

Frequency of Fungal Diseases in Nasal and Paranasal Sinuses Masses

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ABSTRACT

Background: Nasal polyps/nasal masses are common problems in our community that bring the patient to clinical attention because of worsening symptoms of nasal obstruction, referred pain and discomfort in paranasal sinuses and sometimes problems of vision. Histopathologic examination categorizes the nasal masses into different entities. Suspicion of fungal infection was one of the differentials in recurrent infections and in immunocompromised individuals. **Objective:** To determine the frequency of fungal disease in nasal and paranasal sinuses mass/biopsies on histopathological examination. **Study Design:** This was a descriptive study. **Settings:** ENT department of Sheikh Zayed Hospital, Lahore Pakistan. **Duration:** Two years from September 2011 to September 2013. **Methods:** Surgical specimens of 60 patients presenting in ENT department of Sheikh Zayed Hospital, Lahore with the complaint of nasal polyps or nasal /paranasal sinuses masses. **Results:** Biopsies procured from these sixty patients were examined histologically. Out of these sixty cases 11 patients were found to have fungal growth in the surgical specimens on histological examination. 48 patients had diagnosis of “inflamed/allergic nasal polypi”. Two of the cases were having chronic granulomatous inflammation. One case out of these 60 cases was diagnosed as having mass due to chronic granulomatous inflammation. In one case the granulomatous inflammation was associated with fungal infection while in other case it was most likely caused by tuberculosis. **Conclusion:** Fungal disease/fungal mass were present in 18% patients of nasal polyposis, chronic sinusitis with nasal obstruction/masses. Female were the majority in the positive population. Based on morphological features most common (91%) fungal species was *Aspergillus*.

Keywords: Nasal polyps, Nasal and paranasal sinuses masses, Fungal diseases / Fungal masses.

INTRODUCTION

Humidification, filtering and temperature regulation are important functions of nose and paranasal sinuses. The nose and paranasal sinuses are connected through the various sinus ostia and are lined with ciliated columnar epithelium containing goblet cells. During fetal development the paranasal sinuses originate as invagination of nasal mucosa into the lateral nasal wall, the nose opens into the nasal cavity, which is divided into two nasal passages. During breathing air moves through these passages. The nasal cavity lies above the bone that forms the roof of the mouth and curves down at the back to join the throat. The area just inside the nostrils is called the nasal vestibul.¹

Swelling of nasal mucosa and paranasal sinuses is caused by fever, infections, and allergic conditions and is also seen in sinusitis. There is mucosal swelling and edema in allergic conditions or after exposure to irritant factors. These allergic conditions or irritations can lead to polyp formation due to prolonged sustained edema and inflammation. This polyp can initially appear as mucosal bump that can progressively convert into a visible mucosal lump having a stalk. These polyps are usually bilateral and freely movable lesions with smooth contour and shiny surface. Majority of times these are curable by surgical intervention / Functional Endoscopic Sinus Surgery but the only complication that is commonly associated with these polyps is the rate of high recurrence.²

On microscopic examination there are polypoidal lesions covered by pseudostratified ciliated columnar epithelium along with thickened basement membrane. Underlying core in these polyps comprise of edematous fibro collagenous tissue infiltrated by moderate chronic inflammatory cell infiltrate with predominance of eosinophils. This fibro collagenous tissue also encloses small sized congested vascular channels along with some nerve bundles. Eosinophilia is a prominent feature appreciated on both tissue sections and in complete blood cell count. Polyps can be etiologically related with many diseases like allergic rhinitis, upper respiratory tract infections and fungal infections of nose and paranasal sinuses.³

Fungi are a group of microbial organisms widely distributed in environment as well as at various body sites as a part of normal flora. They cause diseases both in human beings and in animals. There are thousands of species of fungi but very few of them cause illness in human beings. Fungi can cause a wide spectrum of infections ranging from localized infections to life threatening infectious diseases. Fungal sinusitis is the word that is used to depict the infection of nasal and paranasal sinuses by fungi.⁴

Fungal presence can be in the form of a benign, localized mucosal protrusion or it can be a saprophytic crusted lesion. Fungi may also cause life threatening invasive disease. Regarding nasal cavity and paranasal sinuses fungal infection is an increasingly recognized entity in both normal and immunocompromised individuals.^{5,6} This is because of excessive exposure to various treatment modalities and improved rate of survival of immunocompromised patients. Because histopathological examination of tissues detects fungal invasion of tissues and vessels as well as the host reaction to the fungus, it is and will remain an important tool to diagnose fungi.⁷

