Original Article

Prevalence of Fungal Infections in Patients with Nasal Polyposis in Babylon Governorate

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Abstract

Background: Nasal polyps are caused by frequent local respiratory sinus or nasal mucosal swelling. Antibiotic overuse and air pollution in overcrowded cities have resulted in the proliferation of many fungi, including saprophytes and pathogens, causing the emergence of various disorders. **Objectives:** The aim of this study is to identify the prevalence of fungal infections in cases of nasal polyposis in Babylon, Iraq. **Materials and Methods:** During 6 months, mucosal samples from 60 patients with nasal polyposis were obtained. The patients included 43 males and 17 females. The samples were separated into two portions: One was placed in normal saline, while the other was in formalin and sent for microbiological examination for fungi and pathological examination, respectively. **Results:** Nasal polyps were collected from 60 patients (43 males and 17 females), with a male/female ratio of 2.6:1. The age groups are between 12 and 60 years, with a mean age of 37 years. A positive direct smear for fungus was positive in four patients' samples. A positive culture of fungi was found in six patients' samples; four fungal species were identified as *Aspergillus flavus* and two species as *Aspergillus fumigates*. Histopathological examination showed inflammatory sinonasal polyposis in 58 samples and inverted papilloma in two samples. Submucosal fungal hyphae were found in three samples. **Conclusion:** Fungal infections of the nose and sinuses coupled with nasal polyps used to be considered uncommon. However, they have now become less rare. This disease was found even in immunocompetent individuals. *Aspergillus* was the most prevalent type of fungus, with adult males being more predominant.

Keywords: *Aspergillus*, fungal infection, nasal polyps

Introduction

Nasal polyposis is a chronic inflammatory disease of the mucous membrane in the nose and paranasal sinuses, round or pear-shaped masses of inflamed mucosa prolapsing into the nasal cavity. Nasal polyposis affects 1–4% of the general population; it is more common in adults.[1,2]

Nasal polyposis mostly forms as a result of chronic infection, aspirin intolerance, alterations in aerodynamic nasal airways, inhalants, or food allergens.[3] The diagnostic process consists of historical methods along with clinical checks and radiological and endoscopic investigations backed by specific tests measuring allergy response, bacterial samples, and lung functioning.[3,4] The main symptoms of nasal polyposis consist of nasal congestion accompanied by a decreased sense of smell or loss of smell, while chronic sinusitis complicates the presentation with purulent discharge along with postnasal drip, facial pain, headaches, sleep disturbances, and decreased life quality.[5] More than 200 fungal species exist which spread infections among human beings. For the previous five decades, the significance of fungal infections, particularly saprophytic infections, has emerged as essential.[6]

The fungi attach themselves to dust particles so they can enter the nasal opening along with the paranasal sinus

Access this article online

Quick Response Code:

Website: https://journals.lww.com/mjby

DOI: 10.4103/MJBL.MJBL_610_24

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Submission: 07-Jun-2024 **Accepted:** 13-May-2025 **Published:** 30-Sep-2025

How to cite this article: Witwit MLK, Al-Janabi UHK, Khairullah AR. Prevalence of fungal infections in patients with nasal polyposis in Babylon Governorate. Med J Babylon 2025;22:893-6.

mucosa. The respiratory tract section of the upper end serves as an optimal environment where these organisms multiply abundantly.[7,8]

The pathogenic effects of the infection are minimal in patients with strong host resistance; yet, allergic fungal sinusitis commonly presents with sinonasal symptoms and polyps in vulnerable subjects, particularly under conducive growth environments. The disease frequently recurs because of insufficient removal of allergic fungal mucin. Proper follow-up care requires careful attention to both clinical assessments and endoscopic reviews, as well as radiological evaluations, according to literature reports.[9]

The fungal infection exists in two main categories, which are invasive and noninvasive types. The noninvasive type functions as a saprophytic infection and grows without symptoms before turning into fungal balls as well as subepithelial fungal infections with diagnosis possible through histopathological examination only.[10] Patients require precise medical management after etiological diagnosis of nasal polyposis becomes possible through endoscopy, as well as computerized tomography (CT) scans, magnetic resonance imaging, and histopathological examinations with both hematoxylin and eosin stains and Gomorri Methylamine Silver and periodic acid-Schiff special stains.[11]

Materials and Methods

Patients and study design

During six months, from September 3, 2023, to March 3, 2024, samples of nasal polyps from patients with nasal polyposis were obtained from the ENT department of Hilla Teaching General Hospital, private hospitals, and private clinics of ENT surgeons. Sixty patients were enrolled in this study, comprising 43 males and 17 females, male-to-female ratio of 2.6:1. After polypectomy, the samples were separated into two portions: One was placed in normal saline, while the other in formalin for direct microscopic examination of mucous membranes besides polyps, with 10% KOH. Polyps were cultured on Sabouraud's dextrose media, and histopathological examination was performed by a pathologist using hematoxylin and eosin-stained sections. The hyphae were verified by PAS and silver stains.

