



A Study of Allergic Fungal Rhinosinusitis among Subjects Presenting with Nasal Polyposis

Authors

Dr Manju S U¹, Dr Simla S R², Dr Sabarisree M³

¹ENT Surgeon, Health services, Kerala

²Assistant Professor in ENT, SUT Medical College, Trivandrum

³Associate Professor (CAP) in Orthopaedics, Govt Medical College, Trivandrum

Corresponding Author

Dr Sabarisree M

Associate Professor (CAP) in Orthopaedics, Govt Medical College, Trivandrum

Abstract

Background: *Our study is to evaluate the prevalence of Allergic Fungal Rhinosinusitis in nasal polyposis in a tertiary care hospital and to compare the clinical features of chronic rhinosinusitis patients with nasal polyposis of fungal and non fungal aetiology.*

Materials and Methods: *The study was conducted in the Department of ENT and Department of Pathology, Medical College, Thiruvananthapuram during the period February 2009 to January 2010. 100 successive cases were taken into consideration. These were patients with nasal polyposis and chronic rhinosinusitis who were admitted to undergo surgery for the condition. The study design is a cross-sectional study.*

Conclusion: *AFRS in nasal polyposis is common in adults in the age group of 21-40. Nasal polyps without AFRS was also common in the above age group. The condition occurs more in males than in females with a male: female ratio of 1.75:1. The presenting complaints are the same as in chronic sinusitis. Nasal obstruction was the commonest complaint. The prevalence of allergic fungal sinusitis in nasal polyposis was found to be 11% in Medical College Hospital, Thiruvananthapuram.*

Keywords: *Allergic fungal rhinosinusitis, Nasal polyposis, chronic rhinosinusitis.*

INTRODUCTION

Nasal polyposis has been known to man since centuries. It is described in the Indian scriptures of 1000 BC. Later Hippocrates (460-370 BC) and prominent physicians of Arabia also recognized this condition. The word polyp comes from Greek but it was subsequently latinised to mean 'many-footed' (polypous). The ancient physicians devised various instruments for the removal of polyps including snare-like instruments and hot irons for cauterization

Nasal polyps are a nonspecific response to a variety of inflammatory conditions. A number of theories of polyp formation have emerged over the years. Some are of historical interest whereas others provide a greater insight into the pathogenesis of nasal polyps. Many causes contribute to polyp formation. The theories are divided into those that advocate a primary development and those that attribute polyp formation as a secondary event.

Fungal infection of the nose and the paranasal sinuses or fungal rhinosinusitis is a relatively

recently described entity compared to nasal polyps. It was first described by Plaignaud in 1791. In the last two decades, there has been resurgence in the interest to recognize fungal rhinosinusitis since allergic fungal rhinosinusitis was described in 1981 by Millar and Lamb. Also there is a worldwide increase in the reported incidence of mycotic infections of the nose and paranasal sinuses. This is probably the result of two factors: because of availability of better diagnostic methods and an increase in factors which predispose to fungal infection.

Association of nasal polyposis with fungal infection of the nose and paranasal sinuses is increasingly being identified, as the medical community especially otorhinolaryngologists became more aware of fungal rhinosinusitis in its various forms. Nasal polyps is seen in almost 100% cases of allergic fungal rhinosinusitis, in about 10% cases of fungal balls of nose and paranasal sinuses and is also described in invasive fungal sinusitis especially chronic invasive fungal rhinosinusitis. Hence once an association with fungal infection is made in a case of nasal polyposis and once the type of fungal rhinosinusitis is also established, management of the condition becomes easy since each form of fungal rhinosinusitis varies in its treatment protocol.

An additional interest in identifying fungal infection in nasal polyposis is due to the bone eroding characteristics in some forms of fungal sinusitis especially the invasive and allergic fungal rhinosinusitis. Because of the proximity of the nose and paranasal sinuses to important structures like the orbit and brain, early identification of fungal rhinosinusitis and its appropriate management is essential in preventing orbital, intracranial and fatal complications. Hence this study has been taken up considering the importance of the condition.

OBJECTIVES OF THE STUDY

1. To study the prevalence of Allergic Fungal Rhinosinusitis in nasal polyposis in a tertiary care hospital.
2. To compare the clinical features of chronic rhinosinusitis patients with nasal polyposis of fungal and non fungal etiology

MATERIALS AND METHODS

The study was conducted in the Department of ENT and Department of Pathology, Govt Medical College, Thiruvananthapuram during the period February 2009 to January 2010. 100 successive cases were taken into consideration. These were patients with nasal polyposis and chronic rhinosinusitis who were admitted to undergo surgery for the condition.

The study design is a cross-sectional study.