A variety of different organisms are responsible for paranasal mycosis. Aspergillosis, mucormycosis, histoplasmosis and coccidioidomycosis are the most prevalent fungal species observed in nasal and paranasal sinuses. Among these prevalent fungi *Aspergillus fumigatus* is the most common one mostly encountered in the paranasal sinuses. Among the paranasal sinuses the maxillary antrum is the sinus most often involved. For the sake of recognition of fungal infection in nose and paranasal sinuses a high index of suspicion is required. Immunosuppressed patients are clearly at highest risk. Diagnosis is established through antrostomy and biopsy.^{8,9}

Presence of fungal infections can be predicted on the basis of Histopathological features in a biopsy specimen

obtained from nose or paranasal sinuses. In tissue biopsies fungal hyphae can be seen as refractile septate or non-septate structures entrapped in surface secretions or present in fragments of debris included in these biopsy specimens. Hyphae bear different microscopic appearance in different part of tissue sections and deeper levels. Toward the center of fungal mass they tend to appear swollen and blotted until they lose their structure altogether. In allergic fungal sinusitis, thick yellow or green inspissated mucous is seen along with typical nasal polyp. The allergic basophilic or eosinophilic mucin contains sloughed respiratory epithelium, chronic inflammatory cells with prominent eosinophils, and char coat Leyden crystals. Fungal hyphae which are visible in routine histologic stain can be confirmed by specialized histochemical stains.^{10,11}

Objectives: (1) To determine the frequency of fungal diseases of nasal and paranasal sinuses within nasal masses and nasal biopsies on histopathological examination. (2) Identification of various fungal strains and their percentages within nasal or paranasal sinus masses.

METHODS

This was a descriptive study conducted in the Department of Histopathology, Shaikh Zayed Hospital Lahore. Specimens were received in the Histopathology Department after conduction of surgical procedures in the Department of ENT Shaikh Zayed Hospital, Lahore Pakistan. The duration of the study was two years From September 2011 to September 2013.

Sample size for the present study was 60, comprising of patients who presented in the department of ENT with chronic sinusitis accompanied by nasal polyposis, or nasal and paranasal sinus masses (nonneoplastic) undergoing surgical procedure in ENT department of Shaikh Zayed Hospital Lahore.

Patients of both genders above the age of 10 years undergoing surgical procedure in department of ENT with masses/lesion of nasal and paranasal masses were included. Specimens received without formalin and inadequate biopsies were not included.

All patients were explained about the purpose of this study and an informed consent was obtained. The patients were enquired about the symptoms, previous history of sinus surgery, and any previous medical history, history of systemic illness like diabetes mellitus, immunodeficiency or history of immunosuppressive drug therapy. Radiological work up was observed wherever it was necessary.

The data was recorded into specific designed study proforma through the information provided by the

patient and patient hospital record provided in file after the consent of patient through signed consent form. Immediately after surgery, biopsies were fixed in 10% formalin. The collected samples were processed in automatic tissue processor. Specimens collected and slides prepared were analyzed by and reported in the Histopathology Department. All the biopsy specimens were fixed in 10% formalin overnight for 24 hours, processed in automatic tissue processor through increasing concentration of 70% to 95% to 100% alcohol, treated with clearing agent (xylene) and embedded in paraffin wax. Three-micron thick sections were cut and stained with following methods. Hematoxylin and eosin staining methods using Harris's hematoxylin. Silver methenamine staining, Periodic acid Schiff staining & Zeihl Neelsen staining on all biopsy specimens to see and confirm the presence of fungi.

RESULTS

Sixty patients with complaints of nasal polyps, chronic rhinosinusitis with polyps and suspicion of fungal masses who underwent surgery in ENT department of Shaikh Zayed hospital, Lahore were included in this study. Biopsies from these patients were procured and examined.

The age range of these sixty cases was between 16-65 years (Table 1) Out of these sixty cases 25 were male and 35 patients were female. (Table 2)

Table 1: Age of the patient

	n	Minimum	Maximum	Mean	Standard deviation
Age of patient	60	16	65	32.18	13.39

Table 2: Gender of the patient

	Frequency	Percentage
Male	25	41.7
Female	35	58.3
Total	60	100.0

Fungal growth in the surgical specimens on histological examination was found in 11 cases (Figure 3-4). 48 patients were diagnosed as having, "Benign inflamed /allergic nasal polyps" (Table 3) & (Figure 1, 2). One patient out of these 48 cases was having inflamed polyps accompanied by chronic granulomatous inflammation (Figure 2). One out of these sixty cases was found to have "Chronic granulomatous inflammation" of nose with the suspicion of tuberculosis.

