polyposis is a common clinical condition with multiple underlying etiologies. Allergic fungal rhinosinusitis (AFRS) represents an important association and is characterized by an allergic response to fungal antigens with accumulation of allergic mucin containing fungal elements without tissue invasion. Differentiation of AFRS from conventional sinonasal polyposis is clinically important because the diagnosis may influence surgical planning and postoperative medical management. ***Methods:*** A prospective cross-sectional study was conducted among patients with sinonasal polyposis who were candidates for surgical treatment at KMCRI hospital, Hubli. Patients underwent detailed clinical evaluation, computed tomography of the nose and paranasal sinuses, absolute eosinophil count and estimation of total serum immunoglobulin E (IgE). All patients underwent surgery, and surgical specimens consisting of nasal polyps and/or allergic mucin were subjected to histopathological examination and fungal culture. Histological evaluation included hematoxylin and eosin, periodic acid-Schiff and Gomori methenamine silver staining. Fungal culture was performed using Sabouraud dextrose agar. ***Results:*** Among 42 patients with sinonasal polyposis, 4 patients (9.5%) fulfilled the clinical, radiological, histopathological and mycological criteria for AFRS. All four patients with AFRS had positive fungal cultures for Aspergillus species. Three of the four patients (75%) demonstrated unilateral predominance of sinonasal disease. A history of previous nasal surgery was present in three patients (75%) with AFRS compared with four patients among the 38 patients without AFRS; this difference was statistically significant ($p<0.000$). Total serum IgE levels were significantly higher in patients with AFRS-associated sinonasal polyposis than in patients without an underlying fungal etiology ($p<0.000$). ***Conclusion:*** AFRS was identified in 9.5% of patients with sinonasal polyposis in this study. Histopathological examination and fungal culture of surgical specimens, together with clinical, radiological and immunological evaluation, are important for identifying AFRS among patients presenting with sinonasal polyposis.

Keywords: Allergic Fungal Rhinosinusitis, Sinonasal Polyposis, Nasal Polyps, Fungal Sinusitis, Aspergillus, Serum IgE.

INTRODUCTION

Allergic fungal rhinosinusitis is a distinct non-invasive form of fungal rhinosinusitis characterized by an exaggerated host response to fungal antigens rather than tissue invasion. The entity was described by Robson and colleagues in 1989 and subsequently became increasingly recognized as a clinicopathological disorder occurring in immunocompetent patients, often in association with nasal polyposis and atopy.[1,2]

Bent and Kuhn proposed a widely used diagnostic framework in 1994 that incorporated type I hypersensitivity, nasal polyposis, characteristic computed tomography findings, positive fungal staining or culture without tissue invasion, and allergic mucin containing fungal elements.[3] Subsequent studies have emphasized that fungi may be difficult to demonstrate preoperatively and that histopathological assessment of surgical material is particularly important.[4,5]

The reported prevalence of AFRS varies considerably according to geographic region, patient selection and diagnostic criteria. Published series have generally reported AFRS in approximately 5–10% of patients with chronic rhinosinusitis undergoing surgery, while studies from different regions have produced differing estimates.[6–8] In the Indian subcontinent, Aspergillus species, particularly Aspergillus flavus, have been frequently reported among fungal isolates.[9-11]

The present study was undertaken to determine the prevalence of AFRS among patients with sinonasal polyposis and to assess the clinical, radiological, immunological, histopathological and mycological features that may help distinguish AFRS from non-AFRS polyposis.

Objectives

1. To detect the co-existence of fungal elements in patients presenting with sinonasal polyposis and establish the diagnosis of AFRS.
2. To evaluate the prevalence of AFRS among patients with sinonasal polyposis.

MATERIALS AND METHODS

This was a prospective, time-bound cross-sectional study conducted in patients attending the ENT outpatient departments of Karnataka medical college and research institute (KMCRI) Hubli, Karnataka, India. The study period was from October 2014 to August 2016.