INCLUSION CRITERIA

- Nasal polyps whether ethmoidal or antrochoanal, bilateral or unilateral with chronic rhinosinusitis were taken into consideration.
- Recurrent cases of nasal polyposis were also taken in the study
- Patients of all age groups admitted with nasal polyps were considered.

EXCLUSION CRITERIA

- Cases of rhinosporidiosis with polypoidal appearance.
- Case of nasal polyps clinically which on histopathological examination were found to be neoplasms.

A detailed history in the patient was taken, Special emphasis was given to the occupation of the patient and to find any occupational exposure to dusts likely to contain fungal elements. History of nasal allergy, drug allergy, bronchial asthma, food allergy, atopic dermatitis, other allergies if any were also asked for.

A detailed clinical evaluation and examination of the patient was also done. General examination was done. Detailed ear, nose and throat

examination was done. All the relevant details were entered in the proforma.

Apart from the routine preoperative investigations absolute eosinophil count and radiological evaluation was done. Absolute eosinophil count more than 440 cells/mm³ was considered as elevated. X-ray of the paranasal sinuses was taken for all the cases. CT scan of the nose and paranasal sinus was taken by all who underwent endoscopic sinus surgery.

Once the surgical procedure, (endoscopic sinus surgery) was over the polyps and inspissated debris were collected in sterile containers containing 10% formalin and taken to the pathology laboratory for histopathological examination.

LABORATORY TECHNIQUE

The biopsied polypectomy specimen was processed with paraffin embedding and 5 sectioning and stained with haematoxylin and eosin stain and Gomorimethenamine silver stain and examined under microscope. After staining the slides were examined for fungal colonies and allergic mucin.

Diagnosis of Allergic Fungal sinusitis

The diagnosis of Allergic Fungal Sinusitis was considered if the patients fulfilled the following criteria (3 major and 2 minor criteria of Bent and Kuhn²).

1. Presence of allergic mucin in histopathology
2. Fungal stain positive
3. Presence of nasal polyps
4. Raised absolute eosinophil count
5. History of bronchial asthma

The age, gender and clinical features of those patients with AFRS and those without AFRS were compared.

Post operative Management and follow-up

All the patients were treated post operatively with systemic steroids and parenteral antibiotics. Saline

nasal irrigation was done on the first post operative day and during follow-up. Systemic steroids were started on the day of surgery itself. This early intervention takes advantage of the decreased oedema caused by surgical removal of the fungal burden and allergic mucin. The starting dose was 0.4 mg/kg/day. On obtaining histopathological report, for AFRS patients, the systemic steroids were given at a dose of 0.4 mg/kg/day for 4 days. The dose is then decreased by 0.1 mg/kg/day in cycles of 4 days until a dose of 20mg/day or 0.2 mg/kg/day whichever is greater is reached. This is continued until one month post operative visit when it is adjusted to 0.2mg/kg/day. This dose is then maintained and the patients were followed up monthly with nasal endoscopy. The patients were followed up weekly for 1 month and monthly for 6 months after surgery.

At follow up the patients were monitored for weight gain, facial puffiness and raised blood sugar levels. The condition of the nasal and sinus mucosa was assessed during each visit using endoscopy.

AFRS patients were categorized as per endoscopic mucosal staging system.

Stage 0 - No mucosal oedema/allergic mucin

Stage I - Mucosal oedema with/without allergic mucin

Stage II - Polypoidoedema with/without allergic mucin

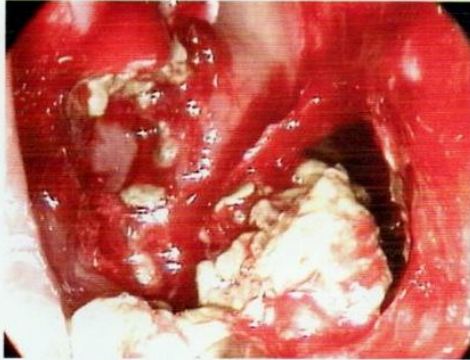
Stage III - Sinus polyps with fungal debris/allergic mucin

The prednisolone dose is then adjusted based on maintenance of Stage 0. After maintaining stage 0 for 4 consecutive months, while receiving a dose of 0.2 mg prednisolone/kg/day, the prednisolone is reduced to 0.1mg/kg/day. Intranasal steroid spray is simultaneously started (1 spray in each nostril – 50 µgm 3 times daily). If the patient stays at stage 0 for 2 additional months, the prednisolone is tapered to zero and the intranasal steroid spray is continued for one year. Nasal