Table 3: Presence of Fungal Lesion

	Frequency	Percentage
No	49	81.7
Yes	11	18.3
Total	60	100.0

Based on the morphological picture the distribution of various fungal organisms was as follows (Table 5)

Table 4: Type of Fungal Strain

	Frequency	Percentage
Aspergillus	10	90.0
Mucormycosis	01	9.1
Total	11	100.0

Table 5 Association of nasal masses with other predisposing conditions

	Frequency	Percentage
Deviated nasal septum	24	40%
Diabetes mellitus	11	18.3%
Use of corticosteroid	11	18.3%
Neutropenia	01	1.6%

Figure 1: Photomicrograph of one case of an inflamed polyp showing chronic granulomatous inflammation that was negative for AFB (ZN Stainx70)

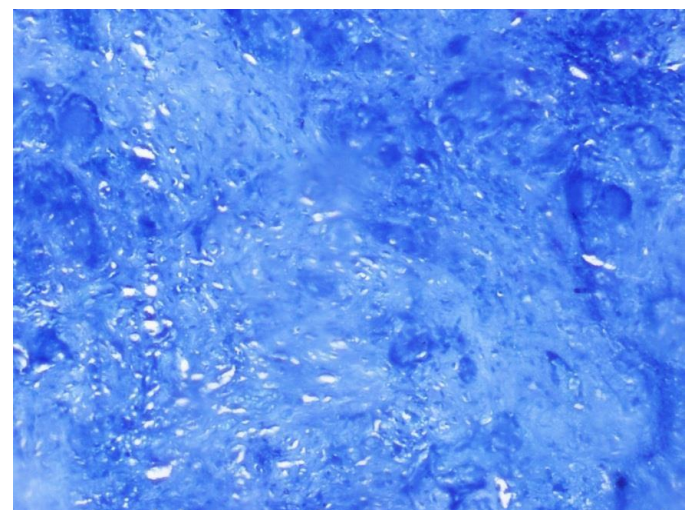


Figure 2: Photomicrograph of an inflamed / allergic nasal polyp (H&EX70)

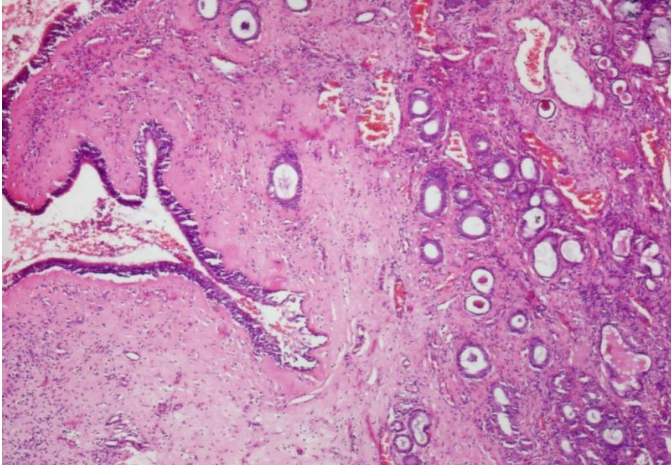


Figure 3: Photomicrograph confirming the presence of septate fungal hyphae (Aspergillus) on specialized histochemical stain for fungus (Silver Methenamine stainx70)