Inclusion Criteria

1. Patients between 20 to 70 years of age and of either sex.
2. Patient presenting with Symptoms of nasal obstruction, headache, mass in the nose, hyposmia/anosmia.
3. On Anterior rhinoscopic examination - nasal cavity showing polypoidal glistening mass in either or both sides, which were soft and insensitive to probing.
4. Patients with ability to understand and sign the informed consent.

Exclusion Criteria

1. Pregnant, lactating mother
2. Patients <15 years of age
3. Presence of nasal or sinus tumor
4. Known case of immunodeficiency

Clinical and Laboratory Evaluation

A structured clinical history and otorhinolaryngological examination were performed. Diagnostic nasal endoscopy documented laterality of polyposis and the presence of discharge. All patients underwent non-contrast CT of the nose and paranasal sinuses. Absolute eosinophil count and total serum IgE were measured as indicators of the allergic/immunological profile.

Surgical and Mycological Evaluation

All patients underwent surgery at the study institution. Surgical specimens, including nasal polyps and allergic mucin or caseous material when present, were submitted separately for histopathological and mycological evaluation. Histological sections were stained with hematoxylin and eosin, periodic acid–Schiff and Gomori methenamine silver stains. For fungal evaluation, specimens were processed for direct 20% potassium hydroxide examination and cultured on Sabouraud's dextrose agar with antibiotics at 25℃ and 37℃ for up to four weeks. Isolates were identified using colony morphology and lactophenol cotton blue preparation.[12]

Diagnostic Approach

AFRS was diagnosed using the combined clinical, radiological, histopathological and mycological findings in the study, consistent with the diagnostic principles described by Bent and Kuhn.[3] Particular attention was given to allergic mucin with fungal hyphae, absence of invasive fungal disease, characteristic CT abnormalities, elevated allergic markers and fungal culture.

RESULTS

No. of patients: 42

Table 1: Age Distribution

Age	Frequency	Percent
20-29	6	14.3
30-39	14	33.3
40-49	12	28.6
50-59	6	14.3
60-69	4	9.5
Total	42	100.0
Mean & Sd	40.6 ± 17.3	

In this study, the youngest was 20 years and eldest was 68 years old patient. Maximum number of cases were found to be of the age group 30-39 years (33.3%) followed by 40-49 years (28.6%). The mean age was 40.6 ±17.3.

Table 2: Sex Distribution

Sex	Frequency	Percent
Male	26	61.9
Female	16	38.1
Total	42	100.0

In this study number of male patients were 26 (61.9%) and female patients were 16 (38.1%). Male to female ratio was 1.62:1.

Table 3: Nasal Symptoms

Nasal Symptoms	Frequency	Percent
Nasal obstruction	42	100.0
Nasal discharge	42	100.0
Smell	36	85.7
Headache	22	52.4
Sneezing	34	81.0

In this study, all the 42 patients presented with the complaints of nasal obstruction and nasal discharge (100%), followed by smell abnormality (85.7%) and sneezing (81%).

Table 4a: Other Variables

Other Variables	Frequency	Percent
H/o allergy (aspirin)	1	2.4
H/o asthma	4	9.5
H/o recurrent nasal surgery	7	16.7

In this study, 4 (9.5%) out of 42 patients were asthmatics and the remaining 38 patients (90.5%) were non-asthmatic.

7 patients (16.7%) underwent repeated nasal surgery. Only one patient (2.4%) in this study had a history of aspirin sensitivity.

Table 4b

Other variables			
Recurrent Surgery	HPE		Fisher's Exact Test
	AFRS	Non-AFRS	
Present	3	4	P<0.000
Absent	1	34	

7 (16.7%) out of 42 patients had history of recurrent nasal surgery (polypectomy). 3 out of 4 patients of AFRS had history of previous nasal surgery. This difference was statistically highly significant (p<0.000) when compared to non-AFRS patients.

