

Original Article

Disease Characteristics of Fungal Infection With Nasal Polyps (NP), The Influencing Factors, And Existing Condition Of Rhinosinusitis Among Patients; A Cross-Sectional Study

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Abstract

Objective: To determine the frequency of fungal infection among patients, as well as its characteristics and features, in patients with nasal polyps presenting at tertiary care hospitals.

Methods: We conducted a cross-sectional study for 6 months after project approval, from September 18, 2023, to March 18, 2024. After setting the inclusion criteria, patients were enrolled, and informed written consent was obtained after explaining the study's aims, benefits, and risks. Demographic details, including age, sex, and address, were recorded, and participants underwent physical and medical assessments. Patients diagnosed with nasal polyps were tested for fungal infections through histopathology using biopsy specimens to identify fungal growth, hyphae, and branching patterns. All observations were documented on pre-defined proformas.

Results: out of 195 patients, the mean age was 42.30 ± 11.05 years. Participants were distributed across age groups as follows: 10.3% (18–30 years), 36.4% (31–40 years), 30.3% (41–50 years), and 23.1% (>50 years). Of the total, 41.5% were men, 58.5% were women, 66.7% were employed, and 33.3% were unemployed. Most had unilateral (55.4%) rather than bilateral (44.6%) nasal polyps. Fungal infection was present in 45.6% of the patients. The mean weight, height, and BMI were 38.66 kg, 1.437 meters, and 18.43, respectively. Stratification by age, sex, employment status, polyp type, and BMI revealed no significant associations with fungal infection, as indicated by p-values above 0.05 in all categories.

Conclusion: Patients with nasal polyps showed a high frequency of fungal infections.

Keywords: Body Mass Index, Fungal Sinusitis, Nasal Polyps.

Introduction

Nasal polyposis (NP) is a chronic condition that significantly affects patients' quality of life, although it is relatively easy to diagnose; its treatment poses challenges for otorhinolaryngologists because of its unclear aetiopathogenesis, limited treatment efficacy, and frequent relapses.¹ NP are noncancerous growths that arise from the mucosal lining of the nasal cavity or paranasal sinuses, often forming near the outflow tracts of one or more sinuses. This condition has a multifactorial origin, with contributing factors including allergic infections, fungal sinusitis, asthma, and aspirin intolerance. While nasal polyps are not life-threatening on their own, they can lead to severe complications, such as sinusitis, ocular cellulitis, meningitis, aneurysms, thromboembolism, and obstructive sleep apnoea.²

Nasal polyps are categorised based on their location: ethmoidal polyps, commonly associated with bilateral presentations and allergies, or antrochoanal polyps, which are typically unilateral and arise from the maxillary sinus.³ Fungal sinus infections, once considered rare, are now recognised as major contributors. Chronic inflammation, anatomical abnormalities, and mucosal injuries create an environment conducive to fungal colonisation, particularly in areas where mucus pooling occurs. Studies have shown fungal infections in approximately 46.15% of patients with nasal polyps.⁴

They are typically associated with chronic inflammation and are characterised by a soft, oedematous consistency, often presenting bilaterally in patients. Despite their benign nature, nasal polyps can significantly impair quality of life by causing nasal obstruction, reduced or lost sense of smell (anosmia), recurrent sinus infections, and persistent nasal discharge. Conditions such as chronic rhinosinusitis and asthma.⁵ Furthermore, their high recurrence rate, even after surgical removal or medical treatment, adds to the complexity of their management. Diagnosing and treating NP represents a substantial portion of the workload for otolaryngologists, particularly those specialising in rhinology.⁶

Owing to the chronic and recurrent nature of the condition, patients often require long-term follow-up to monitor for recurrence and manage associated complications, making nasal polyposis (NP) a challenging and resource-intensive condition to address in clinical practice. Nasal polyposis is a common condition affecting 1–4% of the general population, with higher rates observed in individuals with chronic rhinosinusitis, asthma, or cystic fibrosis.⁷ It is more frequently diagnosed in adults aged 30–60 years and is rare in children, unless associated with systemic conditions, such as cystic fibrosis or primary ciliary dyskinesia; however, it slightly favours males, with a reported male-to-female ratio of 2:1 in some studies, which varies across populations.⁸ Although non-life-threatening, NP significantly impacts quality of life through symptoms, such as nasal obstruction, anosmia, and recurrent infections, requiring long-term management and imposing a considerable healthcare burden. Recognising its epidemiological trends is crucial for timely diagnosis and effective treatment strategies.⁵

Contributions:

RK WS- Conception, Design
JI MI- Acquisition, Analysis,
Interpretation
RK MI- Drafting
WS JI- Critical Review

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

Conflicts of Interest: None

Financial Support: None to report

Potential Competing Interests:

None to report

Institutional Review Board

Approval

1440

24-08-2023

Hayyatabad Medical Complex

Review began 16/05/2025

Review ended 26/12/2026

Published 31/12/2025

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How to cite this article: Khan R, Sajjad

W, Iqbal J, Idrees M. Disease

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Factors, And Existing Condition Of

Rhinosinusitis Among Patients; A Cross-

Sectional Study. JRM. 2026. Mar.