Ethical approval

The proposal for this study was approved by the research committee at the University of Babylon, College of Medicine, under reference No. 227 on July 22, 2023. The consent of the institutional committees was obtained from the relevant Iraqi Ministry of Health authority for collecting the data, and the confidentiality of the collected data of the subjects was maintained. All aspects of this study adhered to the Declaration of Helsinki.

Results

Out of 60 patients exposed to nasal polypectomy, 43 were males (72%) and 17 females (28%). The male/female ratio was 2.6:1. The age groups ranged between 12 and 60 years of age. The mean age was 37 years [Table 1].

Table 1: Relation between age groups, numbers, and results of culture for fungal nasal polyposis

Age group (year)	No path	+ve	%	−ve	%
12–22	5	1	1.7	4	6.6
23–33	14	0	0	14	23.3
34–44	25	3	5	22	37.6
45–55	10	2	3.3	8	13.3
56–60	6	0	0	6	8.3
Total	60	6	10	54	90

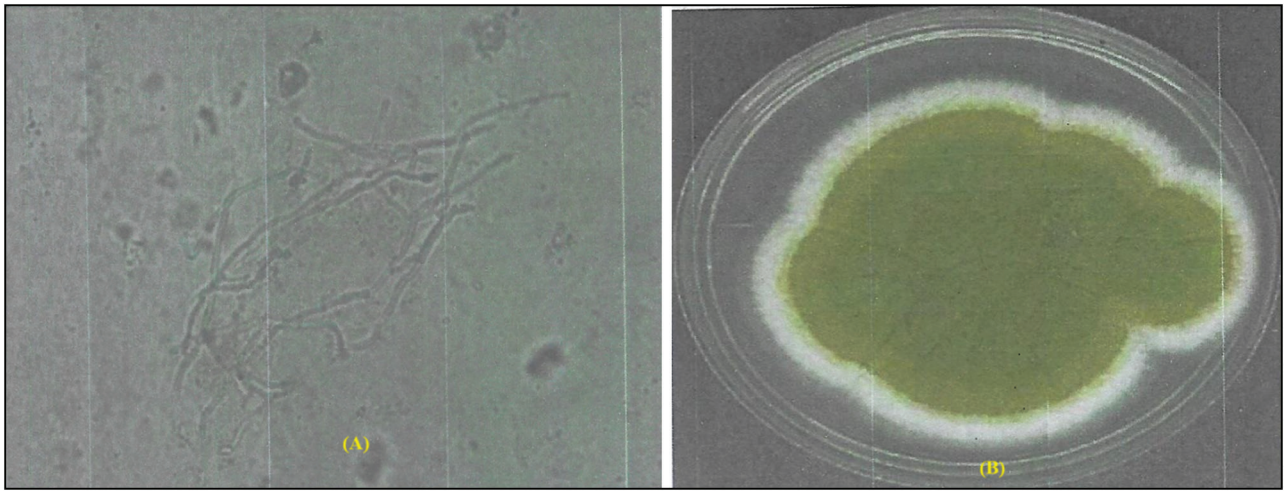

Figure 1: Microscopic (a) and macroscopic (b) views of *Aspergillus flavus* isolated from patients with nasal polyposis

Table 2: Relation between clinical presentation, culture, and histopathology results

Clinical presentation	No	%	+ve	Histopathology
Allergic respiratory diseases	42	70	2	1 submucosal fungal hyphen
Recurrent nasal polyposis	22	37	3	2 submucosal fungal hyphen
Chronic sinusitis	16	27	1	0 submucosal fungal hyphen
Diabetes mellitus	2	3.3	0	0 submucosal fungal hyphen