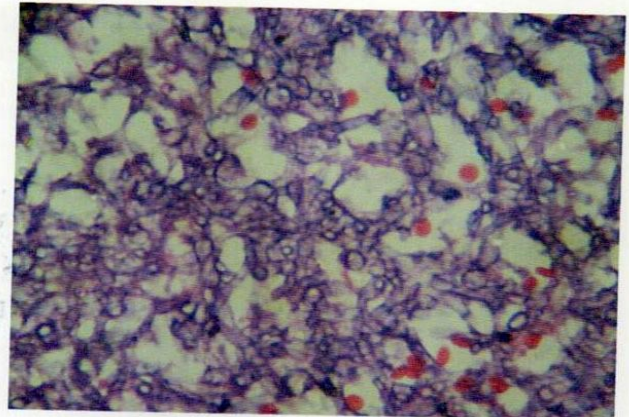
endoscopy is continued monthly for 6 months and bimonthly for one year.

If any of the patients developed systemic complications like diabetes, cataract, glaucoma or rapid weight gain, the steroids were rapidly

tapered and stopped. They were put on topical intranasal steroid sprays and were put on regular follow up.



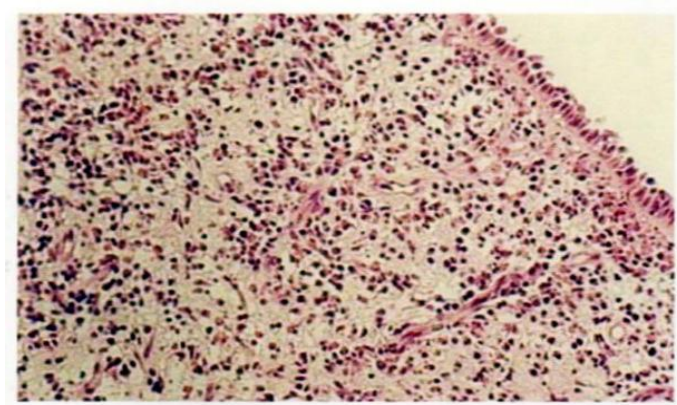
Pic. no: 3
Allergic fungal sinusitis – preoperative Endoscopic view of maxillary sinus with allergic - mucin and inspissated debris



Pic. No. 6
Fungal hyphae : H&E Stain (100 x)



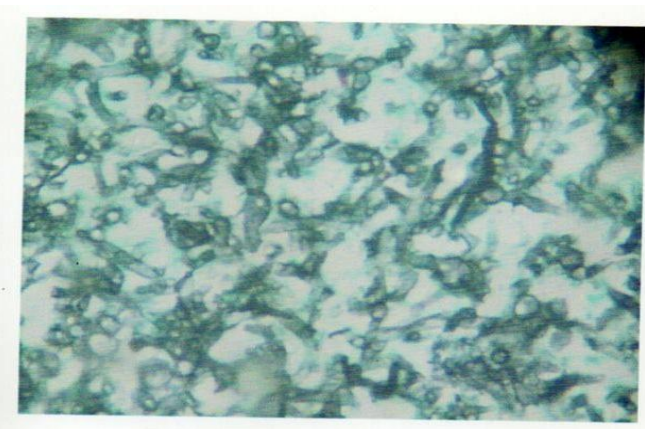
Pic. no. 4
CT scan paranasal sinuses coronal view – allergic fungal sinusitis showing areas of hyper attenuation



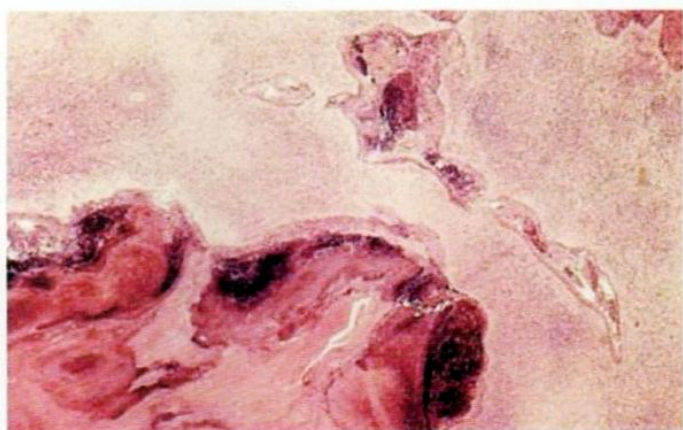
Pic. No. 7
Dense inflammatory exudate, mainly eosinophils in tissue surrounding inspissated mucous