31;30(1).

<https://doi.org/10.37939/jrmc.v30i1.2919>

Despite advances in therapeutic options, the recurrence of NP remains a formidable challenge. This issue is particularly pronounced in individuals with underlying conditions, such as asthma, who exhibit a heightened propensity for recurrence. This study aimed to assess the disease characteristics of fungal infection with nasal polyps, influencing factors, and the existing condition of rhinosinusitis among patients at a tertiary care hospital.

Materials And Methods

This cross-sectional study was conducted at the Department of ENT, Hayatabad Medical Complex, Peshawar. The duration of the study was 06 months, starting from 18 September 2023 to 18 March 2024. The WHO Rao-soft sample size calculator was used to determine the sample size. Using a proportion of fungal infection (46.15%) in patients with nasal polyps, a 95% confidence level, and a 7% margin of absolute precision, the calculated sample size was 195. Both Male and Female. The age range was 18 to 70 years, and patients with a confirmed diagnosis of nasal polyps were included; however, patients with sinonasal malignancies, inverted papillomas, and pregnant patients were excluded from the study.

Fungal infection was diagnosed through histopathology by obtaining biopsy specimens, which showed fungal culture growth, septate or non-septate hyphae, and branching patterns. The entire procedure was performed under the supervision of a consultant with at least five years of post-fellowship experience. Patient details were recorded on a designated proforma. The process was also overseen by a CPSP fellow with a minimum of four years of experience in the relevant field. All patient observations were documented on predefined proformas.

Data was entered and analyzed using SPSS version 23. Frequencies, mean, median, and standard deviation were calculated for all quantitative variables such as age, weight, height, and BMI. Effect modifiers, including age, BMI, gender, employment status, and type of polyps, were controlled through stratification. The results of the study were presented in tables.

Results

The mean age of the 195 enrolled patients was 42.30 ± 11.05 years. The distribution of participants across age groups showed that 10.3% (n=20) were aged 18–30 years, 36.4% (n=71) were aged 31–40 years, 30.3% (n=59) were aged 41–50 years, and 23.1% (n=45) were older than 50 years. The sex distribution revealed that male participants were 41.5% (n=81) of the total participants, while 58.5% (n=114) were female. Out of the total, 66.7% (n=130) of the participants were employed, while 33.3% (n=65) were unemployed. The distribution of polyp types showed that 55.4% (n=108) were unilateral, while 44.6% (n=87) were bilateral.

Table 1: Age Groups of The Patients With Fungal Infection

Gender	Fungal infection		Total	p-value
	Yes	No		
Male	37(41.6%)	44(41.5%)	81(41.5%)	0.99
Female	52(58.4%)	62(58.5%)	114(58.5%)	
18-30 years	7(7.9%)	13(12.3%)	20(10.3%)	
31-40 years	37(41.6%)	34(32.1%)	71(36.4%)	
41-50 years	26(29.2%)	33(31.1%)	59(30.3%)	
>50 years	19(21.3%)	26(24.5%)	45(23.1%)	0.49

Table 2: BMI of The Patients With Fungal Infection

BMI	Fungal Infection		Total	P-Value
	Yes	No		
Underweight	52(58.4%)	66(62.3%)	118(60.5%)	0.50
Normal	36(40.4%)	39(36.8%)	75(38.5%)	
Overweight	1(1.1%)	0(0.0%)	1(0.5%)	
Obese	0(0.0%)	1(0.9%)	1(0.5%)	

The p-value of 0.49 suggests that there is no significant association between fungal infection and age group.

The stratification of fungal infection based on sex showed that among men, 37 (41.6%) had a fungal infection, and 44 (41.5%) did not, with a total of 81 male participants. The mean height of the participants was 1.437 m, with a standard deviation of 0.148.

The mean BMI of the participants was 18.43, with a standard deviation of 2.75.

With a total of 45 participants. Among the women, 52 (58.4%) had a fungal infection, and 62 (58.5%) did not, with a total of 114 female participants. The p-value of 0.99 suggests that there is no significant association between fungal infection and sex.

The stratification of fungal infection based on employment status showed that among employed individuals, 61 (68.5%) had a fungal infection, and 69 (65.1%) did not, with a total of 130 employed participants (p = 0.61).