Table 5: Signs

Signs	Frequency	Percent
Septal deviation	18	42.9
Discharge	28	66.7
Inferior turbinate hypertrophy	13	31
Mucosa Normal	23	54.8
Mucosa pale	19	45.2

In this study on patients with sinonasal polyposis, apart from nasal polyp which was present in all the 42 patients (100%), the next commonest sign was nasal discharge which was present in 28 patients (66.7%), normal mucosa (54.8%).

Table 6: Diagnostic Nasal Endoscopy

Diagnostic Nasal Endoscopy		Frequency	Percent
Polyp on DNE	Unilateral	8	19.0
	Bilateral	34	81.0
Discharge	Present	12	28.6
	Absent	30	71.4

In this study, on DNE, nasal polyps were present unilaterally in 8 cases (19%) and bilateral in 34 (81%). Nasal discharge was present in 12 cases (28.6%) and absent in 30 (71.4%).

Table 7a: CT PNS

CT-PNS	Frequency	Percent
Unilateral	8	19
Bilateral	34	81
Hyperdensity	8	19
Bone erosion	4	9.5

On CT scan of PNS, sinonasal disease was unilateral in 8 (19%) out of 42 patients and bilateral in 34 patients (81%). Hyperdensity was present in 8 cases (19%) and bone erosion in 4 cases (9.5%).

Table 7b

CT-PNS			
Laterality	HPE		Fisher's Exact Test
	AFRS	Non-AFRS	
Bilateral	1	33	P<0.01
Unilateral	3	5	
Total	4	38	42

In this study, on CT scan of PNS, 33 out of 38 non-AFRS patients had bilateral sinonasal disease, whereas among 4 AFRS patients, 3 patients had unilateral predominance of the disease and 1 patient had bilateral sinonasal involvement. This unilateral predominance of sinonasal disease among AFRS patients was statistically significant. (p<0.01).

Table 7c

CT-PNS			
Bone erosion	HPE		Fisher's Exact Test
	AFRS	Non-AFRS	
Present	4	0	P<0.000
Absent	0	38	

In this study, on CT of PNS, bone erosion was present in all the 4 cases of AFRS. None of the patients of non-AFRS had bony erosion on CT scan of PNS. This difference was found to be statistically significant (p<0,000).

Table 8a

	AEC	Total S.IgE
Mean	509.93	603.86
Std. Deviation	203.49	697.92
Range	862.00	2937.10
Minimum	106.00	62.90
Maximum	968.00	3000.00

In this study, the mean AEC among all the 42 patients was 509.93 cells/cumm and the total serum IgE was 603.86 IU/ml.

Table 8b

Parameters	HPE				Unpaired t test	
	AFS		Non-AFS			
	Mean	Std. Deviation	Mean	Std. Deviation	t value	P value
AEC	909.00	42.03	467.92	163.43	5.32	P<0.000
Total S.IgE	2413.05	406.73	413.42	367.73	10.26	P<0.000

In this study, mean AEC among AFRS patients was 909 cells/cumm and mean total S.IgE was 2413.05 IU/ml. the mean AEC among non-AFRS patients was 467.92 cells/cumm and total S.IgE was 413.42 IU/ml. this difference in AEC and total S.IgE level was found be statistically highly significant (p<0.000).

Table 9

HPE	Frequency	Percent
Inflammatory polyp	37	88.1
Allergic mucin with fungal hyphae	4	9.5
Allergic mucin without fungal hyphae	1	2.4

In this study, all the 42 patients with sinonasal polyposis were operated at our institution. Surgical specimen was sent to Histopathological and mycological examination.

On HPE, 37 patients (88.1%) showed inflammatory polyp and 4 patients (9.5%) showed typical characteristics of allergic mucin with fungal hyphae. However in 1 case (2.4%), all though classic allergic mucin was present on HPE, fungal hyphae could not be identified.