Pic. No. 5
Nasal Polyps with allergic mucin

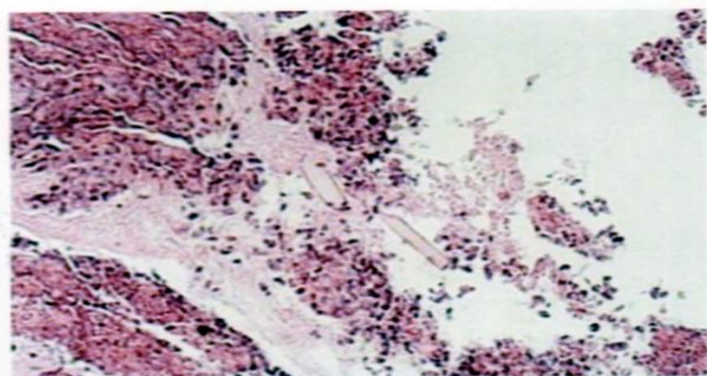


Pic. No: 8
Branching fungal hyphae in inspissated mucous –Grocot methenamine silver stain (400x)



Pic. No: 9

Low power view of inspissated mucous in distended submucous glands. The dark staining material is composed of necrotic inflammatory cells mainly eosinophils



Pic. No: 10

Necrotic inflammatory cells in inspissated mucous with Charcot Leyden crystals

RESULTS AND OBSERVATIONS

100 cases of nasal polyposis, examined, admitted and treated in the Department of ENT, Medical College Hospital, Thiruvananthapuram during the period February 2009 to January 2010 are included in the present study. The observations are given below.

Out of 100 patients, 11 patients had AFRS. All the patients had chronic rhinosinusitis. The diagnosis of AFRS was considered if they satisfy three major and two minor criteria of Bent & Kuhn².

1) AGE

Table 1: Age incidence of patients

Age	No. of patients with AFRS	%	No. of patients without AFRS	%
≤ 20	1	9	11	12.3%
21-30	5	45%	26	29.2%
31-40	4	36%	21	23.59%
41-50	1	9%	17	19%
51-60	0	0	10	11.23%
61-70	0	0	4	4.4%

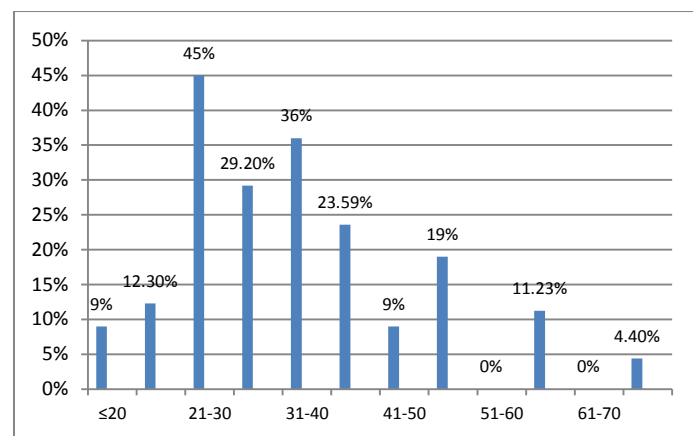


Figure 1: age incidence of patients

From the above table, it can be seen that majority of cases are in 21-30 years age group in both the groups (Patients with AFRS and patients without AFRS). Among AFRS patients, youngest was 15 years and eldest was 46 years. Among patients without AFRS, the youngest patient was 11 years and eldest was 70 years.

2) GENDER

Table 2: Gender characteristics of patients

Gender	No. of patients with AFRS	%	No. of patients without AFRS	%
Male	7	64%	59	66.3%
Female	4	36%	30	33.7%

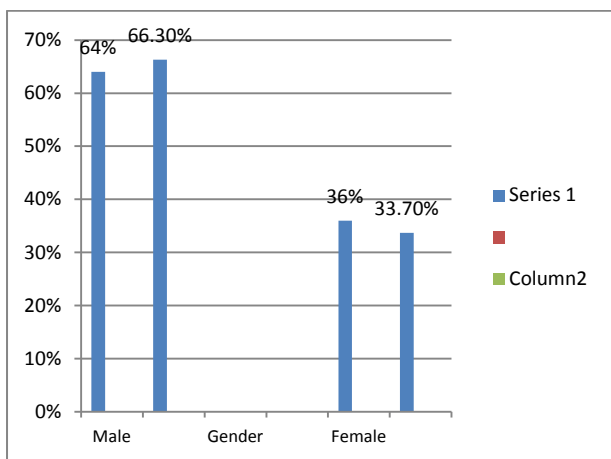


Figure 2: Gender characteristics of patients
Out of 11 patients with APRS, 64% were males and 36% females. Among 89 patients without AFRS, 66.3% were males and 33.7% females.

