

# Clinicomycological Spectrum of Fungal Rhino-Sinusitis from University Hospital, North India

RAGINI TILAK, VIKAS KUMAR, CHAITANYA NIGAM, MUNESH KUMAR GUPTA, RAJESH KUMAR, R.K. JAIN

## ABSTRACT

**Background:** Fungal infection of the paranasal sinuses is an increasingly recognized entity, both in normal and immunocompromised individuals. Various agents including bacteria, viruses and fungi have been introduced as aetiological origins of the disease. Fungi have been reported as a common cause of sinusitis and among them *Aspergillus* species are the usual. The objective of this study was to explore the frequency of different fungi isolated by in vitro culture from biopsy samples obtained from operated rhinosinusitis patients.

**Materials and Methods:** A total of 47 patients clinically diagnosed with sinusitis and who underwent sinonasal surgery

performed between 2008-2011 in the University hospital were included in this study.

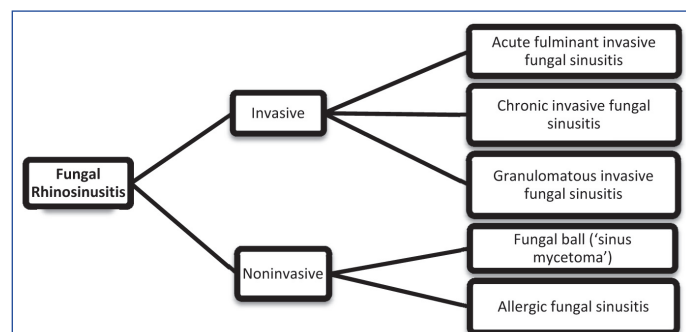
**Results:** Fungal cultures were positive in 10 (21.3%) of 47 patients from surgical specimen. *Aspergillus spp*, *Fusarium*, *Rhizopus*, *Candida albicans* and *Bipolaris species* were isolated in these cases.

**Conclusion:** The overall frequency of fungal sinusitis in studied population was 21.3%. Early diagnosis and combination therapy of surgery and antifungal therapy is needed. Although culture helps in definite diagnosis and identification, direct microscopic detection (10% KOH) of fungal structures in biopsies permits a rapid presumptive diagnosis.

**Key Words:** Fungi, Rhinosinusitis, *Candida albicans*, *Aspergillus sp*, *Fusarium*, *Rhizopus*

## INTRODUCTION

Sinusitis is the term representing inflammation of the paranasal sinus mucosa. Fungal sinusitis is one of important health care problem and its incidence and prevalence are increasing day- by -day. The term rhinosinusitis has become a common replacement for the term sinusitis because sinusitis is often preceded by rhinitis and rarely occurs without concurrent nasal airway inflammation due to the contiguous nature of nasal and paranasal sinus mucosa, as well as their interactions and potentially shared involvement in various inflammatory processes. A wide range of fungal species are involved as a common cause of sinusitis but the most common are those belonging to genus *Aspergillus*. Fungi can cause both acute and chronic rhinosinusitis and can occur as either invasive or non-invasive conditions [Table/Fig 1] [1].



[Table/Fig-1]: Types of Fungal Rhinosinusitis

### 1. Acute Fulminant Invasive Fungal Sinusitis

Of the invasive disorders, the acute fulminant necrotizing form is the classic fungal infection epitomized by 'mucormycosis'. It usually occurs in immunosuppressed hosts. The risk factors include diabetes mellitus, immunodeficiency, cancer and immunosuppressive drugs.

Wide surgical debridement of infected tissue and concomitant antifungal drug therapy is required urgently. Prognosis is poor without correction of the underlying immunocompromised states.

### 2. Chronic Invasive Fungal Sinusitis

It usually occurs in patients with diabetes mellitus and commonly leads to periorbital tissue invasion and the 'orbital apex syndrome' [2, 3]. Surgical resection and systemic antifungal drugs are required, but the infection may recur and is difficult to treat.

### 3. Granulomatous Invasive Fungal Sinusitis

A more indolent form of invasive disease has been termed granulomatous invasive fungal sinusitis. Sinus mucosal resection may be curative, but systemic anti-fungal drugs are commonly used postoperatively to assure complete resolution of fungal infection.