Table 10

Fungal Culture	Frequency	Percent
Positive	4	9.5
Negative	38	90.5
Total	42	100.0

In this study, on fungal culture, growth was identified on fungal culture in 4 out of 42 patients (9.5%) and no growth was seen in the remaining 38 patients (90.5%).

Table 11: Principal findings of the study

Variable	Finding	Interpretation
Study population	42 patients	Sinonasal polyposis requiring surgery
AFRS prevalence	4/42 (9. 5%)	AFRS identified in approximately one in ten patients
AFRS fungal culture	4/4 positive	All grew Aspergillus species
Unilateral disease in AFRS	3/4 (75%)	Significant unilateral predominance; p<0.01
Bone erosion in AFRS	4/4 (100%)	Absent in non-AFRS; p<0.000
Previous nasal surgery	3/4 AFRS vs 4/38 non-AFRS	Significant association; p<0.000
Mean AEC	909 vs 467.92 cells/mm³	Higher in AFRS; p<0.000
Mean total serum IgE	2413.05 vs 413.42 IU/mL	Higher in AFRS; p<0.000

DISCUSSION

AFRS represents an important subtype of chronic sinonasal disease in which fungal exposure is associated with an exaggerated allergic inflammatory response. The condition differs fundamentally from invasive fungal rhinosinusitis because fungal elements remain within allergic mucin and do not invade viable tissue.[3,13] Recognition is important because patients may have extensive disease, recurrent polyposis and characteristic radiological changes despite an apparently typical presentation of sinonasal polyposis.

In the present study, AFRS was identified in 4 of 42 patients, giving a prevalence of 9.5%. This finding is closely comparable with the 9.45% prevalence reported by Bakhshaee and colleagues among patients with sinonasal polyposis in northeastern Iran.[14] It is also within the broad 5–10% range described in surgical chronic rhinosinusitis populations.[6,15,16] Telmesani reported a somewhat higher prevalence of 12.1% among patients with nasal polyps in the Middle East,[17] whereas Collins and colleagues reported an 8.6% prevalence of allergic fungal sinusitis in a South Australian surgical population with chronic rhinosinusitis.[18] The variation between studies may reflect differences in diagnostic criteria, geographic fungal exposure, referral patterns and methods of fungal detection.

The demographic profile of the present cohort showed a mean age of 40.6 years and male predominance. The thesis literature review notes that AFRS has often been described in younger patients and that sex distribution varies among published series, with some reporting approximately equal distribution and others a male predominance.[2,7] Because only four patients were classified as AFRS in the present study, the demographic characteristics of the AFRS subgroup should be interpreted cautiously.

The most frequent symptoms in the cohort were nasal obstruction and nasal discharge, followed by smell abnormality and sneezing. These findings are consistent with the nonspecific presentation of chronic sinonasal polyposis and reinforce the difficulty of diagnosing AFRS solely from symptoms. The thesis review notes that AFRS may resemble other forms of chronic rhinosinusitis and that a history of nasal polyposis, previous sinonasal surgery and atopy may provide useful clues.[6]

Previous nasal surgery showed a strong association with AFRS in this study: three of four AFRS patients had undergone previous nasal surgery compared with four of 38 non-AFRS patients ($p<0.000$). Recurrent disease and revision surgery are recognized features of AFRS, and historical series have documented multiple procedures in affected patients.[19] This finding may indicate that AFRS should be considered in patients with recurrent sinonasal polyposis, particularly when other characteristic features are present.

CT findings provided an important distinction between AFRS and non-AFRS polyposis. Three of four AFRS patients had unilateral disease, compared with five of 38 non-AFRS patients, and this difference was significant ($p<0.01$). All four AFRS patients had CT evidence of bone erosion, whereas no non-AFRS patient showed bone erosion. Characteristic CT abnormalities, including heterogeneous or hyperdense sinus contents and bony remodeling or erosion, have been described in AFRS.[20,21] The present observation supports the role of CT as an important component of the preoperative assessment, although CT findings alone are not sufficient to establish the diagnosis.