3) OCCUPATIONAL EXPOSURE TO DUST

Table 3: Occupational exposure to dust

Occupational exposure to dust	No. of patients with AFRS	%	No. of patients without AFRS	%
Absent	4	36%	54	60.7%
Present	7	64%	35	39.3%

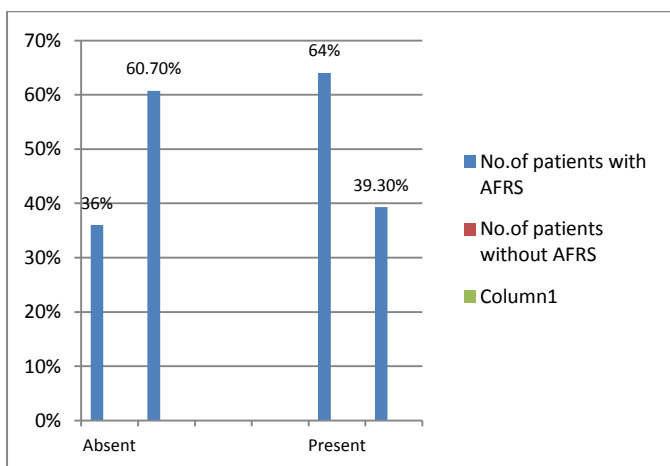


Figure 3: Occupational exposure to dust

64% of patients with AFRS had occupational exposure to dust. Among patients without AFRS, 39.3% had occupational exposure to dust.

4) COMPARISON OF CLINICAL SYMPTOMS

Table 4: Comparison of clinical symptoms

Clinical Symptoms	No. of patients with AFRS	%	No. of patients without AFRS	%
Nasal obstruction	11	100%	83	93%
Nasal Discharge	9	82%	57	64%
Headache	9	82%	35	39%
Post Nasal Drip	7	64%	21	23%
Nasal Allergy	7	64%	40	45%
Anosmia	8	73%	49	55%
Mass in nose	3	27%	3	3.4%
Facial Swelling	0	0%	2	2.2%

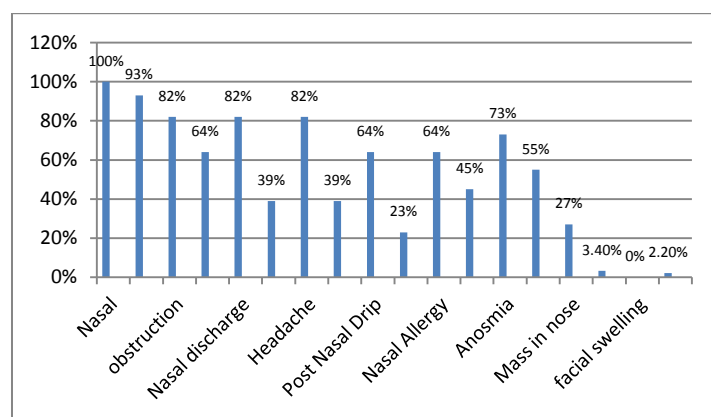


Figure 4: Comparison of clinical symptoms

Among the 11 patients with AFRS, all patients had nasal obstruction, 82% had nasal discharge, 82% had headache, 64% had post nasal drip, 64% had nasal allergy, 73% had anosmia and 27% had mass in nose. None of the patients had facial swelling / orbital symptoms.

Among 89 patients without AFRS, 93% had nasal obstruction, 64% patients had nasal discharge, 39% patients had nasal allergy, 55% patients had anosmia, 3.4% patients had mass in nose and 2% patients had facial swelling. Symptoms of patients with AFRS are almost similar to those patients without AFRS.

5) LOCAL EXAMINATION FINDINGS

Table 5: Local examination findings

Local Examination findings		No. of patients with AFRS	%	No. of patients without AFRS	%
Septum	Central	8	73%	73	92%
	Deviated	3	27%	27	7.8%
A/R	B/L polyps	11	100%	73	82%
	U/L polyps			16	18%
PNS tenderness		1	9%	7	7.8%

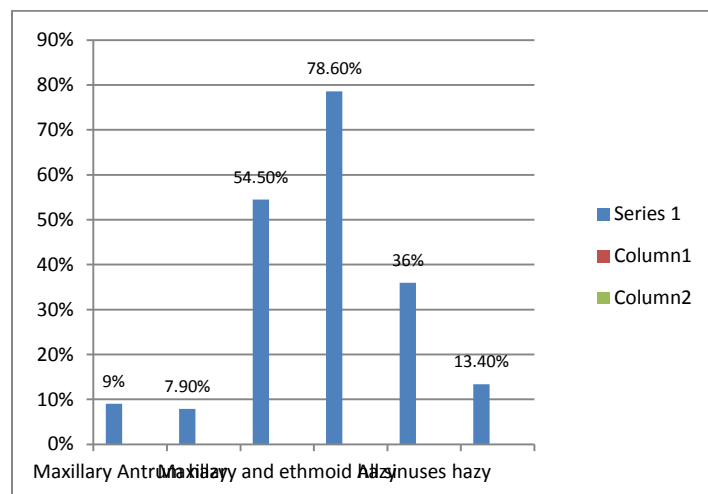


Table 6: X-ray - PNS findings

Among patients without AFRS, 12 patients had all sinuses hazy, 70 patients had both maxillary and ethmoid hazy, 7 patients had maxillary antrum haziness alone.