More than one presentation in the same patients

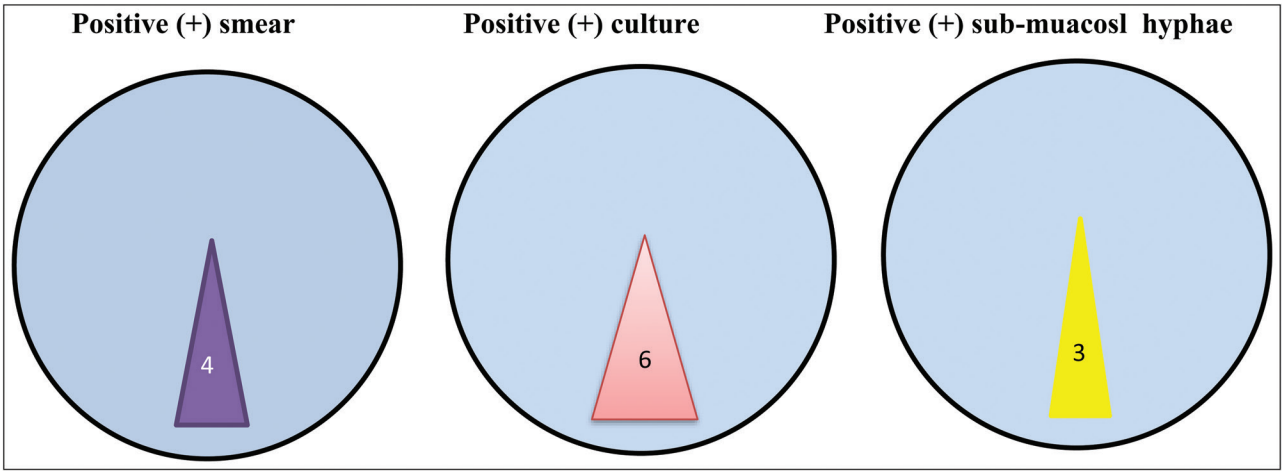

Figure 2: Number of positive smears, cultures, and submucosal hyphae of fungal infections

All patients had one or more clinical presentations. Forty-two (70%) had allergic respiratory disease, recurrent polyposis (22 patients, 37%), chronic sinusitis (16 patients, 27%), and diabetes mellitus (two patients, 3.3%).

The results also found that unilateral nasal polyps were detected in 41 patients (68%) and bilateral nasal polyps in 19 patients (32%). A positive direct smear for fungus was found in four patients (6.6%). A positive (+ve) culture of fungus was found in six patients (10%), four *Aspergillus flavus*, and two *Aspergillus fumigatus* [Figure 1].

Histopathological examination of polyps shows features consistent with inflammatory sinonasal polyposis in 58 patients (97%) and two patients with inverted papilloma. Submucosal hyphae of the fungus are found in the pathological lamella in three polyp samples (5%) [Table 2]. Figure 2 shows the numbers of positive smears, cultures, and submucosal hyphae of the fungal infections.

Discussion

Medical diagnosis of nasal polyps appears frequently in clinical practice. Nasal polyps affect one to four out of a hundred individuals across the entire population. The occurrence of nasal polyps dominates within the adult demographic but appears infrequently in people under 10 years old. Physical exposure to air pollution, alongside increased antibiotic use, makes people susceptible to developing nasal polyps. Nasal polyps develop most commonly because of allergic, viral, or bacterial infections, as well as fungal infections, together with environmental pollutants.[12]

Research by Siddiqui *et al*. revealed a gender breakdown of 51% female participants and 49% male participants, with an M:F ratio of 1:0.9. Our findings displayed a different distribution, issuing 72% male patients and 28% female patients. The patient population includes two times more males than females (2.6:1) (M:F), according to research.[13] According to research, the patient population reaching maximum numbers belonged to the age bracket of 20–29 years, but research findings indicated 34–44 years (42%) as the most prominent age range.

A study conducted by Aziz *et al.*[14] on unilateral nasal polyps (80%) was also studied by Wahid *et al*. and Srivani *et al*. (92% and 72%, respectively),[15,16] while in our study, only 68% of patients presented with unilateral nasal polyps.

Research from Iran examined 98 patients, resulting in eight patients with fungal involvement in 8.1% of nasal polypectomy cases.[17] The investigation at King Fahd Hospital, Saudi Arabia, detected fungi in 11 out of 91 specimens (12.1%),[18] whereas our research discovered fungus in 10% of samples.

Chauhan *et al.*[19] investigated the spectrum of fungi associated with acute invasive fungal rhinosinusitis during COVID-19, and they found that 94.1% of samples collected from patients were fungal culture-positive, and

a total of 52 fungi were isolated. Mucoromycetes were predominantly isolated from the samples, followed by *Aspergillus* species and *Candida* species.

Hussein and Jaf[20] studied the association of rhinoscopy and CT studies in the early stages of chronic rhinosinusitis. They revealed that the largest percentage (41.7%) of the sample was under the age of 30–39, and only 16.7% were above 50 years. The primary symptoms of the participants were ear pressure (up to 80%), nasal obstruction (about 80%), and rhinorrhea (78.3%). No statistically significant alteration was distinguished between the two tests concerning their results.

The occurrence of fungal infections among nasal polyp patients in Iraq and other regions in the Middle East was recently reported by several authors who revealed that the infection is dominated within adults but may appear infrequently in people under 10 years old.[19,21-23]

Conclusion

The study revealed that recurrent nasal polyposis had the highest quantity of positive fungal cultures and the highest quantity of submucosal hyphae. The results from incomplete clearance of fungal infection can lead to recurrences of polyposis, so antifungal treatment should be used after polypectomy in cases with a positive culture. Patients with recurrent nasal polyposis should follow up properly with periodic radiological and endoscopic examinations to prevent the recurrence of nasal polyposis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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