### 4. Fungal Ball

In fungal ball, multitudes of fungal hyphae are compressed into a thick exudate within a sinus lumen. This non-invasive fungal sinusitis is resistant to medical management and must be removed surgically. This may occur in patients with previous sinus surgery, oral-sinus fistula, history for cancer chemotherapy or those without any known predisposing factor [1,4,5]. It is also called as "sinus mycetoma".

### 5. Allergic Fungal Sinusitis

AFS is the other form of non-invasive fungal rhinosinusitis. It represents more of a hypersensitivity response to the presence of extra-mucosal sinus fungal hyphae; with a prominent element of fungal-specific type I immediate hypersensitivity although the disease appears complex and likely involves the interplay of various inflammatory modalities [6, 7].

Case no	Age (years)	Sex	Clinical features	Duration of symptoms (months)	Underlying conditions
1	55	F	Headache, nasal discharge, nasal obstruction	11	Diabetes Mellitus/ Hypertension/allergic rhinitis
2	28	M	Nasal discharge, left nasal obstruction	48	None
3	60	M	Fever, nasal discharge	1	Diabetes mellitus
4	80	M	Right Nasal blockage	2	Bronchial asthma
5	28	F	Bilateral Obstruction, discharge, bleeding from nose	4	Allergic rhinitis
6	38	F	Headache,excessive lacrimation, right nasal blockage	2	Pulmonary Tuberculosis
7	40	F	Bilateral nasal blockage and discharge	60	Allergic rhinitis and asthma
8	29	F	Headache, bilateral nasal blockage, sneezing	6	None
9	11	F	Left Blockage and discharge	4	None
10	32	M	Headache, right nasal obstruction, discharge	7	Bronchial asthma

[Table/Fig-2]: Clinical data of ten patients with allergic fungal sinusitis

Fungal sinusitis has remained a diagnostic and therapeutic challenge since its prominence about two and a half decades ago, so the current purpose of this study was to explore the frequency of different fungi isolated by in vitro culture from biopsy samples obtained from operated rhinosinusitis patients and to increase awareness among physicians.

## MATERIALS AND METHODS

A total of 47 patients with clear symptoms of chronic rhinosinusitis that their diagnosis had been confirmed by CT scan and who underwent sinonasal surgery performed between 2008-2011 in the University hospital were included in the study. Information regarding age, sex, clinical presentation, radiological appearance, and type of treatment were recorded whenever available. Biopsy samples from their polyps and sinusoidal mucosa dissected under surgery operations and aseptically transferred to sterile phosphate buffered saline to make invitro cultures. A small amount processed sample was mixed with 10% KOH and was examined using light microscopy for presence of fungal elements. The size and morphology was noted. Gram stain was performed to observe the yeasts. Specimen was inoculated on to Sabouraud's dextrose agar (SDA); SDA with chloramphenicol for fungal culture. All cultures done in parallels, one in 25°C and another incubated in 35°C. All cultures were kept in proper condition upto 3 weeks and observed for fungal growth daily for one week and then weekly. Growth if any was identified on the basis of rate of growth, colour, texture, pigmentation of fungal colony and morphological features in microscopy (lacto phenol cotton blue stain /LPCB mount). Yeast cells were further confirmed by germ tube test, chlamydo spores production on cornmeal agar and growth at 42°C. Slide cultures were also done to explore microscopic features of the isolates.

## RESULTS

Clinical data of ten patients with allergic fungal sinusitis are summarized in [Table/Fig-2]. The mean age of the patients was 40 years (range 11-80 years). There was female predominance (6/10 cases).The clinical presentation of most of the patients was nasal obstruction of the corresponding side, with or without headache and nasal discharge. The duration of symptoms before diagnosis ranged from one months to 60 months, with a mean duration of 14.5 months. Most of the patients had a history of chronic rhinosinusitis or bronchial asthma. Radiographically, most of the patients showed opacification and soft tissue mass involving multiple paranasal sinuses either in one or both sides. Out of the 47

Type of fungi	Positive	Percentage
<i>Aspergillus flavus</i>	3	30%
<i>Aspergillus fumigatus</i>	2	20%
<i>Fusarium</i>	1	10%
<i>Rhizopus</i>	1	10%
<i>Bipolaris</i>	1	10%
<i>Candida albicans</i>	2	20%