b) **CT Scan:** CT scan of all the AFRS patients showed heterogeneous pattern in density. Nasal polyps patients without AFRS had uniform haziness and no heterogeneous appearance patterns

SURGICAL TECHNIQUE PERFORMED

All AFRS patients, underwent functional endoscopic sinus surgery. Surgery was performed to achieve 3 goals.

1. Complete extirpation of all allergic mucin and fungal debris.
2. To impart permanent drainage and ventilation to affected sinuses
3. To provide postoperative access to previously diseased areas.

FOLLOW UP

The patients were followed up weekly for one month, monthly for 6 months and bimonthly for 1 year. During 2-6months follow up period after stoppage of prednisolone; 2 patients were in Stage III of endoscopic mucosal staging system; 2 patients in stageII, one patient in stage I and 6 patients in Stage 0. Those patients who were in StageI, II and III were planned for revision surgery.

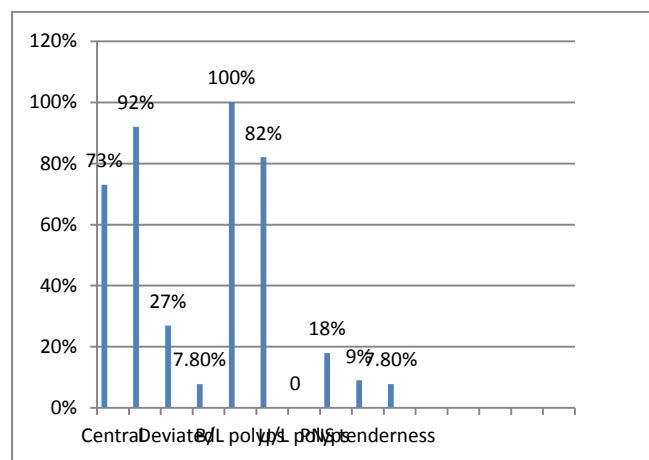


Figure 5: Local examination findings

Among 11 AFRS patients, septum was deviated in 3 patients; all patients had B/L polyps and PNS tenderness was present in 1 patient. Among patients without AFRS, septum was deviated in 7 patients, polyps were unilateral in 16 patients, B/L in 73% patients; PNS tenderness was present in 7 patients. On comparing the local examination findings, findings in AFRS patients were almost similar to those patients without AFRS.

6) RADIOLOGY

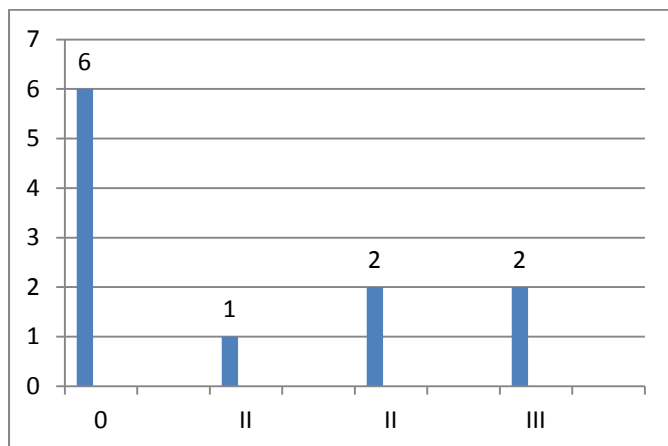
a) X-ray PNS

Table 6: X ray-PNS findings

X-Ray PNS	No. of patients with AFRS	%	No. of patients without AFRS	%
Maxillary Antrum hazy	1	9%	7	7.9%
Maxillary and ethmoid hazy	6	54.5%	70	78.6%
All sinuses hazy	4	36%	12	13.4%

Table 7: Follow up endoscopic mucosal staging

Stages	No. of patients
0	6
I	1
II	2
III	2

**Figure 7:** Follow up endoscopic mucosal staging

Three patients developed systemic complications of steroid therapy (2patients - uncontrolled diabetes, 1 patient - increased weight gain and facialpuffiness). For those patients, oral steroids were discontinued and theywere puton topical steroid sprays (1 puff in each nostril three times daily) and kept onregular follow up.