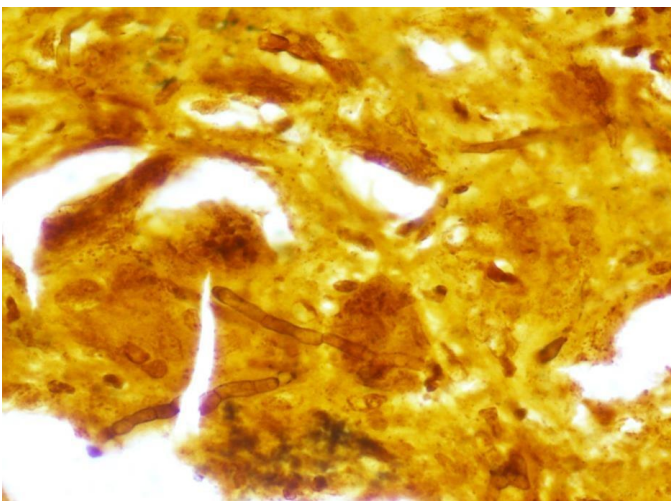
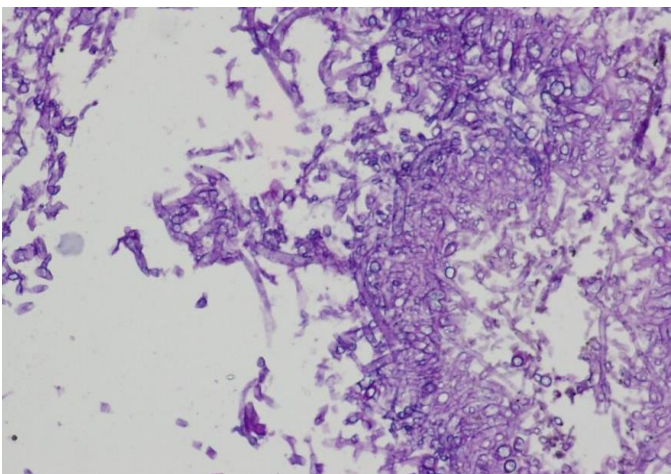


Figure 4: Photomicrograph revealing the presence of septations within the fungal hyphae of Aspergillus (PAS stainx28)



DISCUSSION

Formation of polyps in upper airways is a common condition. It seems likely that nasal polyposis is a result of many pathological processes including allergic reactions, fungal ball or part of neoplastic process. This study describes the frequency of fungal diseases in patients with nasal polyps/nasal masses.

Fungal infections/growth is promoted by evidence of prolonged antibiotic therapy that alters the normal flora of nose.¹²

This study describes the frequency of fungal diseases in patients with nasal masses/polyps. We utilized various histological staining techniques that help to identify the various fungal organisms within the surface mucin. Hematoxylin and Eosin staining accentuates the mucin and cellular components of allergic fungal mucin. Fungi may be difficult to identify on this stain, so Gomori methenamine silver stain which turns fungi brown to dark black was used along with PAS stain. The use of fungal stain complement the findings of initial H&E stain and are exclusively important in the identification of fungus.

In our study mean age of patients were 32 years ranging from 16-55 years. Eighty percent of the patients were below 40 years of age. These results are close to the result described by Ullah N, Mill T.L and Pal M.B in surgical management of massive nasal polyps that were 35.5years but another study conducted by Thahim *et al* and Yousaf *et al* showed different results with average age of patients of 20.75 years and 24 years respectively. Regarding the gender distribution in patients who had histopathological evidence, we saw female predilection. Danyal *et al*. And Suriya *et al* also found the female predilection but M. Yousaf and Thahim *et al* found male preponderance with ratio of 3:1 and 7:3 respectively.^{13,14}

A slight deviation of nasal septum towards the site of lesion was found in 24 patients, in the rest of the patients the predisposing condition like diabetes was present in 11/60(18.3%), corticosteroid use was present in 11/60(18.3%). None of the patient was immunodeficient but one of them was having neutropenia (table 5).No patient was having maxillofacial anatomical abnormalities. Proptosis was present in 11% cases that are close to the results in a study by Anees-ur-Rehman who reported proptosis in 8% of cases.¹⁵

Two of our patients complained of visual problems. Likewise bone invasion was found on CT scan was observed in four out of 11 patients having fungal disease. On the contrary extremely dense areas deep inside the fungal masses were identified in all of our case. This finding is considered pathognomic for the aspergillosis of

paranasal sinuses and is due to calcium phosphate and to a lesser degree calcium sulfate accumulation in necrotic areas toward the center of the fungal mass.

In our study the *Aspergillus* was the most prevalent species followed by mucormycoses. These results were close to a study in Saudi Arabia that reported the presence of *aspergillus* as most common species followed by dermataceous fungi. On the other hand literature from west quotes the *Bipolaris* as most commonly occurring species.^{16,17}

CONCLUSION

Detection of fungal infection in association with these pathologies highlights the importance of histopathologic examination of this specimen. Through timely commencement of conservative treatment risk of invasive infections can be reduced.

LIMITATIONS

Correlation of histologic findings with culture reports could not be done due to financial constraints and incidental findings.

SUGGESTIONS / RECOMMENDATIONS

Every nasal mass must be evaluated through histopathology to find out the category of the lesion.

CONFLICT OF INTEREST / DISCLOSURE

All authors declare no conflicts of interest.

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