Prevalence of Allergic Fungal Rhinosinusitis Among Patients with Nasal Polyps

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Abstract

Objective: The objective of the study was to determine the frequency of allergic fungal rhinosinusitis among patients with nasal polyps.
Methods: This study was performed at Department of ENT and Head Surgery, Jinnah Post Graduate Medical Center, Karachi during July 2018 to January 2019. Patients with nasal polyp fulfilling the inclusion criteria were enrolled. Sino-nasal contents were removed during operation and divided into two parts. Sample one was preserved in formalin solution and sent for histopathology to verify eosinophilic mucin and polyps. Another sample was preserved in 10% of potassium hydroxide solution to observe fungal hyphae by culture and fungal staining SPSS v-23.0 was used for the analysis.
Results: Total of one hundred and fifty patients was included in the present study. There were sixty-one females (40.7%) and eighty-nine (59.3%) males. The mean age of patients was 30.5 ± 11.4 years. Out of 150 patients with nasal polyps, 33(22.0%) had allergic fungal rhino sinusitis (AFRS). In this study, it was found that, AFRS was associated with gender and smoking (p=0.036).
Conclusion: AFRS is perceived generally among patients with nasal polyps. In this way, each patient with nasal polyp ought to be assessed for the existence of AFRS.
Keywords: Nasal Polyps, Rhinitis, Allergic IgE, mucins
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Introduction

Nasal polyps (NP) is a constant provocative infection of the mucous layer in the nose and para-nasal sinuses presentingas semi-translucent, pear or round, pedunculated, thick and smooth molded masses of kindled mucosa prolapsing into the nose[1].

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Nasal polyps allude to an unusual edematous non-neoplastic pedunculated swelling emerging from the paranasal sinuses and mucosa of nose having stalk, body, and, fundus[2].

These are amiable pathologies. Having a questionable etiology and inclination to repeat, they speak to a testing conclusion for the doctor to treat and now and again it is related with hypersensitive parasitic rhinosinusitis[3].

Essential side effects of nasal polyps are nasal blockage, nasal clog, hyposmia or anosmia and whenever related with interminable sinusitis a purulent nasal release. Auxiliary side effects include post nasal dribble, rhinorrhea, facial agony, cerebral pain and rest unsettling influence[4].

It has been expected that hypersensitivity inclines to NP since manifestations of mucosal swelling and watery rhinorrhea were available in the two illnesses alongside a plenitude of eosinophils in the nasal discharges[5,6].

In any case, epidemiological examinations give little proof to establish this association with NP, that were found in just one to two percent of patients with positive skin prick tests. A relationship between nasal polyps and contagious samples has been built up for a long time. This acknowledgment prompted the term "Allergic Fungal Rhinosinusitis" (AFRS)[7].

In Allergic Fungal Rhinosinusitis, specific IgE has been developed in eosinophilic mucin and nasal lavage fluid. The prevalence of AFRS in Saudi Arabia was 12.1%[8]. In a study, Allergic fungal Rhinosinusitis was detected in 11% patients[9].

Irregular mucosal swelling that start from any part of paranasal sinuses or nasal mucosa are called as nasal polyps. Polyps are a final product of fluctuating ailment forms in the nasal cavities. Kind semitransparent nasal sores are the most ordinary examined polyps that emerge from paranasal sinuses mostly at the surge tract of the sinuses or from the mucosa of the nasal cavity. In youngsters, various polyps can occur with cystic fibrosis (CF), hypersensitive rhinitis, unfavorably susceptible contagious sinusitis or chronic sinusitis. An antrochoanal polyp may actually be harmful or benevolent tumor or a kind of enormous polyp. It is important to assess all kids with different benign nasal polyposis for CF and asthma. Teaching patients about the chronicity of the illness is critical to make them mindful of the repetitive idea of the disease. The pathogenesis of nasal polyps is obscure. Improvement of polyps have been connected to unending aggravation, autonomic sensory system brokenness, and hereditary inclination. Most hypotheses view polyp as a definitive appearance of incessant aggravation; in this way, conditions promoting chronic irritation in the nasal pit can lead to nasal polyps. The conditions associated with multiple benign polyps are allergic rhinitis and CF. Polyps were found in 6-44% of patients with CF, chronic rhino sinusitis and in 85% of patients with AFS[10].

Most investigations recommend that polyp is related more emphatically with non-unfavorably susceptible infection than with hypersensitive ailment. Measurably, nasal polyps are progressively normal in patients with non-hypersensitive asthma (13%) than with unfavorably susceptible asthma (5%) and just 0.5% of 3000 atopic people have nasal polyps. A few hypotheses have been proposed to clarify the nasal polyps' pathogenesis albeit, none appears to account completely for the well-established actualities. A few specialists trust that polyps are an evagination of the sinus mucosa or typical nasal that loads up with edematous stroma; others trust polyps are a particular element emerging from the mucosa.

