

Original Research Article

ASSESSMENT OF FUNGAL DISEASES IN CASES OF SINONASAL POLYPOSIS AND CHRONIC RHINOSINUSITIS UNDERGOING FESS

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ABSTRACT

Background: Chronic rhinosinusitis (CRS) is an inflammatory condition of the paranasal sinuses that causes chronic sinonasal symptoms. Fungal rhinosinusitis (FRS), caused by a fungus, has become more common in recent years, lowering quality of life. Nonetheless, the pathogenesis, etiology, and successful treatment remain controversial. This study sought to determine the prevalence of fungal sinusitis in relation to chronic rhinosinusitis and sinonasal polyposis in patients undergoing functional endoscopic sinus surgery (FESS).

Materials and Methods: A total of 98 people with clinically and radiologically confirmed sinusitis who had symptoms for more than three months prior to receiving FESS were included. We analyzed nasal tissue, sinus secretions, and allergy mucus samples from patients having Functional Endoscopic Sinus Surgery (FESS). The obtained specimen sample underwent culture and direct microscopy using 10% potassium hydroxide. We performed a microscopic examination using a lactophenol cotton blue mount to investigate fungal morphology.

Results: Nasal obstruction was the most common clinical symptom, occurring in 30% of cases, followed by nasal secretion (16%), headache (13%), sneezing (10%), cough (9%), hyposmia (9%), fatigue (5%), allergic rhinitis (4%), and asthma (4%). Favorable cultural results were observed in 21.42% of cases. *Aspergillus fumigatus* was the most frequently found fungus at 14.28%, followed by *A. flavus* at 6.12% and *Mucor* at 1.02% (see Table 3). Fungal proliferation was detected in 21 cases, as demonstrated by culture and KOH mount.

Conclusion: Finally, endoscopic sinus surgery and antifungal therapy are the most common treatments for fungal sinusitis. Due to the rising occurrence of paranasal sinus infections, otolaryngologists must incorporate fungal infections into their usual practice. Fungal sinusitis often manifests as unilateral paranasal sinus involvement. The maxillary sinus is the most usually affected paranasal sinus in fungal rhinosinusitis because its ostium is located lower in the middle meatus, allowing bacteria easy access.

Keywords: Chronic rhinosinusitis, fungal sinusitis, Functional endoscopic sinus surgery (FESS), *Aspergillus*.

INTRODUCTION

Chronic rhinosinusitis represents an inflammatory condition of the paranasal sinuses, impacting approximately 1% to 5% of the population in the United States. Chronic rhinosinusitis is defined by

the presence of at least two of four key symptoms persisting for a minimum of 12 consecutive weeks. Fungal rhinosinusitis (FRS), previously considered uncommon and affecting 5%–10% of chronic rhinosinusitis cases, has experienced an increase in reported occurrences attributed to improvements in

diagnostic technologies. The rise in FRS could be linked to increased antibiotic use, longer life spans, climate change, higher levels of air pollution, and more time spent indoors.^[3,4]

Fungal rhinosinusitis (FRS) has been recorded in medical literature for over two hundred years. In the last quarter-century, it has received significant focus, along with increased diagnostic awareness and improvements in laboratory techniques for identifying fungi. Classifying fungi based on how they interact with their host's immune system and how much they invade tissues is important for selecting the appropriate treatment and predicting the outcome. Understanding this type of fungus, how often it occurs, its symptoms, results from physical exams, and other tests in people with chronic rhinosinusitis (CRS) will help doctors better diagnose and manage the condition.^[5,6] The most effective treatment for allergic fungal sinusitis involves the thorough removal of allergic mucin through functional endoscopic sinus surgery. This facilitates ongoing drainage and airflow in the affected sinuses.^[7]

This investigation sought to evaluate the occurrence of fungal sinusitis in connection with chronic rhinosinusitis and sinonasal polyposis among patients undergoing functional endoscopic sinus surgery (FESS).

MATERIALS AND METHODS

This study was carried out from April 2023 to September 2024 in the ENT department of MNR

Medical College and Hospital in Sangareddy. A total of 98 patients with sinusitis that had been clinically and radiologically diagnosed and had symptoms longer than three months prior to receiving FESS were included. Patients who had a fungal infection in their DNE, had cancerous nasal lesions, had been on steroids for the previous month, or were unwilling to take part were not included. The study procedure was approved by the institutional ethics committee, and participants provided written informed consent.