A marked difference in allergic markers was also observed. Mean AEC was 909 cells/mm³ in AFRS compared with 467.92 cells/mm³ in non-AFRS patients, and mean total serum IgE was 2413.05 IU/mL versus 413.42 IU/mL, respectively; both differences were highly significant ($p<0.000$). Elevated IgE and eosinophilic inflammation are consistent with the proposed hypersensitivity-mediated pathophysiology of AFRS.[2,22] The present findings therefore support the use of AEC and total serum IgE as supportive investigations rather than isolated diagnostic tests.

Histopathology was central to diagnosis. Allergic mucin with fungal hyphae was demonstrated in four patients, while one additional patient showed allergic mucin without demonstrable fungal hyphae. The latter finding illustrates an important limitation of relying on a single diagnostic modality: fungi may be difficult to demonstrate, and the literature has highlighted differences in the sensitivity of fungal detection methods.[4,5] Ponikau and colleagues also emphasized the importance of histopathological identification of allergic mucin in chronic rhinosinusitis.[5]

All four AFRS cases in the present study yielded Aspergillus species on culture. This observation is compatible with reports from India in which Aspergillus, particularly A. flavus, has been frequently identified.[9-11] In contrast, studies from other geographic regions have reported a substantial contribution from dematiaceous fungi such as Bipolaris, Curvularia and Alternaria.[7,23,24] Geographic and environmental factors may therefore influence the fungal profile of AFRS.

The study findings support a multimodal approach to AFRS diagnosis. Clinical history and endoscopy identify patients with sinonasal polyposis; CT can demonstrate characteristic distribution and bony changes; AEC and serum IgE provide evidence of an allergic phenotype; and histopathology and fungal culture provide direct evidence from surgical material. This combined approach is consistent with the diagnostic principles outlined by Bent and Kuhn.[3]

Clinical Implications

- AFRS should be considered in patients with sinonasal polyposis, particularly when disease is recurrent, unilateral or associated with marked eosinophilia/elevated serum IgE.
- CT findings such as heterogeneous hyperdensity, unilateral predominance and bony remodeling or erosion may raise suspicion for AFRS.
- Surgical material should be systematically submitted for histopathological examination and fungal culture when AFRS is suspected.
- A negative fungal study on one modality does not necessarily exclude AFRS; clinicoradiological and histopathological findings should be interpreted together.
- Recognition of AFRS is relevant to postoperative care because recurrence is common and adjunctive anti-inflammatory strategies may be required.[25,26].

CONCLUSION

The prevalence of allergic fungal rhinosinusitis among patients with sinonasal polyposis in the present study was 9.5%. All patients diagnosed with AFRS had positive fungal cultures for Aspergillus species. Unilateral predominance of disease was observed in 75% of AFRS patients. A history of previous nasal surgery and elevated total serum IgE were significantly associated with AFRS in this study.

AFRS should therefore be considered in patients presenting with sinonasal polyposis, particularly in those with recurrent disease, unilateral or asymmetric sinonasal involvement and elevated serum IgE. A combination of clinical assessment, CT imaging, histopathological examination of surgical material and fungal culture is useful for establishing the diagnosis.