In light of an audit of the writing and a few unpredictable investigations of the bio-electric characteristics of polyps, Bernstein inferred a persuading hypothesis on the pathogenesis of nasal polyp, expanding on different speculations and data[11].

Fiery changes initially happen in the sinus mucosa or parallel nasal divider as the consequence of viral-bacterial host connections or auxiliary to fierce flow of air, according to Bernstein's theory.

As a rule, polyps start from exchanged territories of the center meatus, particularly the tight fissures in the fronto ethmoidal locale that make tempestuous wind current, and especially when limited by mucosal irritation. Prolapse or ulceration of the submucosa can happen, with new organ arrangement or with re-epithelialization.

Amid this process, a polyp can frame from the mucosa on the grounds of increased activation of fibroblasts, vascular endothelial cells and epithelial cells which influences the bioelectric honesty of the sodium networks at the luminal surface of the epithelial cells (respiratory) in nasal mucosa. This reaction aggravates polyp development by promoting water maintenance and sodium ingestion.

Chronic inflammation obviously has an underlying role in the nasal polyps' pathogenesis. Different polyps develop in kids who are unfavorably susceptible to rhinitis and interminable sinusitis. A disconnected polyp could be a huge polyp, an antro-choanal polyp, a nasolacrimal channel sore or any of the accompanying inherent lesion or threatening malignant or benign tumors like gliomas, nasolacrimal duct cysts, papillomas and dermoid tumors. The overall prevalence of nasal polyps is 0.1% among children in United States (US) and 6 to 48% in patients of Cystic fibrosis (CF). The prevalence is 1 to 4% among adults, a minimum and maximum of 0.2 to 28%. Prevalence worldwide is same as in the US. Multiple benign nasal polyps are generally apparent among patients who are more than 20 years of age and are more prevalent among patients with ages more than 40 years. NP are infrequent among kids less than 10 years. However, ratio of man to woman is 2-4:1 among adults while the ratio among children is not reported. A survey of researchers writing about kids whose nasal polyps requiring medical procedure clearly demonstrated a rise in incidence among young adults, despite the fact that the information is uncertain[12].

No prevalent mortality is related with nasal polyps. Dismalness is generally connected with modified personal satisfaction, nasal obstacle, anosmia, incessant sinusitis, cerebral pains, wheezing and post-nasal seepage. In specific circumstances, nasal polyps may change the craniofacial skeleton in light of the fact that un-removed polyps may expand intracranially or into the orbital vaults. Recurrence is common after management with therapeutic or careful treatment if different kinds of polyps are present. Single substantial polyps are more averse to reoccur. The literature contains scanty information regarding medications. Endoscopic sinus medical procedure seems to enhance both olfaction and personal satisfaction in incessant rhinosinusitis patients with nasal polyps[13].

AFRS (Allergic fungal rhinosinusitis) is a distinct type of CRS (chronic rhinosinusitis) accounting for between five to ten percent of all cases of CRS. AFRS is accepted to result from unending, extreme unfavorably susceptible aggravation coordinated against colonizing growths.

Patients with AFRS are immune-competent and show proof of allergy to more than one fungus. Definitive diagnosis is usually confirmed after sinus surgery. Successful treatment involves a combination of surgical and medical management. AFRS is defined as a specific subtype of chronic rhinosinusitis (CRS). Inflammatory conditions engaging the linings of passages and paranasal sinuses that last for twelve weeks or longer is known as CRS. The diagnosis of all forms of CRS requires objective evidence of mucosal inflammation. AFRS is a distinct subtype of CRS that arises as a result of a localized allergic reaction to noninvasive fungal growth in areas of compromised mucus drainage[14].

AFRS is defined as an intense, localized allergic/eosinophilic inflammatory sinus disease that results in the accumulation of eosinophilic (allergic) mucin (a thick, tenacious eosinophilic secretion), which contains fungal hyphae, intense eosinophilic inflammation and characteristic radiographic findings. The diagnostic criteria for AFRS require the presence of CRS with nasal polyposis (NP), unless the patient has undergone surgery or aggressive medical therapy with systemic glucocorticoids to remove or shrink the polyps, existence of eosinophilic mucin, evidence of immunoglobulin (Ig)E-mediated allergy to fungus (documented either by skin testing or in vitro IgE immunoassays) and radiographic findings.

The pathophysiology of AFRS is most consistent with chronic, intense T helper type 2 (Th2) allergic inflammation directed against colonizing fungi. The sinuses become filled with thick, inspissated mucus that is dense with degranulating eosinophils[15].

