



AN OBSERVATIONAL STUDY OF FUNGAL DISEASES IN NOSE AND PARANASAL SINUSES AND THEIR CLINICAL OUTCOME

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ABSTRACT **Background:** Fungi are ubiquitous in the environment, and fungal elements are routinely deposited in the nasal cavity and paranasal sinuses during normal respiration. The prevalence of fungal rhinosinusitis appears to have increased in recent decades, possibly due to greater clinical awareness, antibiotic overuse, and increased use of immunosuppressive medications. Increasing evidence suggests a potential role for fungi in chronic rhinosinusitis. Fungal rhinosinusitis is primarily categorized based on whether the fungus invades local tissues, a characteristic closely linked to the host's immune system status. It encompasses a range of conditions with varying clinical presentations, histological features, and biological impacts. It can be categorized as acute, subacute, or chronic. **Methods:** This is a cross sectional and descriptive study conducted in a tertiary care center, from July 2022 to March 2025. 50 patients with history suggestive of rhinosinusitis were considered. Relevant investigations were done and management was done accordingly. **Results:** The average age of patients was 42.18 with a female predominance. The most commonly involved sinus was Maxillary (98%) and the most common pathogen identified in cultures was *Aspergillus* species (44%). Mucormycosis was found in 12 cases, and 92% of these patients had uncontrolled diabetes. **Conclusion:** The study highlights that fungal infections predominantly affect the nose and maxillary sinus, with mucormycosis becoming more common after COVID-19. Accurately distinguishing between fungal sinusitis types and recognizing aggressive forms are critical for effective management. These insights improve diagnostic precision, treatment outcomes, and resource allocation.

KEYWORDS : Fungal Rhinosinusitis; *Aspergillus*; Mucormycosis.

INTRODUCTION

Once regarded as a rare condition, fungal rhinosinusitis (FRS) is now being reported more frequently worldwide. It is particularly concerning in India, which has the highest incidence of mucormycosis cases globally.¹

Fungal rhinosinusitis (FRS) comprises a spectrum of disease processes, which vary in clinical presentation, histologic appearances, and biological significance. FRS can be acute (aggressive; symptoms < 30 days), subacute (symptoms 30–90 days), and chronic (indolent; symptoms > 90 days).² Fungal rhinosinusitis is primarily classified based on whether the fungus invades local tissues, which is closely linked to the state of the host's immune system. Noninvasive fungal rhinosinusitis includes fungal colonization, fungal ball, and allergic fungal rhinosinusitis (AFRS). Spread of fungus into local tissues characterizes acute invasive, chronic invasive, and chronic granulomatous forms of fungal rhinosinusitis.³

Mucormycosis, a type of acute invasive fungal rhinosinusitis, has been present for a long time, but there has been a significant rise in cases following the COVID-19 pandemic. This increase is particularly notable in regions with widespread COVID-19 and high diabetes prevalence.

Objectives

1. To study the epidemiology of fungal infections of nose and para nasal sinuses.
2. To study the clinical and pathological manifestations of fungal infections of the nose and para nasal sinuses.
3. To evaluate the role of Computed Tomography (CT) scan in diagnosing the fungal diseases of nose and para nasal sinuses.

Methodology

This cross-sectional descriptive study included patients attending the Otorhinolaryngology outpatient department and those referred from other departments of a tertiary care hospital in Karnataka. A total of 50 patients who had clinical features suggestive of fungal infections of nose and paranasal sinuses were evaluated using a standard proforma and investigative procedures systematically as and when required.

Inclusion Criteria

1. Patients of age more than 5 years.
2. Patients of both the sexes are included in this study.

Exclusion Criteria

1. Patients below the age of 5 years.

RESULTS

A total of 50 cases were included in this study.

Age- Age in the study ranged between 7 years and 73 years with an average of 42.18 years and SD 16.92 years, 10 % were less than 20 years of age.

Gender- 48.00% were males and 52.00% were females.

Distribution of Symptoms- 49(98.00%) had symptoms of Nasal obstruction, 33(66.00%) had Nasal discharge, 7(14.00%) had Facial swelling, 26(52.00%) had symptoms of Allergy, 28(56.00%) had Hyposmia, 4(8.00%) had symptoms of Anosmia, 40(80.00%) had Headache, 13(26.00%) had symptoms of Facial pain and 2(4.00%) had ocular symptoms.

Distribution of Co-morbidities- 36.00% had Diabetes mellitus and 14.00% had Hypertension.

History of Covid-19 Among Cases of Mucormycosis- 11(92%) of 12 cases have previous history of Covid-19.

Recurrent Cases Distribution- Recurrent cases were identified based on a history of similar complaints in the past and previous treatments, including both medical and surgical interventions. 28% were recurrent cases.

Signs- 36(72.00%) cases had Nasal mass/ polypoidal mass, 24(48.00%) cases had Nasal discharge, 31(62.00%) cases had Maxillary sinus tenderness, 23(46.00%) cases had Ethmoidal sinus tenderness, 22 (44.00%) cases had Frontal sinus tenderness and 5(10.00%) had Palate involvement.

