

# Spectrum of Sinonasal Fungal Lesions: A Cross Sectional Histopathological Study at a Tertiary Care Hospital

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## ABSTRACT

### Background:

Sinonasal fungal infections have emerged as an important clinical entity worldwide, with a marked rise in incidence following the COVID-19 pandemic. These lesions range from non-invasive allergic forms to rapidly progressive invasive fungal sinusitis, particularly in immunocompromised individuals. Histopathology remains the diagnostic gold standard.

### Aim:

To evaluate the histopathological spectrum of fungal lesions in the sinonasal tract and correlate findings with clinical and demographic features.

### Materials and Methods:

A cross-sectional study of 117 cases was conducted over two years in a tertiary care center. Biopsy specimens from clinically suspected fungal sinusitis were processed, stained with H&E, and supplemented with PAS and GMS wherever required. Data regarding demographics, symptoms, anatomical site, fungal subtype, necrosis, granulomas, eosinophils, bone invasion, and KOH positivity were analyzed using SPSS v27.

### Results:

The mean patient age was 42.28 years; males constituted 54.7%. The most common diagnosis was Allergic Fungal Rhinosinusitis (AFRS) (29.91%), followed by Acute Invasive Fungal Sinusitis (AIFS) (25.64%) and fungal ball (16.24%).

Eosinophilic infiltration was highest in AFRS (74.29%), whereas granulomas predominated in Chronic Granulomatous Fungal Sinusitis (82.35%). Bone invasion (60%) and necrosis were most frequent in AIFS. Maxillary sinuses were the most commonly involved sites bilaterally.

KOH positivity varied across groups (15.79–47.06%) but did not show statistical significance.

### Conclusion:

Sinonasal fungal lesions show a wide histopathological spectrum with distinct immune and tissue response patterns. Allergic fungal rhinosinusitis remains the most common non-invasive subtype, while Acute invasive fungal sinusitis

exhibits aggressive features such as necrosis and bone invasion. Early histopathological diagnosis remains crucial for timely intervention.

Keywords:

Fungal rhinosinusitis, invasive fungal sinusitis, mucormycosis, allergic fungal sinusitis, histopathology, sinus infections.

## INTRODUCTION

Fungal infections of the sinonasal tract have become increasingly prominent, especially in tropical regions like India where high humidity and environmental exposure promote fungal proliferation. Over the past decade, and particularly during the COVID-19 pandemic, invasive fungal sinusitis has emerged as a major clinical challenge.

Fungal rhinosinusitis comprises a spectrum of diseases broadly categorized into

non-invasive (fungal ball, Allergic fungal rhinosinusitis ) and

invasive (acute, chronic, granulomatous).

Diagnosis relies heavily on histopathology, which identifies fungal elements, tissue invasion, necrosis, and characteristic inflammatory patterns.

Given the rising burden of sinonasal fungal disease, especially post-COVID-19, there is a need for region-specific studies to understand prevailing fungal patterns and host responses. This study evaluates the clinical and histopathological spectrum of sinonasal fungal lesions in a tertiary care hospital in South India.

## MATERIALS AND METHODS

Study Design & Setting:

A cross-sectional observational study conducted over two years in the Department of Pathology, Osmania Medical College, Hyderabad.

Sample:

All clinically suspected or incidentally detected sinonasal fungal lesions submitted for histopathological evaluation were included.

Sample size: 117 cases.

Inclusion Criteria:

- All age groups
- Clinical suspicion of fungal sinusitis
- Histopathological evidence of fungal elements

Exclusion Criteria:

- Non-fungal sinus infections
- Specimens from areas outside the sinonasal tract

Procedures:

- Specimens were fixed, processed, and stained with H&E.
- PAS and GMS stains were used where fungal morphology required clarification.
- Parameters assessed: necrosis, granulomas, eosinophils, bone invasion, crystals, KOH positivity.

#### Data Analysis:

SPSS v27 was used. Results expressed as percentages. Chi-square test applied;  $p < 0.05$  considered significant.

## RESULTS

#### Demographics:

A total of 117 histopathologically confirmed cases of sinonasal fungal lesions were included in the present study. The patients' age ranged from **7 to 76 years**, with a **mean age of 42.28 years**. The majority of cases were observed in the **31–50 years age group**. There was a **male predominance**, with males accounting for **54.7%** of cases and females **45.3%**.