Key steps in the pathogenesis are mentioned in literaturesuch as fungal spores become stuck in sinus mucus or nasal. This is known to occur in healthy subjects, depending on geographic and climactic conditions. The host becomes sensitized to fungal antigens. Some of the fungal spores germi-

nate into hyphae. The hyphae provide the local antigenic stimulus for the allergic response. The large local load of fungal antigen elicits a localized Th2-allergic immune response. This likely explains the localization of disease to one or more sinuses (AFRS is often a unilateral process). Chronic allergic inflammation results in local fungal-specific IgE production, mast cell degranulation and late-phase allergic inflammation with an influx of large numbers of eosinophils. The eosinophils attack the fungal hyphae, degranulate and release inflammatory mediators, cytokines and growth factors that amplify the inflammatory process, and may contribute to airway remodeling, nasal polyp formation, and possibly to bony demineralization. The sinonasal mucosa becomes damaged, which facilitates bacterial penetration of the mucosa, leading to bacterial infection, biofilm formation, and further perpetuation of the inflammatory process[16].

In an in vitro study, peripheral blood lymphocytes from patients with AFRS produced greater amounts of IL-5 when stimulated by fungal antigens from Alternaria and Cladosporiumas compared with lymphocytes from healthy control subjects.

Patients with AFRS are, by definition, allergic to one or more fungi, as determined by skin testing or in vitro testing for fungal-specific IgE. However, one study found that AFRS patients were not distinguishable from patients with fungal allergy and allergic rhinitis and in the following parameters: IgA levels, IgG levels, IgE levels in total serum or the percent of fungal-specific serum IgE comparative to entire serum IgE quantities[17].

Subjects and Methods

The present study was a descriptive cross sectional study conducted at Department of ENT Surgery, Jinnah Post Medical Center, Karachi during July 2018 to January 2019. The sample size of one hundred fifty was estimated by 95% confidence level with the help of Open EPI software. Margin of error was 5% taking predictable percentage of AFRS as 11% in patients with nasal polyps via non-probability consecutive sampling. Patients of age between 10 to 50 years of either sex who had nasal polyps of any duration, severity, size seen by speculum examination were included. Patients were excluded due to co-morbid diseases (Diabetes Mellitus BSR >200mg/dl), (Hypertension BP >160/90) and thoseusing steroids (nasal/systemic) for past 14 days, those who had friable nasal mass which bled on touch and pregnant women.

After taking informed consent, all patients were enrolled. Demographic information was recorded. Sinonasal contents were removed during operation and divided into two parts as Sample-one and Sample-two. Sample-one was preserved in formalin solution and sent for histopathology to verify eosinophilic mucin and polyps. Sample-two preserved in 10% of potassium hydroxide solution and to see fungal hyphae, it was sent for culture and fungal staining. The diagnosis of AFRS was considered as per standard definition.

SPSS v-23.0 was used for the analysis of data. Percentages and frequencies were determined for qualitative variables i.e. gender, AFRS, socioeconomic status, smoking status and duration of illness. Mean and standard deviation was used to express the quantitative variable i.e.age and duration of illness to deal with effect modifiers. Chi-Square test was used for post-stratification, taking p-value<0.05 as statistically significant.

Results

Total 150 patients were enrolled in this study out of which 89 (59.3%) were male and 61 (40.7%) were females. The mean age of patients was 30.5 ± 11.4 years.

There were 37 (24.7%) in 10-20 years age group, while 56 (37.3%) and 57 (38.0%) were in 21-35 years and 36-50 years age groups respectively. Among patients, 81 (54.0%) had low socio-economic status (SES), while 54 (36.0%) and 15 (10.0%) had middle and high SES respectively. Among patients, 61 (40.7%) had duration of disease <1 year, while 46 (30.7%) and 43 (28.7%) had duration of disease 1-3 years and duration of disease <3 years respectively. Out of 150 patients with

Table 1. Study Characteristics (n=150)

Variables	Frequency	Percentage
Age groups in years(p=0.872)		
10-20	37	24.7
21-35	56	37.3
36-50	57	38
Socio-economic status (p=0.158)		
Low (<20,000)	81	54.0
Middle (20,000 to 50,000)	54	36.0
High (>50,000)	15	10.0
Patients with polyposis (p=0.036)		
With AFRS	33	22.0
Without AFRS	117	78.0

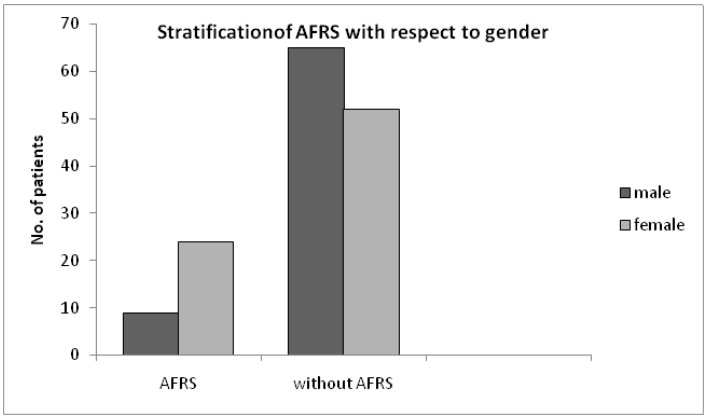

Fig 1. Stratification of gender in allergic fungal rhinosinusitis in enrolled patients of polyposis