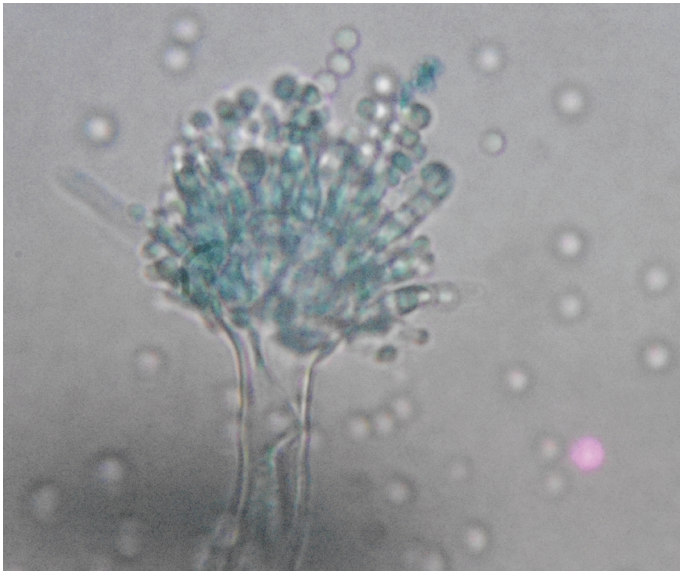
[Table/Fig-3]: Fungal agents recovered from patients with sinusitis

cases of sinusitis investigated; fungal infection was observed in 10 patients. On microscopic examination out of these 10 cases, direct KOH mount was positive in seven cases. In vitro cultures on fungal culture medium of the patients sample, showed pure growth of the fungus. On Lacto phenol cotton blue staining examination, the isolated fungi were *Aspergillus flavus* (3), *Aspergillus fumigatus* (2), *Fusarium* (1), *Rhizopus* (1), *Bipolaris* (1) and *Candida albicans* (2) [Table/ Fig 3-9].

## DISCUSSION

The overall incidence and prevalence of fungal sinusitis is increasing, particularly during the last three decades. A major contributor to this emergence is growing number of immunocompromised and susceptible individuals. Fungal agents are part and parcel of soil and the environment, atmospheric air, acts as the most common source of infections. Fungal spores find easily their ways to sinusoidal cavities through respiration. The colonization and invasion of paranasal sinuses by various species of *Aspergillus* has been substantially observed as clinically significant. The aetiology has been found to be different in different types and subtypes of fungal sinusitis. The Northern part of India, Sudan and South Western states of the USA are endemic areas for fungal sinusitis. *Aspergillus flavus* is the predominant agent in the Indian subcontinent, whereas in other parts it is *A.fumigatus* [8, 9]. Among the studied population, 10 out of 47 patients (21.3%) had fungi in in-vitro cultures and the most commonly isolated fungus belonged to *Aspergillus* (5 cases) and *Candida albicans* (2 cases) and there was a *Fusarium*, *Rhizopus*, *Bipolaris* case too. In a study conducted by Rupa et al., from India, *Aspergillus* species were the most common fungi isolated (95.8%) in a series of 24 patients with AFS [10]. Study from abroad, Matsuwaki et al., reported a case of AFS caused by *Penicillium* spp. and *Cladosporium* spp [11], Fadl et al., reported 4 cases of AFS, and all were *Aspergillus* spp [12] and Sabokbar et al., showed *Candida* spp. as the predominant agent in fungal rhinosinusitis [13].

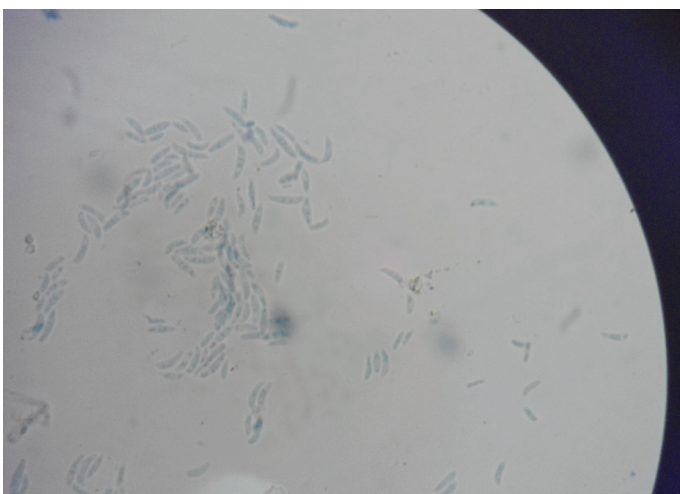




[Table/Fig-4]: LPCB Mount: Conidiophores, vesicle and conidia of *Aspergillus flavus*.