DISCUSSION

100 patients with nasal polyposis who were examined, admitted and underwent surgery in the Department of Orthorhinolaryngology, Medical College Hospital, Thiruvananthapuram are included in the present study.

A cross sectional study was conducted. The study was conducted from February 2009 to January 2010. Out of 100, 11 patients were found to have AFRS. All the patients had chronic rhinosinusitis.

1. Age incidence

In this study, the total number of cases was 100. Most of the cases of nasal polyposis were in the range 11-60 years with maximum in 21-40 years age group. According to Drake Lee³ nasal polyps are a disease of adults and the incidence in every

10 years is equal between ages 30-60 years and then the chance of developing polyp decreases.

The age characteristics of AFRS are as follows. Majority of cases (45%) were in the age group 21-30 years and 36% cases in 31-40 years age group. The average age was 29.73±8.4 and median age was 29 years.

Table 7: Age incidence of AFRS in various studies

Name of study	Place of study	Average age
Allphin et al ⁴	Ohio (USA)	29
Cody et al ⁵	Rochester	34
de Shazo et al ⁶	New York	32
Present study	India	29.73±8.4

Allphin et al⁴, Cody et al⁵ and de Shazo et al⁶ in their study of AFRS patients reported that majority of cases were seen in the 3rd and 4th decade.

In our study, the peak age incidence is seen in 3rd and 4th decade. It is evident from various studies that the peak age incidence is in 3rd and 4th decade.

The age characterization of patients without AFRS are as follows:

Majority of cases were in 21-30 years age group followed by 22% patients in 31-40 years age group. In AFRS group also majority of patients were in 21-30 years age group.

2. Gender distribution

The total number of AFRS cases were 11 of which 7 were males and 4 females with male: female ratio of 1.75:1. Maaning and Holman⁷ also detected a male predominance of 1:6:1.

Among patients without AFRS male:female ratio was 1.97:1 (59 males and 30 females).

3. Clinical features.

a) In AFRS patients

Kinsella et al⁸ in their study of 25 cases of AFRS reported that all patients had nasal obstruction and nasal polyps and one patient had orbital symptoms.

Waxman et al⁹ in their study of 15 AFRS patients found out that 14 patients had nasal obstruction and nasal polyps.

Torres et al¹⁰ in their study of 16 patients with AFRS found out that all of them had nasal obstruction and 5 patients had orbital symptoms.

Al Dousary SH¹¹ in his study of 59 cases of AFRS reported that 27.1% of cases had strong history of atopy and all patients had history of allergic nasal symptoms.

In our study, nasal obstruction was present in 100% cases, nasal discharge in 72% cases, post nasal drip in 64% cases, nasal allergy in 64% cases and anosmia in 73% cases.

b) Nasal polyp patients without AFRS

Francis Ling and Stilianos¹² in their study of 201 patients with chronic rhinosinusitis, reported that post nasal drip was present in 72% patients, nasal obstruction in 84% and facial congestion in 79% patients.

Isekh KR and Makusidi¹³ in their study of 195 cases of rhinosinusitis reported that nasal obstruction was present in 24% patients, nasal discharge in 84% patients, epistaxis in 22% cases and sneezing in 20% cases.

Wan Long et al¹⁴ in his study of 119 patients with chronic rhinosinusitis reported that the most common symptoms were nasal obstruction, nasal discharge, headache, facial pressure and altered sense of smell. The most disturbing symptom in chronic rhinosinusitis patients with nasal polyps was altered sense of smell.

In our study, among nasal polyp patients without AFRS, 95% patients had nasal obstruction and 64% patients had nasal discharge, 39% patients had headache and 23% patients had post nasal discharge and 45% patients had history of nasal allergy.

According to Steven M. Houser and P Corey¹⁵, symptoms of patients with AFRS were almost similar to other chronic rhinosinusitis patients.

In our study also the symptoms and signs among patients with AFRS were almost similar to those without AFRS.

4. X-Ray PNS in AFRS patients.

X-ray PNS - maxillary and ethmoid were hazy in 6 patients and all sinuses were hazy in 4 patients. Multiple sinus involvement was present in 10 out of 11 patients with AFRS.

Name of study	No. of cases of AFRS	No. of cases with multiple sinus involvement.
Allphin et al ⁴	3	3
Cody et al ⁵	26	26
de Shazo ⁶	7	7
Manning ¹⁵	18	18
Present study	11	10

According to Allphin et al⁴, Cody et al⁵, de Shazo⁶, Manning¹⁵ all the AFRS cases had multiple sinus involvement. Among patients without AFRS, 12 patients had multiple sinus involvement.

