ORIGINAL ARTICLE

Demographic and clinical insights into fungal and non-fungal nasal polyposis

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ABSTRACT

Background Fungal infections have been increasingly recognized as a potential contributor to nasal polyposis. Understanding the demographic and clinical differences between fungal and non-fungal nasal polyposis is essential for improving diagnostic accuracy and guiding targeted treatment strategies. To analyze and compare the demographic and clinical characteristics of patients with fungal and non-fungal nasal polyposis, providing insights into their presentation and potential implications for diagnosis and treatment.

Material and Methods: A comparative cross-sectional study was conducted in the Department of Otorhinolaryngology, Jinnah Postgraduate Medical Centre, Karachi, over 12 months (September 2023–September 2024). Patients aged 18–65 years, clinically diagnosed with nasal polyps, were included through non-probability consecutive sampling. Tissue specimens were analyzed via histopathology and microbiology. Data were analyzed using SPSS version 26.0, with statistical significance set at $p<0.05$.

Results: Among 205 participants (mean age: 30.65 ± 10.13 years), 63.9% were male, and 36.1% were female. Fungal infection was identified in 72.2% of cases (n=148). No significant differences were found in age (p=0.560), BMI (p=0.239), or illness duration (p=0.969) between fungal-positive and fungal-negative groups. Symptoms such as impaired smell (p=0.300), headache (p=0.657), sneezing (p=0.938), proptosis (p=0.749), and nasal deformity (p=0.820) were similarly distributed across both groups.

Conclusion: There were no significant demographic or clinical differences between fungal and non-fungal nasal polyposis cases. Given their similar presentation, advanced diagnostics are essential for accurate differentiation and treatment. Further research is needed to explore the role of fungi in nasal polyposis.

Keywords: Demographic characteristics, Fungal infection, Nasal polyposis, Sinus

BACKGROUND

Nasal polyps are common inflammatory growths in the nasal and paranasal sinuses, often leading to symptoms such as hyposmia, nasal obstruction, rhinorrhea, and sneezing.[1,2] These polypoid lesions result from chronic mucosal inflammation, which can be triggered by various factors, including infections, allergies, and environmental exposures.[3] While their exact etiology remains unclear, studies suggest that immune dysregulation and persistent inflammation contribute significantly to their development.[4] Fungal infections have been increasingly recognized as a potential contributor to nasal polyposis.[5] Aspergillus species, in particular, have been frequently isolated from patients with chronic rhinosinusitis and nasal polyps, suggesting a possible pathogenic role.[6,7] However, distinguishing fungal-related polyposis from non-fungal cases remains a challenge, as both conditions share overlapping clinical presentations.[8] Understanding the demographic and clinical differences between fungal and non-fungal nasal polyposis is essential for improving diagnostic accuracy and guiding targeted treatment strategies.[9] Despite advancements in microbiological and histopathological techniques, fungal involvement in nasal polyps is often underdiagnosed due to the limitations of routine diagnostic methods.[10] This study aims to evaluate and compare the demographic and clinical characteristics of patients diagnosed with nasal polyposis, distinguishing between fungal and non-fungal cases. By identifying potential differences in presentation, this research seeks to enhance current

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diagnostic practices and contribute to better patient management strategies.

MATERIAL AND METHODS

A 12-month comparative cross-sectional study was conducted at JPMC, Karachi. Ethical approval was obtained vide reference number F-2-81/2024-GENL/159/JPMC dated 27th February 2024, and patients were recruited via non-probability consecutive sampling. Specimens were analyzed using histopathology and fungal culture. Data were processed using SPSS version 26.0, applying Chi-square or Fisher's exact tests to evaluate associations. Patients included in this study were adults between the ages of 18 and 65, clinically diagnosed with nasal polyps, and scheduled for nasal polypectomy. Both male and female patients who provided informed consent were eligible. However, individuals with known sinonasal malignancies, those with a history of prior nasal surgeries, and patients with conditions affecting sinonasal immunity-such as uncontrolled diabetes or immunodeficiency disorders-were excluded to minimize confounding variables.

Written informed consent was obtained from each patient before participation. A detailed history, including presenting complaints, was recorded using a structured proforma that captured demographic data, clinical history, and examination findings. Patients underwent a comprehensive ENT examination following standard protocols. Laboratory investigations included a complete blood count, serum IgE levels, and random blood sugar measurement. Tissue specimens were collected from patients undergoing nasal polypectomy under either local or general anaesthesia. Each specimen was divided into two parts: one portion was fixed in formalin for histopathological analysis, while the other was preserved in saline for microbiological evaluation. Specimens were examined using direct microscopy with 10% potassium hydroxide (KOH) mounts to detect fungal elements. Fungal cultures were performed on Sabouraud dextrose agar and incubated at 25°C and 37°C for up to one month. Fungal species were identified based on colony morphology and lactophenol cotton blue staining. Histopathological evaluations were conducted on tissue samples which were stained with periodic acid–Schiff (PAS) and Gomori methenamine silver (GMS) to detect invasive fungal elements. The samples were also assessed for chronic inflammation and fibrosis. Data were analyzed using IBM SPSS version 26. Associations between fungal involvement and clinical variables were assessed using the chi-square test or Fisher's exact test, as appropriate, with a significance level of 5%. Descriptive statistics were calculated for demographic and clinical variables.