Table No. 3: Statistical Analysis of Age & Gender Of Patients With Fungal Infection

Data Analysis of Fungal Infection In Compassion To Age And Gender Of Patients			
Fungal Infection		Age	Gender
No	Mean	42.2360	1.5843
	N	89	89
Fungal Infection	Std. Deviation	11.09261	.49564
	Mean	42.3679	1.5849
Fungal Infection	N	106	106
	Std. Deviation	11.07406	.49508
Total	Mean	42.3077	1.5846
	N	195	195
	Std. Deviation	11.05412	.49406

Of the unemployed individuals, 28 (31.5%) had a fungal infection, and 37 (34.9%) did not, for a total of 65 unemployed participants. The p-value of the presence of fungal infection was observed in 45.6% (n=89) of cases, while 54.4% (n=106) showed no fungal infection. Stratification of fungal infection based on age groups shows the following distribution: In the 18–30 years age group, 7 (7.9%) had a fungal infection, and 13 (12.3%) did not, for a total of 20 participants. In the 31–40 years age group, 37 (41.6%) had a fungal infection, and 34 (32.1%) did not, for a total of 71 participants. In the 41–50 years age group, 26 (29.2%) had a fungal infection, and 33 (31.1%) did not, for a total of 59 participants. In the >50 years age group, 19 (21.3%) had a fungal infection, and 26 (24.5%) did not.

Table 4: Statistical Analysis Of Fungal Infection With Age And Gender

Paired Samples T-Tests Statistics		Mean	N	Std. Deviation	Std. Error Mean
PAIR 1	Types of polyps	1.4462	195	.49837	.03569
	Fungal infection	1.5436	195	.49938	.03576
PAIR 2	Gender	1.5846	195	.49406	.03538
	Age	42.3077	195	11.05412	.79160

Discussion

Nasal polyps are a common condition that can lead to significant morbidity, with symptoms including nasal obstruction, anosmia, and recurrent sinus infections. A growing body of research has suggested that fungal infections may play a role in the pathogenesis of nasal polyps, particularly in chronic rhinosinusitis (CRS). The findings of this study indicate that 45.6% of patients with nasal polyps had a concurrent fungal infection, suggesting a relatively high prevalence of fungal involvement in this patient population. This result is consistent with several studies in the literature that have reported an increased incidence of fungal infections in patients with chronic rhinosinusitis and nasal polyps.⁹

A previous study on the same topic reported that fungal infection was found in 60 (46.15%) patients, whereas 70 (53.85%) had no fungal infection.¹⁰ Another study reported a prevalence of fungal infections at 40.7% (90 patients) in nasal polyposis.¹¹ Another study reported that 24% of cases were caused by fungal infections and 13% of cases were in the age range of 42–57 years, whereas the BMI of the patients in association with the fungal infections developed was more common with a BMI >30.¹²

Stratification of fungal infection based on various factors, such as age, sex, employment status, and type of polyps, did not show any significant association. The p-values for these stratifications were consistently above 0.05, indicating no statistically significant relationship between these demographic and clinical factors and the presence of fungal infection.¹³ For instance, while there was a higher proportion of fungal infections in the 31–40 years age group, the p-value of 0.49 suggests that age is not a significant factor in determining fungal infection status in this study.¹³ NP is more commonly observed in adults than in those aged 10 years; the affected population, if exposed to air pollution and who consume antibiotics, is prone to develop nasal polyps. Individuals exposed to air pollutants and those on antibiotics are more affected by allergies and nasal polyps.¹⁴

According to a study on fungal infections in NP, the majority of their patients were between the ages of 20 and 29. In comparison with the current study, another study found a 62% higher incidence in the age group of 21–40 years. Similarly, there were no significant variations in the distribution of fungal infections by sex (male vs. female) or employment status (employed vs. unemployed), as indicated by p values of 0.99 and 0.61, respectively.¹⁵

A previous study observed that 51% of females and 49% of males had an M: F ratio of 1:0.9, in comparison to which we found 59% of males and 41% of females with an M: F ratio of 1.43:1. (86) Another study reported an almost equal sex proportion with slight female predominance, with 46% of males and 54% of females.¹⁶

This study also explored the role of BMI in fungal infections. Although most participants were either underweight or of normal weight, there was no significant association between BMI and fungal infection ($p = 0.50$). This finding aligns with other studies that have not consistently demonstrated a link between body mass index and the presence of fungal infection in nasal polyps.¹⁷

Despite the high prevalence of fungal infection observed in this study, the p- p-values for the various stratifications suggest that factors such as age, sex, body mass index (BMI), and polyp type do not have a significant impact on the likelihood of fungal infection in patients with nasal polyps [18]. It is important to note that this study was cross-sectional; therefore, causal relationships cannot be inferred. Future longitudinal studies with larger sample sizes and more detailed microbiological investigations could provide more insight into the role of fungal infections in the development and exacerbation of nasal polyps.

Conclusions

It is concluded that the frequency of fungal infection was high in patients with nasal polyps. Future studies with larger sample sizes and advanced diagnostic methods are necessary to further explore the relationship between fungal infections and nasal polyps.

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