5. Occupational exposure to dust

The occupational exposure to dust was asked for in all 100 patients. This was done as certain occupations are associated with exposure to dust containing fungal elements. There were farmers, manual labourers, tailors- sales workers in shops, ration shop owners, painters and wood workers.

A study by Loidoit¹⁶ al showed that most patients with mycotic infection of the paranasal sinuses were exposed to moulds during work and in their spare time. 7 out of 11 cases of AFRS had occupational exposure to dust. Among patients without AFRS (out of 89), 35 patients had occupational exposure to dust.

6. Distribution of AFRS patients in 100 cases of nasal polyposis.

The prevalence of AFRS in patients with nasal polyposis (in Medical College, Thiruvananthapuram) was found to be 11%

Telmesani¹⁷ reviewed 91 cases of nasal polyposis and observed that allergic mucin containing fungal hyphae was positive in 12.1% cases.

Deshpande et al¹⁸ studied 85 cases of nasal polyposis and found that allergic mucin containing fungal hyphae was present in 8.2% cases.

In the above two studies, allergic mucin containing fungal hyphae was considered to be diagnostic of AFRS. So the prevalence of AFRS in the above studies is 12.1% (Telmesani¹⁷) and 8.2% (Deshpande¹⁸).

Table 9 : Prevalence of AFRS in various studies

Author	Place of study	No. of cases	No. of allergic mucin positive	%
Telmesani ¹⁷	Saudi Arabia	91	11	12.1%
Deshpande ¹⁸	Bombay	85	7	8.2%
Present Study	Trivandrum	100	11	11%

Limitation of the study

The study cannot be generalized as the sample size is

$$\text{Sample size} = \frac{Z^2 a P (1-P)}{d^2}$$

d- precision (0.06)

Z_{α} - 1.96(constant)

P - Prevalence in the pilot study.

The sample size required as per the formula is 120. But we got only 100 samples.

SUMMARY AND CONCLUSION

The present study, a descriptive study involving 100 patients with nasal polyps admitted for surgery was conducted in the Department of Otorhinolaryngology and Department of Pathology, Medical College Hospital, Thiruvananthapuram for a period of 1 year from February 2009 to January 2010. The aim was to study the prevalence of allergic fungal rhinosinusitis in nasal polyposis in a tertiary care hospital and to compare the clinical* features of chronic rhinosinusitis patients with nasal

polyposis of fungal and non fungal etiology. Occupational exposure to dusts containing fungal elements and history of nasal allergy was specifically asked for. The polyps and inspissated debris removed during surgery were collected in sterile containers containing formalin solution and taken to Pathology laboratory for histopathological examination. The slides were examined for fungal colonies and allergic mucin with fungal stain. The diagnosis of AFRS was considered if the patients satisfying three major and two minor criteria of Bent and Kuhn² (nasal polyps, fungal positivity, presence of allergic mucin, history of Bronchial asthma, raised absolute eosinophil count). The age characteristics, gender and clinical features of AFRS patients were compared with those nasal polyps patients without AFRS.

Based on the study the following conclusions were drawn:

1. AFRS in nasal polyposis is common in adults in the age group of 21-40. Nasal polyps without AFRS was also common in the above age group.
2. The condition occurs more in males than in females with a male: female ratio of 1.75:1.
3. The presenting complaints are the same as in chronic sinusitis. Nasal obstruction was the commonest complaint.
4. The prevalence of allergic fungal sinusitis in nasal polyposis was found to be 11% in Medical College Hospital, Thiruvananthapuram.
5. 7 out of 11 cases of AFRS gave history of occupational exposure to dust which was likely to contain fungal elements.
6. 7 out of 11 cases of allergic fungal sinusitis had history of nasal allergy.
7. Five patients developed recurrence 2- 6 months after stoppage of oral steroids. They were taken up for revision surgery.

Functional endoscopic sinus surgery was done in all the AFRS patients. All the patients were started on post operative systemic steroids which were tapered and stopped. Meanwhile topical steroids were added.

Allergic fungal sinusitis is to be considered as an important differential diagnosis in patients with sinonasal polyposis. The present study has highlighted the diagnosis of AFRS with histopathologic examination and fungal stain. It is important to distinguish AFRS from other types' of fungal sinus disease because appropriate diagnosis and early intervention can avoid unnecessary extensive surgery and systemic antifungal therapy. Further the recognition of AFRS indicates the need for early surgery followed by corticosteroid therapy. Additional therapeutic and prophylactic therapies need to be identified and studied to advance the clinical treatment of AFRS.

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