RESULTS

A total of 205 participants were included in the study, and their demographic characteristics are summarized in Table I. The mean age of the cohort was 30.65 ± 10.13 years. The majority of participants (64.7%) were aged over 50 years, while the remaining 35.3% were between 18 and 50 years. The mean Body Mass Index (BMI) was 25.91 ± 3.66 kg/m², with an equal distribution between participants with a BMI below and above 26 kg/m². The mean duration of illness was 15.4 ± 11.26 months. A total of 97 participants (64.7%) had been diagnosed for more than 15 months. Regarding gender distribution, males comprised a larger proportion of the sample (n = 131, 63.9%) compared to females (n = 74, 36.1%). Socioeconomic status analysis revealed that most participants (n = 152, 74.1%) belonged to the lower class, while 43 (21%) were from the middle class and 10 (4.9%) from the upper class. Among the reported symptoms, 31 participants (15.1%) had an impaired sense of smell, 22 (10.7%) experienced headaches, 46 (22.4%) reported sneezing, 16 (7.8%) had proptosis and/or nasal obstruction, and 27 (13.2%) presented with nasal deformities. However, most participants did not report these symptoms. The demographic and clinical characteristics of fungal-positive and fungal-negative patients were analyzed. The mean age of fungal-positive patients was 30.39 ± 10.07 years, while fungalnegative patients had a mean age of 31.32 ± 10.33 years. The difference in age was not statistically significant (p = 0.560). Similarly, the mean BMI was 26.10 ± 3.78 kg/m² for fungal- positive patients and 25.43 ± 3.31 kg/m² for fungal-negative patients, with no significant difference (p = 0.239). The mean duration of illness was approximately 15.4 months for both groups (p = 0.969). In terms of gender distribution, males comprised 64.9% (n = 96) of the fungal-positive group and 61.4% (n = 35) of the fungal-negative group, with no statistically significant difference (p = 0.644). Likewise, females represented 35.1% of the fungal-positive group and

38.6% of the fungal-negative group. Socioeconomic status distribution was also comparable between groups, with the lower class being more prevalent among fungal-negative patients (n = 45, 78.9%) compared to fungal-positive patients (n = 107, 72.3%), though this difference was not statistically significant (p = 0.381). Regarding clinical characteristics, no significant differences were observed between fungalpositive and fungal-negative patients. The prevalence of impaired sense of smell (p = 0.300), headaches (p = 0.657), sneezing (p = 0.938), proptosis (p = 0.749), and nasal deformity was similar between both groups. Overall, the findings in Table II indicate that none of the evaluated demographic or clinical variables were significantly associated with fungal infection in this cohort.

Table-I: Demographic characteristics of study participants (n=205).

Variable	n (%)
Age (Mean ± SD) = 30.65 ± 10.13	
18-50 years	53 (35.3)
>50 years	97 (64.7)
Body Mass Index (Mean ± SD) = 25.91 ± 3.66	
20-26 kg/m^2	53 (35.3)
>26 kg/m^2	97 (64.7)
Duration of Illness (Mean ± SD) = 15.40 ± 11.26	
1-15 months	53 (35.3)
>15 months	97 (64.7)
Gender	
Male	131 (63.9)
Female	74 (36.1)
Socioeconomic Status	
Lower Class	152 (74.1)
Middle Class	43 (21.0)
Upper Class	10 (4.9)
Impaired Sense of Smell	
Yes	31 (15.1)
No	174 (84.9)
Headache	
Yes	22 (10.7)
No	183 (89.3)
Sneezing	
Yes	46 (22.4)
No	159 (77.6)
Proptosis	
Yes	16 (7.8)
No	189 (92.2)
Nasal Deformity	
Yes	27 (13.2)
No	178 (86.8)

Table-II: Characteristics of Patients with Fungal positive polyposis (n=205).

Variables		Fungal Infection		p-Value
		Positive (n=148)	Negative (n=57)	
Age in years, Mean ± SD		30.39 ± 10.07	31.32 ± 10.33	0.560
Body Mass Index in kg/m^2, Mean ± SD		26.10 ± 3.78	25.43 ± 3.31	0.239
Duration of Illness in months, Mean ± SD		15.42 ± 11.30	15.35 ± 11.24	0.969
Gender	Male, *n* (%)	96 (64.9)	35 (61.4)	0.644
	Female, *n* (%)	52 (35.1)	22 (38.6)	
Socioeconomic Status	Lower Class, *n* (%)	107 (72.3)	45 (78.9)	0.381
	Middle Class, *n* (%)	32 (21.6)	11 (19.3)	