REFERENCES

1. Robson JMB, Benn RAV, Hogan PG, et al. Allergic fungal sinusitis presenting as a paranasal sinus tumor. Australia and New Zealand Journal of Medicine 1989;19:351-3.
2. Manning SC, Holman M. Further evidence for allergic pathophysiology in allergic fungal rhinosinusitis. Laryngoscope 1998;108:1485-96.
3. Bent JP Kuhn FA: The diagnosis of allergic fungal sinusitis. Otol Head Neck Surg 1994;111:580-8.
4. Lebowitz RA, Waltzman MN, Jacobs JB, et al. Isolation of fungi by standard laboratory methods in patients with chronic rhinosinusitis. Laryngoscope 2002;112:2189-91.
5. Ponikau JU, Shems DA, Kern EB et al. The diagnosis and incidence of allergic fungal sinusitis. Mayo clinic proc 1999;74:877-84.
6. Allphin AL, Strauss M, Abdul-Karim, FW. Allergic fungal sinusitis: problems in diagnosis and treatment. Laryngoscope 1991;101:815-20.
7. Schubert MS, Goetz DW. Evaluation and treatment of allergic fungal sinusitis 1: demographics & diagnosis and 2. Treatment and follow up. Journ Allergy Clinic Immunology 1998;103:387-402.
8. Houser SM, Corey JP. Allergic fungal rhinisinusitis: pathophysiology, epidemiology and diagnosis. Otolaryngologic clinics of North America 2000;38:399-408.
9. Chakrabarti A, Sharma SC, Chandler J. Epidemiology and Pathogenesis of paranasal sinus mycosis. Otolaryngol Head Neck Surg 1992;107:745-50.
10. Prateek S, Banerjee G, Gupta P, et al. Fungal rhinosinusitis: a prospective study in a University hospital of Uttar Pradesh. Indian J Med Microbiol 2013;31(3):266-9.
11. Krishnan KU, Agatha D, Selvi R. fungal rhinosinusitis: a Clinocomycological perspective. Indian J Med Microbiol 2015;33(1):120-4.
12. Friedman GC, Warren R, Hartwick J, et al. Allergic fungal sinusitis. Report of 3 cases associated with dematiaceous fungi. Am J Clin Pathol 1991;96:368-72.
13. Ferguson BJ. Definitions of fungal rhinosinusitis. Otolaryngology Clinics of North America 2000;33:227-35.
14. Mehdi bakhshaee et al. the prevalence of allergic fungal rhinosinusitis in sinonasal polyposis. Eur Arch Otorhinolaryngol 2013;270:3095-8.
15. Ence BK, Gourley DS, Jorgensen NL, et al. allergic fungal sinusitis. Am J Rhinol 1990;4(5):169-78.
16. Morpeth JF, Rupp NT, Dolen WK, et al. fungal sinusitis: an update. Ann Allergy Asthma Immunol 1996;76:128-40.
17. Telmisani LM. Prevalence of allergic fungal sinusitis among patients with nasal polyps. Ann Saudi Med 2009;29(3):212-4.
18. Collins MM, Nair SB, Wormald PJ. Prevalence of noninvasive fungal sinusitis in South Australia. Am J Rhinol 2003;17(3):127-32.
19. Waxman JE, Spector JG, Sale SR, et al. Allergic Aspergillus sinusitis: concepts in diagnosis and treatment of new clinical entity. Laryngoscope 1987;97:261-6.
20. Manning SC, Merkel M, Kriesel K, et al. computed tomography and magnetic resonance diagnosis of allergic fungal sinusitis. Laryngoscope 1997;107:170-6.
21. Mukherji SK, Figueroa R, Grnsberg LE, et al. allergic fungal sinusitis: CT findings. Radiology 1998;207:417-22.
22. Manning SC, Mabry RL, Schaefer SD, et al. evidence of IgE-mediated hypersensitivity in allergic fungal sinusitis. Laryngoscope 1993;103:717-21.
23. Scott C. Manning MD and Marie Holman. Further evidence for allergic pathophysiology in Allergic fungal sinusitis. Laryngoscope 1998;108:1485-96.
24. Bartynski JM, McCaffrey TV, Frigas E. Allergic fungal sinusitis secondary to dermatiaceous fungi- Culvularia lunata and Alternaria. Otolaryngol Head Neck Surg 1990;103:32-9.
25. Marple BF. Allergic fungal rhinosinusitis: surgical management. Otolaryngologic clinics of north America 2000;33(2):409-18.
26. Kuhn AF, Javer AR. Allergic fungal sinusitis: Perioperative management, prevention of recurrence, and role of steroids and antifungal agents. Otolaryngologic clinics of North America 2000;33:419-32.