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COMPARATIVE PREVALENCE OF FUNGAL INFECTION IN ALLERGIC NASAL POLYPS ACROSS TWO REGIONS

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Abstract

Background: *Fungal infections are increasingly recognized as a potential factor in chronic rhinosinusitis in allergic nasal polyps. Aim of the study was to determine the prevalence of fungal infections in allergic nasal polyps among patients in two tertiary care hospitals in Pakistan located in two different provinces (Karachi is coastal and humid while Lahore is comparatively dry).*

Methods: *A prospective, comparative study was conducted at PNS SHIFA Hospital Karachi and CMH Lahore. A total of 160 patients with allergic nasal polyps (80 from each center) undergoing functional endoscopic sinus surgery were included. Tissue samples from nasal polyps were collected during FESS and subjected to histopathological examination and fungal culture. Data on demographics, comorbid history, symptoms, and allergy test results were also collected. The Chi-square test was used to compare the prevalence rates of fungal evidence in histopathology report between the two regions.*

Results: *Fungal infections were detected in 15 (18.75%) patients from PNS SHIFA Karachi and 11 (13.75%) patients from CMH Lahore. Although PNS Shifa Karachi had more cases of fungal sinusitis yet Chi-square test showed no statistically significant difference in the prevalence of fungal infections between the two centers (p = 0.391).*

Conclusion: *Although fungal infection was more frequently observed in patients from Karachi than Lahore yet the difference was not statistically significant. This suggests a broadly similar prevalence of fungal involvement in allergic nasal polyps across these regions.*

INTRODUCTION

Nasal polyps are benign inflammatory growths within the nasal and sinus mucosa that may present with nasal obstruction, discharge, and hyposmia. When these are associated with allergic rhinitis, they can significantly impair quality of life of patients. Chronic rhinosinusitis with nasal polyps (CRSwNP) has multifactorial aetiologias, including allergy and infections etc. In recent years, fungal involvement, particularly in allergic fungal rhinosinusitis (AFRS), has gained clinical attention [1,4,14].

Fungal types such as *Aspergillus* and *Alternaria* have been implicated in the pathogenesis of CRSwNP. These organisms can act as allergens and trigger a Type I hypersensitivity reaction that leads to eosinophilic inflammation and polyp formation [3,12,17]. AFRS is a less common clinical entity

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within this spectrum, characterized by allergic mucin containing fungal hyphae [3,6,17].

The prevalence of fungal infections in nasal polyps varies widely in different geographical regions. Climatic conditions, environmental exposures, and airborne allergens contribute significantly to these variations [2,8,13]. Identifying regional differences in fungal prevalence can be useful to tailor diagnostic and therapeutic strategies [10,11].

This study investigates the comparative prevalence of fungal infections in allergic nasal polyps in two geographically and climatically distinct Pakistani regions (Karachi and Lahore) through the examination of polyp tissue using both histopathological and microbiological methods. Karachi is a coastal and humid city located in Sindh province while Lahore is comparatively dry and located in Punjab province.

Objectives:

1. To determine the prevalence of fungal infections in allergic nasal polyps in Karachi and Lahore.
2. To compare the fungal infection rates between the two regions.

Materials and Methods

Study Design and Setting

A prospective, comparative study was conducted at PNS SHIFA Karachi and CMH Lahore. Ethical approval was obtained from institutional review board.

Sample Size and Population

A total of 160 adult patients (≥18 years) diagnosed with allergic nasal polyps were enrolled, with 80 patients from each center. All participants were undergoing Functional Endoscopic Sinus Surgery for nasal polyp removal under general anesthesia.

Inclusion Criteria

- Age ≥ 18 years
- Clinical diagnosis of nasal polyps confirmed by nasal endoscopy and CT Scans.
- Positive allergy test (skin prick or serum-specific IgE)
- Chronic nasal polyposis for over 2 years

Exclusion Criteria

- Active upper respiratory tract infection
- Recent antifungal treatment (within 3 months)
- Non-polypoid sinonasal masses

Sample Collection and Laboratory Analysis

During FESS, polyp tissue was divided into two parts:

1. **Histopathology:** Fixed in 10% formalin, stained with H&E, and examined microscopically.
2. **Fungal Culture:** Sent in sterile normal saline for fungal culture using standard mycological techniques.