Each participant had a thorough physical and clinical assessment. The cases underwent the required radiological evaluation and laboratory tests. In patients undergoing FESS, samples of nasal tissue, sinus secretions, and allergy mucus were taken for mycological examination. A culture and direct microscopy using 10% potassium hydroxide were performed on the acquired specimen sample. On Sabouraud's dextrose agar, the material was inoculated twice using Gentamicin and Chloramphenicol. Both 250 and 370 Celsius were used to incubate the infected material. For a week, it was observed every day, and for next three more weeks, it was monitored twice weekly. Fungal growth was recognized by looking at its microscopic and macroscopic characteristics. By using Lactophenol Cotton Blue Mount, the microscopic morphology was examined. When the species identification in the LPCB mount was not achievable due to uncertain morphology, slide culture was used.

RESULTS

Table 1: Sociodemographic profile of study participants

Demographic parameters	Total no of cases (n=98)	
	Frequency	Percentage
Age (In years)		
14-30	31	31.63%
31-50	42	42.85%
>50	25	25.52%
Gender		
Male	57	58.16%
Female	41	41.83%
Occupation		
Daily wage labour	28	28.58%
Industrial	11	11.22%
Agriculture	24	24.48%
Professional	07	7.14%
Housewife	28	28.57%

Table 2: Endoscopic and CT scan findings of polyps

Laterality	CT-Scan		Diagnostic nasal endoscopy	
	Frequency	Percentage	Frequency	Percentage
Unilateral right	12	12.24%	14	14.28%
unilateral left	16	16.32%	15	15.30%
Bilateral	22	22.44%	25	25.52%
No polyps	48	48.98%	44	44.90%

Table 3: Details of microbial isolates and culture results among study participants

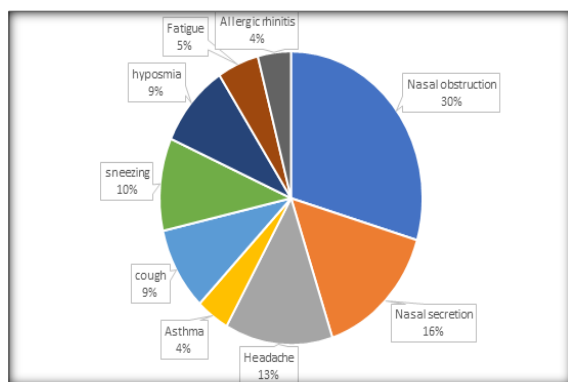
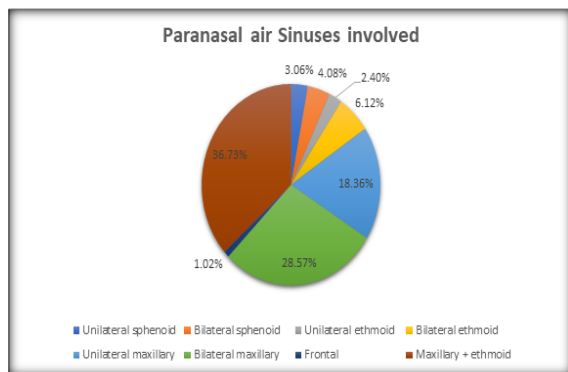
Parameters	Total no of cases	
	Frequency	Percentage
Culture report		
Positive	21	21.42%
Negative	77	78.58%
Microbial isolates		
Mucor	01	1.02%
Aspergillus flavus	06	6.12%
Aspergillus fumigatus	14	14.28%

Table 4: comparison of culture results and KOH mount among study participants

KOH/Culture	Culture +Ve	Culture -Ve
KOH +Ve	21	01
KOH -Ve	0	76

Table 5: Determination of recurrence rate

	With recurrence	Without recurrence
Fungus +Ve	0	22
Fungus -Ve	12	64

**Graph 1: Associated clinical symptoms of the study participants****Graph 2: CT-scan based findings of sinus involvement among study participants**

DISCUSSIONS

The predominant age group of participants was 31-50 years (42.85%), followed by 14-30 years (25.52%) and those over 50 years (22.52%), with a greater percentage of male participation (58.16%). Daily wage laborers represent 28.58% of the population, closely succeeded by housewives at 28.57%. Agricultural dependents constitute 24.48%, industrial workers account for 11.22%, and professional personnel for 7.14% (Table 1).