Computed Tomography (CT) Findings-laterality

Unilateral pathology was found in 34(68.00%) and 16 (32.00%) were bilateral pathologies.

CT Scan – site

49(98%) had maxillary sinus involvement, 38(76 %) had Frontal sinus involvement, 40(80%) had Ethmoidal involvement, 23(46 %) had sphenoid sinus involvement and 3(6%) had orbital involvement.

Management- surgery

10(20%) underwent Right sided Functional Endoscopic Sinus Surgery(FESS), 8(16%) underwent Left sided FESS, 21(42%) underwent Bilateral FESS, 4(8%) underwent FESS with debridement, 1(2%) underwent FESS with maxillectomy, 2(4%) underwent FESS with debridement and maxillectomy and palatotomy, 2(4%) underwent FESS with debridement and orbital decompression, 1(2%) underwent biopsy, 1(2%) underwent removal of necrotic bone.

Post Operative Steroids- 76% patients were given Post Operative Steroids in the form of nasal sprays.

Post Operative Complications- 1(2%) had Oro antral fistula and 9 (18%) had synechia.

Histopathological Examination and Fungal Culture- 1(2.00%) case had *Aspergillus fumigatus*, 4(8.00%) cases had *Aspergillus Niger*, 12(24.00%) cases had *Mucormycosis*, 17(34.00%) cases had *Aspergillus flavus* and 16(32.00%) cases had no growth.

Outcome: The mortality rate was 2(4%).

DISCUSSION

Since the first reported case of rhino sinusitis in the year 1981 by Millar and his colleagues, globally there has been a change in the incidence of chronic sinusitis and the incidence is on the rise. Hence, in this study we decided to evaluate the occurrence of fungal sinusitis and look into the appropriate treatment measures keeping in mind such that it could be added to the routine protocols that are been followed in our hospital so that the patient care can be optimized.

Age: The mean age was 42.18±16.92 years (range, 7-73years), with 10% aged <20 years. Padmavati et al. reported a predominance in the fifth decade¹, whereas N. Srivani et al. reported the third decade as the most commonly affected.⁵ The difference in the above two was probably because of change in the region and also demography changes.

Gender: In our study, 48% of the participants were male and 52% were females, demonstrating a slight predominance of females. Waxman et al. showed female preponderance with allergic sinusitis and female ratio over all incidence of allergic *aspergillus* sinusitis.⁶

Symptoms: In the present study, nasal obstruction (98%), headache (80%), and nasal discharge (66%) were the most common symptoms, which were also frequently reported by Sandeep Suresh et al. (46.6%, 40%, and 40%, respectively).⁷

Comorbidities: Diabetes mellitus was present in 36% of cases, including 92% of those with *mucormycosis*, compared with 100% reported by Hazarika et al.⁸

Signs: Nasal mass/polypoidal mass was the most common finding (72%), consistent with Waxman et al., who reported nasal polyposis as the predominant sign in allergic fungal rhinosinusitis (AFRS).⁹

CT Scan of Nose and Paranasal Sinuses: The maxillary sinus was most commonly involved (98%), followed by the ethmoid (80%) and frontal (76%) sinuses, with orbital involvement in 6%. Similarly, Sandeep Suresh et al. reported maxillary (46.6%), ethmoid (40%), and sphenoid (36.6%) sinus involvement as the most common findings.⁷

Histopathological Examination and Fungal Culture: *Aspergillus* was the predominant fungal pathogen (66%), followed by *mucormycosis* (24%); no other species were identified. This finding is consistent with Chakrabarti et al., who reported *Aspergillus* as the most common pathogen in fungal rhinosinusitis.¹⁰

Surgical Management and Post Operative Steroids: In our study, endoscopic sinus surgery was the primary treatment for fungal infections. This aligns with findings from Ferguson's study.¹¹

Postoperative steroids were used in 76% of cases, predominantly as topical intranasal steroids, whereas Allphin et al. reported their use following an initial course of oral corticosteroids.¹²

Antifungals: Liposomal amphotericin B was administered in 12 proven *mucormycosis* cases, while antifungals were not used for allergic *Aspergillus* sinusitis, consistent with the recommendations of Allphin et al. and Klossek et al.^{12,13}

Post op Complications: Synechia was the most common post-operative complication (18%), while one case of oroantral fistula was noted in a patient presenting with recurrent *mucormycosis*.

Post operative Follow up: Post-treatment endoscopic surveillance facilitates early detection of recurrence. In our series, 16% of patients were lost to follow-up at 6 months.

Mortality Rate: The overall mortality was 4%, with both deaths occurring in patients with *mucormycosis*.

Limitations: Allergic skin testing was not performed in patients with

allergic fungal rhinosinusitis (AFRS) because of limited availability and resource constraints.

CONCLUSION

The study demonstrates that fungal infections most often present as nasal masses, with the maxillary sinus being the paranasal sinus most frequently affected. There is an increased incidence of *mucormycosis* following COVID-19. Accurate differentiation between fungal sinusitis variants and identification of aggressive fulminant types are crucial for effective patient management, enabling tailored treatment strategies. Recent advancements in endoscopy and computed tomography have significantly enhanced the understanding and management of fungal sinusitis.

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