Data Collection

Data on age, gender, symptoms, comorbidities, CT and endoscopic findings, and previous surgeries were recorded.

Statistical Analysis

Data were analyzed using SPSS version 23. Descriptive statistics summarized demographic: age was compared between two groups by applying independent sample t test, gender and comorbidities proportions were compared by chi-square test. Prevalence of fungal infection was calculated and compared using Chi-square test; $p < 0.05$ was considered statistically significant.

Results

The distribution of data of demographics (age, gender and socioeconomic status) and presence of comorbidities in two groups were compared to ascertain their confounding effect on main outcome variable of fungal infection. Comparison of data age between two groups is shown in Boxplot graph figure 1. While P values of all confounding variables is shown in table 2, that proves that the difference of these variables data between two groups was not statistically significant. Therefore these confounding variables are not likely to affect the comparison of main outcome variable (Fungal infection in allergic nasal polypi).

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Fig 1: Boxplot graph of age distribution in two groups

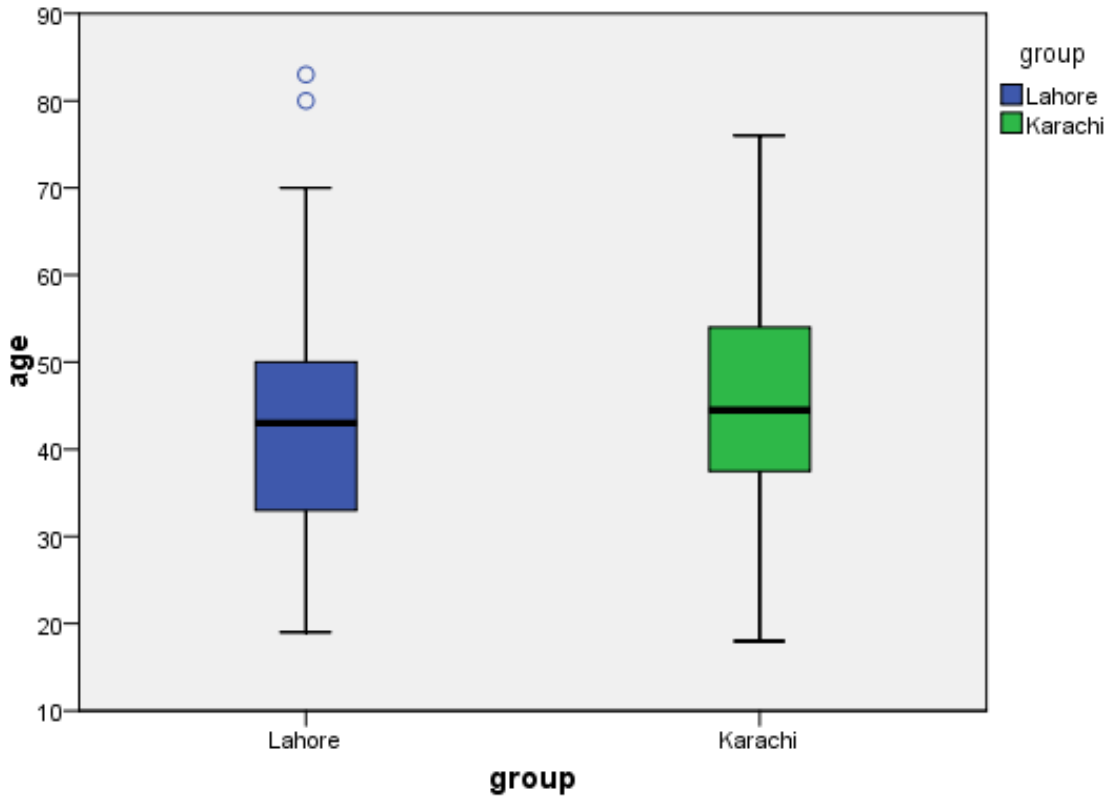

Table 2: P values of confounding variables

Confounding variables	test	P value
Age	T test	0.310
Gender	Chi square test	0.295
Socioeconomic status	Chi square test	0.598
Comorbidities	Chi square test	0.405