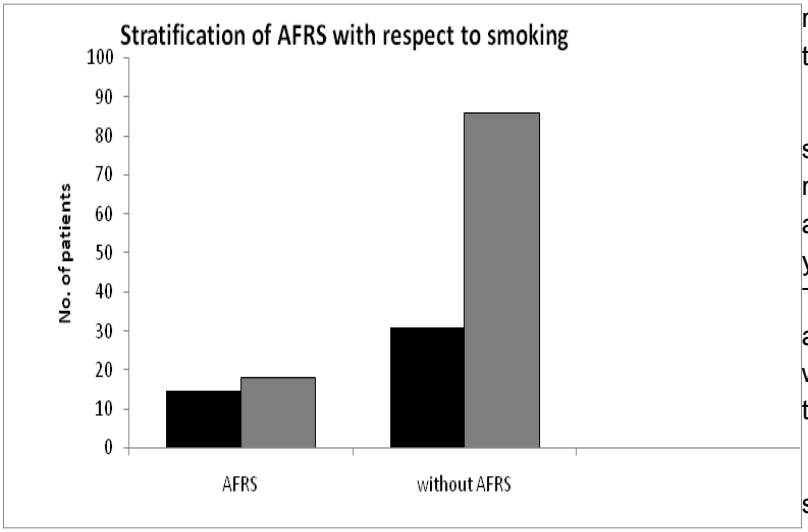

Fig 2. Stratification of smokers in allergic fungal rhinosinusitis in enrolled patients of polyposis

nasal polyps, 33 (22.0%) had allergic fungal rhinosinusitis. (Table 1)

In our study, it was found that, AFRS was associated with female (p=0.036) and smoking (p=0.030). (Figure 1 and 2)

Discussion

For determining the frequency of AFRS, one hundred and fifty patients were included in the study. This study was performed in an ENT Department of a tertiary care hospital. The outcomes of this study exhibited that AFRS was present in 22% patients.

There are several researches on this perspective, however, the findings of the researches are inconsistent to each other. In this study, the average age of the patients was 30.5 ± 11.4 years ranging from ten to fifty years. A research was done by Baloach ZA, on AFRS in which, the average age of the patients was 27.3 ± 12.98 years ranging from 9-64 years. Most of the patients (80%) were <50 years[18]. The average age of the patients in this study was higher than noted by Tahim K, etal. which is 20.75 years and Mian MY, et al, that is 24 years[19,20]. In a research done by Zakirullah, mostly patients were young at presentation (20 years) and 83% were in twenties and thirties that was comparable to our study that is approximately 72.7% patients were in twenties and thirties[21].

According to the gender distribution in this study, males were 59.3% and 40.7% females. This male gender prevalence is additionally affirmed by another investigation led in youngsters; male ruled yet in grown-ups' females commanded[22]. Mian and Thahim found male dominance with a ratio of 3:1 and 7:3. But, this observation is in disagreement with several researches[19,20]. Baloch et al., found, there were 26.3% males and 73.7% females[18].

An investigation was done on patients with nasal polyps to know the recurrence of contagious sinusitis. This investigation included patients who were analyzed by mycological and obsessive strategies for the existence of fungus. Fungi components

appeared as 19% of the considerable number of tests by mycological strategies. At the point when contrasted with our investigation, the recurrence of contagious disease was around 22%, which is very similar to their research[15]. There was positive Histopathological diagnosis for AFRS in 21 out of ninety patients 22.1%[8]. The outcomes of this research are also analogous to that of ours. This supplementary affirms our results as the diagnostic standards are comparable in both studies i.e. on histopathology.

In another study by Baloch et al., all patients were presented with nasal obstruction[18]. Fungal infection was testified with histopathology in 38% of patients. These studies exhibited a higher occurrence of the disease. This is fairly a greater number than any other research[18]. The above discourse mirrors that recurrence of contagious contamination fluctuates enormously among various creators from 9-38%. In our clinical setup, the outcome is tantamount to different researches.

Conclusion

AFRS is perceived generally among patients with nasal polyps. In this way, each patient with nasal polyp ought to be assessed for the existence of AFRS. Patients with AFRS should avoid contact with all possible allergens or smoking and should have close follow up after treatment either medicinal or surgical intervention.

Conflict of Interest

There is no conflict of interest from the authors of this research.

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