Nasal obstruction was the predominant clinical symptom, present in 30% of cases, followed by nasal secretion at 16%, headache at 13%, sneezing at 10%, cough at 9%, hyposmia at 9%, fatigue at 5%, allergic rhinitis at 4%, and asthma at 4% (Graph 1). A study conducted by Dall'Igna C et al. revealed nasal obstruction (92%), nasal discharge (88.7%), postnasal dripping (82.2%), and cough (69.35%) as the primary symptoms in chronic rhinosinusitis (CRS) cases.^[8] The CT scan results revealed that unilateral left-sided polyps were found in 16.32% of patients, unilateral right-sided polyps in 12.24%, bilateral polyps in 22.44%, and no polyps in 48.98% of cases. Diagnostic nasal endoscopy results indicated unilateral right polyps in 14.28% of cases, unilateral left polyps in 15.30%, bilateral polyps in 25.52%, and the absence of polyps in 44.90% of cases (Table 2).

CT scan results revealed maxillary sinus involvement with ethmoid sinus in 36.73% of cases, followed by bilateral maxillary involvement at 28.57%, unilateral maxillary at 18.36%, bilateral ethmoid at 6.12%, bilateral sphenoid at 4.08%, unilateral sphenoid at 3.06%, unilateral ethmoid at 2.40%, and frontal sinus at 1.02% (Graph 2). Positive cultural outcomes were observed in 21.42% of instances. Aspergillus fumigatus was the predominant fungal isolate at 14.28%, succeeded by A. flavus at 6.12% and Mucor at 1.02% (Table 3). Fungal proliferation was noted in 21 instances, as demonstrated by the culture and KOH mount (Table 4).

A study by Suresh Kumar et al. encompassing 156 cases revealed a greater prevalence of fungal rhinosinusitis in males aged 30 to 40 years. Nasal obstruction was noted in 85% of instances, whilst headache was documented in 56%. Radiological evaluations revealed involvement of several air sinuses. Microbiological investigations detected fungus in 18 samples, constituting 11.5%, according to direct culture results and potassium hydroxide mount culture assessment. The Aspergillus genus

was primarily recognized as the causative agent, with *A. flavus* being the most commonly seen species (65%), due to environmental conditions and living circumstances that increase spore exposure. A recurrence research performed post-study time had unfavourable outcomes.^[9]

A study by Dall'Igna C et al. indicated a prevalence of FRS at 6.7%, with *Aspergillus* as the most often found fungus species. Fungal ball was detected in over 50% of cases, but allergic fungal rhinosinusitis (AFRS) was observed in more than one-third of patients. The postoperative evolution was more favorable in patients with a fungal ball, demonstrating a decreased recurrence rate of two cases following endoscopic sinus surgery.

A study by Sarika Jain et al. found that KOH and/or culture tests were positive for fungal hyphae or yeast in 93% (150/161) of the individuals assessed. *Aspergillus* spp. represented the primary isolates, including 70% of the recoveries. All *A. flavus* and *A. fumigatus* isolates exhibited minimum inhibitory concentrations (MICs) within the susceptible range for itraconazole, voriconazole, and amphotericin B.^[10]

A study by Suresh S et al. assessed 100 instances of chronic rhinosinusitis, indicating a prevalence of fungal rhinosinusitis at 30% of cases. *Mucor* was the predominant fungal species isolated, representing 50% of the total. Pathologic examination exhibited superior sensitivity (76.67%) compared to microbiological tests (50%) in the diagnosis of fungal rhinosinusitis. Fungal ball (46.6%) was the predominant manifestation of fungal rhinosinusitis. Invasive fungal rhinosinusitis constituted 40% of cases. The incidence of fungal rhinosinusitis was higher among immunocompetent people (56.6%). In a cohort of immunocompromised patients, 84.6% received a diagnosis of mucormycosis.^[11] A study by Paventhan K et al. encompassing 100 cases found bilateral polyps in 85 instances, with fungal elements discovered in 11 patients. Furthermore, among the 15 patients with antrochoanal polyp, 1 patient demonstrated fungal isolates. Of the 17 patients having a previous surgical history, fungi were isolated in 4, whereas the others were undergoing surgery for the first time. Three out of the eight patients with recurrence tested positive for a fungal infection.^[12]

CONCLUSION

Fungal sinusitis is treated mostly with endoscopic sinus surgery and antifungal medication.

Otolaryngologists should keep fungal infections in mind during their everyday practice due to the rise in paranasal sinus infections. Unilateral paranasal sinus involvement is typical in fungal sinusitis. The maxillary sinus is the most usually affected paranasal sinus in fungal rhinosinusitis because its ostium is lower in the middle meatus and easier to reach by microorganisms.

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