[Table/Fig-5]: LPCB Mount: Conidiophores, vesicle and conidia of *Aspergillus fumigatus*.

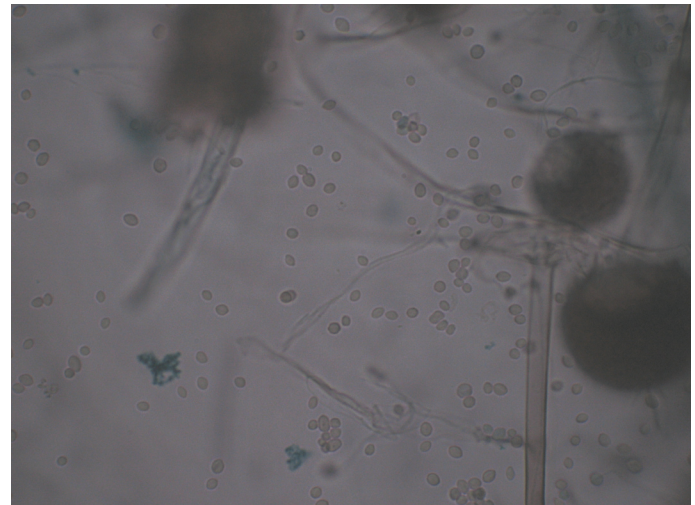


[Table/Fig-6]: LPCB Mount: Bean shaped macroconidia of *Fusarium* species.

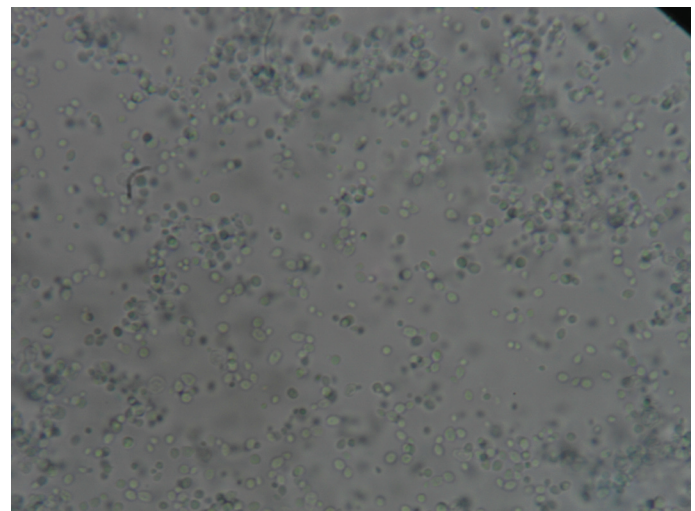
Here in the present study sample size was small so further study should be recommended involving a larger number of samples.

## CONCLUSION

In conclusion, this study highlights the importance of paranasal sinus mycosis in North India. As fungal diseases are not notifiable infections like viral, bacterial or parasitic disease hence these are



[Table/Fig-7]: LPCB Mount: Non-septate hyphae of *Rhizopus* species.



[Table/Fig-8]: LPCB Mount: Budding Yeast cells.



[Table/Fig-9]: LPCB Mount: Conidia of *Bipolaris* species.

not given much attention and usually diagnosis is established very late. Therefore early diagnosis and recognition of fungal sinusitis is very important, not only because it is curable in the early stages, but also to prevent progression of the disease in to the more serious and destructive invasive forms. Therefore our suggestion to clinicians is that all the chronic rhinosinusitis patients should be screened for fungal aetiology. Treatment requires surgical debridement to remove the hypertrophic tissue and mucinous secretions, nasal and oral corticosteroids are often used to modulate the immune

response. In refractory cases, systemic antifungal therapy may be warranted.

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