	Upper Class, *n* (%)	9 (6.1)	1 (1.8)	
	Impaired Sense of Smell, n (%)	20 (13.5)	11 (19.3)	0.300
	Headache, n (%)	15 (10.1)	7 (12.3)	0.657
Clinical Presentation	Sneezing, n (%)	33 (22.3)	13 (22.8)	0.938
	Proptosis, n (%)	11 (7.4)	5 (8.8)	0.749
	Nasal Deformity, n (%)	19 (12.8)	8 (14.0)	0.820

DISCUSSION

Nasal polyps, characterized by inflammatory cell infiltration, have been shown to contribute to epithelial cell damage.[11, 12] The primary factors implicated in this process include elevated local inflammatory mediators, extracellular matrix remodeling, and mucosal epithelial injury. Understanding the clinical and demographic characteristics of patients with nasal polyposis is crucial for optimizing diagnosis and treatment strategies. This study aimed to assess the demographic and clinical features of patients with nasal polyposis, with a particular focus on the presence of fungal infections. Our findings indicate that there were no statistically significant differences between patients with positive and negative fungal cultures across key demographic and clinical parameters. Variables such as age, body mass index (BMI), disease duration, gender distribution, socioeconomic status, and clinical manifestations—including olfactory dysfunction, headache, sneezing, proptosis, and nasal deformity did not differ significantly between the two groups. The mean age of patients in the fungal-positive cohort was 30.39 ± 10.07 years, compared to 31.32 ± 10.33 years in the fungal-negative group, with no statistically significant difference ($p = 0.560$). Similarly, BMI values ($p = 0.239$) and disease duration (approximately 15.4 months in both groups, $p = 0.969$) were comparable between groups, consistent with previous research.[13,14] These findings reinforce the notion that fungal infections in nasal polyposis do not exhibit distinct demographic patterns, underscoring the importance of advanced diagnostic techniques, including fungal cultures and imaging modalities, in clinical evaluation. Regarding gender distribution, 64.9% of fungal-positive patients were male, compared to 61.4% in the fungal-negative group, a difference that was not statistically significant ($p = 0.644$). The observed male predominance (63.9%) aligns with previous studies, which report a male-tofemale ratio of 1.25:1 in nasal polyposis.[15] This may be attributed to differences in healthcareseeking behavior and environmental exposures between genders. Socioeconomic status also did not show a significant association with fungal infections in nasal polyposis, as 72.3% of fungal-positive and 78.9% of fungal-negative patients were from lower socioeconomic backgrounds ($p = 0.381$). These findings are consistent with those of Philpott *et al*. (2021), who reported no significant differences in socioeconomic indicators, including deprivation ($p = 0.787$), income ($p = 0.424$), household occupancy ($p = 0.43$), and educational attainment ($p = 0.251$) between individuals with and without nasal polyps.[16] However, environmental factors linked to poverty—such as exposure to allergens and pollutants—are known to influence the recurrence of nasal polyps and may contribute to disease progression.[17] Furthermore, no significant differences were identified in clinical symptoms, including olfactory dysfunction, headache, sneezing, proptosis, and nasal deformity, between the two groups. This is consistent with the findings of Chen *et al*. (2020), who conducted a systematic review on chronic rhinosinusitis with nasal polyps and reported that the most prevalent symptoms included headache, sneezing, nasal congestion, loss of smell, and facial pain .[18] The strength of this study lies in its relatively large sample size ($n = 205$), which provided sufficient statistical power to detect potential differences between groups. Additionally, the use of fungal cultures as a diagnostic tool enhanced the reliability of the findings. However, some limitations must be acknowledged. The use of non-probability sampling may have introduced selection bias, potentially limiting the generalizability of the results. Additionally, rare cases or smaller subgroups might not have been adequately represented, which could obscure subtle differences between groups. Given the cross-sectional design, this study captured only a single time point, preventing the assessment of disease progression or temporal changes. Moreover, while imaging techniques such as CT and MRI were utilized, their sensitivity in distinguishing fungal from

non-fungal cases remains limited. Future longitudinal studies incorporating more advanced diagnostic methodologies and environmental exposure assessments are warranted to further elucidate the role of fungal infections in nasal polyposis and their clinical implications.

CONCLUSION

This study found no significant differences in demographic characteristics or clinical presentations between patients with nasal polyposis with and without fungal infections. Given the overlapping clinical features, fungal infections can present similarly to non-fungal cases, highlighting the importance of advanced diagnostic modalities for accurate disease characterization and treatment guidance. Further research is needed to delineate the role of fungi in nasal polyposis and improve diagnostic accuracy.

CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Muhammad Razzaq Dogar: Main Conception of study, manuscript writing, final approval, accountable for every aspect of this research work

Noshad Ali: Critical revision, final approval, accountable for every aspect of this research work

Zubair Anwar: Study design, final approval, accountable for every aspect of this research work

Rehana: Interpretation of results, final approval, accountable for every aspect of this research work

Sajid Atif Aleem: Data analysis, data interpretation, manuscript writing, final approval, accountable for every aspect of this research work

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