Table 1: Crosstabulatoin of proportion of data of fungal infection in two groups

Center	PNS Shifa Karachi	CMH Lahore	Total
Fungal infection	12	8	20
No Fungal infection	68	72	140
Total	80	80	160

Fungal infections were detected in 15 (18.75%) patients from PNS SHIFA Karachi and 11 (13.75%) patients from CMH Lahore. Although PNS Shifa Karachi had more cases of fungal sinusitis yet Chi-square test proved that the difference of proportion between two centers is not statistically significant (p value 0.391) as shown in table 1.

Frontier in Medical & Health Research

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Discussion

This study provides comparative insight into the prevalence of fungal infections in allergic nasal polyps across two regions in Pakistan. Fungal elements were identified in 18.75% of cases in Karachi and 11.75% in Lahore. While the numbers indicate a slightly higher prevalence in Karachi, statistical analysis revealed that the difference is not significant.

The findings align with global literature showing variable rates of fungal involvement in chronic rhinosinusitis with nasal polyps (CRSwNP), these are influenced by environmental and climatic factors [2,8,10,13]. Karachi, being a coastal city with significantly higher humidity, may theoretically provide a more conducive environment for fungal growth than Lahore, which has a more dry and continental climate [15]. However, the absence of statistical significance suggests that either the environmental differences are not substantial enough or the sample size was not sufficient to detect such subtle regional effects on our outcome variable.

Relevance of Fungal Involvement: Fungal colonization or infection in nasal polyps, especially in patients with allergic rhinitis backgrounds, has both diagnostic and therapeutic implications [4,6,7]. The identification of fungi in nasal polyps supports the existence of allergic fungal rhinosinusitis (AFRS), a subtype of CRSwNP which is characterized by eosinophilic mucin and the presence of non-invasive fungal hyphae [3,14,17]. AFRS patients mostly experience more severe symptoms and higher recurrence rates after functional endoscopic sinus surgery, emphasizing the requirement for precise diagnosis and management [5,11,16].

In our study, tissue was analyzed using both histopathology and fungal culture tests, which increases diagnostic sensitivity, still each method has limitations. Cultures can miss non-viable fungi or those that are fastidious, on the other hand histology might overlook sparse fungal elements. The use of molecular techniques in future studies on the same topic may improve detection rates and provide insights into species-specific patterns [18,19].

Clinical and Epidemiological Implications: The lack of a statistically significant difference between the two regions suggests either a relatively uniform exposure or host response to fungal antigens across the populations. This means that similar diagnostic and management protocols could be applied across these regions [9,10,20]. However, the presence of fungal elements in this proportion of patients with allergic nasal polyps underscores the importance of routine fungal evaluation, especially in cases with recurrent symptoms or refractory disease.

Understanding the spectrum of fungal species involved also has therapeutic value. Some fungi, such as Aspergillus, are more commonly associated with AFRS and may respond differently to antifungal therapy. In our study all patient's fungal involvement was of Aspergillus.

Limitations: This study was limited by its sample size and scope. It included only two centers. Environmental and occupational data were also not collected, which could have helped explain the slight difference observed between two hospital's drainage areas.

Recommendations for Future Research Future investigations should expand to include multiple centers across different ecological zones and employ advanced diagnostic methods such as PCR for fungal DNA [13,18]. Longitudinal studies tracking recurrence and response to antifungal therapies based on species identification could provide valuable treatment insights. Moreover, environmental sampling and correlation with patient data would help clarify the role of regional exposures.

Conclusion

Although fungal infection was more frequently observed in patients from Karachi than Lahore yet the difference was not statistically significant. This suggests a broadly similar prevalence of fungal involvement in allergic nasal polyps across these regions.

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