#### Diagnosis Spectrum:

- Allergic fungal rhino sinusitis– 35 cases (29.91%)
- Acute invasive fungal sinusitis – 30 (25.64%)
- Fungal ball – 19 (16.24%)
- Chronic Granulomatous invasive fungal rhinosinusitis – 17 (14.53%)
- Chronic invasive fungal rhino sinusitis – 11 (9.4%)
- Others – 5 (4.27%)

#### Clinical Features:

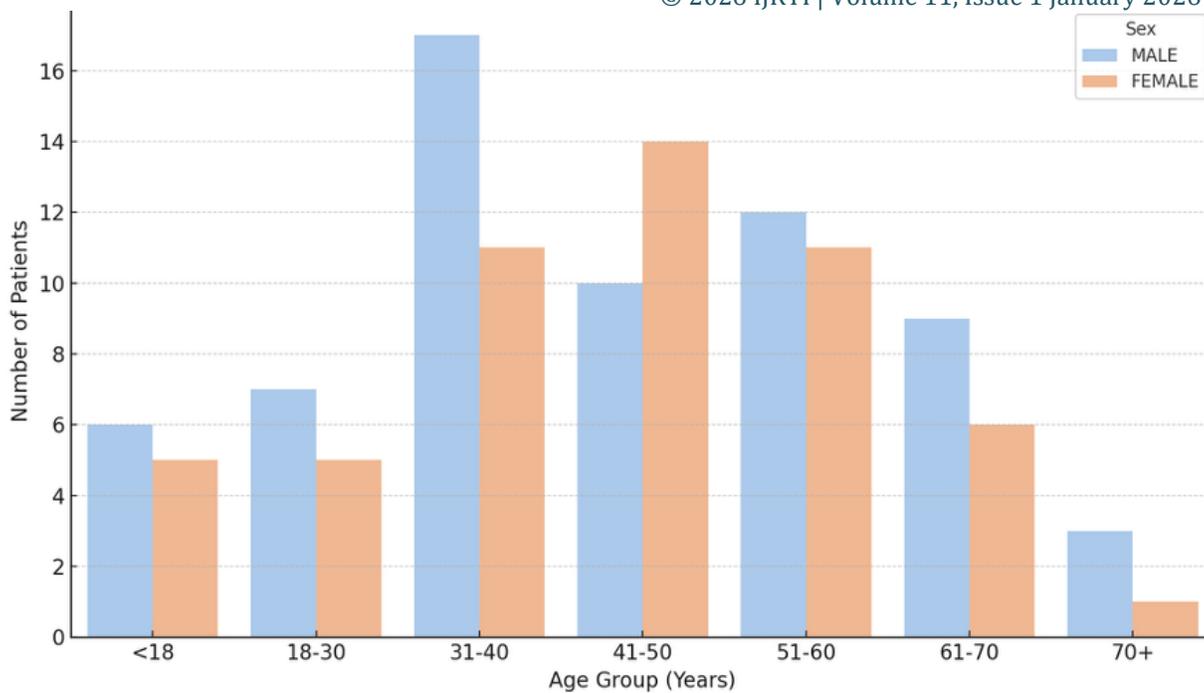
- Nasal obstruction: 46 cases
  - Nasal discharge: 17
  - Cheek swelling: 9
  - Facial pain: 5
  - Proptosis: 3
- Symptoms varied significantly by disease subtype.

#### Site Involvement:

- Maxillary sinuses (right: 17; left: 17) most commonly affected
- Nasal cavity involvement more common in Allergic fungal rhino sinusitis and Chronic invasive fungal sinusitis
- Middle meatus involvement associated mainly with fungal ball

#### Histopathology:

- Granulomas: Highest in Chronic granulomatous invasive fungal rhinosinusitis(82.35%)
- Eosinophils: Highest in Allergic fungal rhinosinusitis (74.29%)
- Bone invasion: Highest in Acute invasive fungal sinusitis (60%)
- Necrosis: Predominant in invasive fungal sinusitis
- Crystals: Rare; occasional in chronic invasive types
- KOH positivity: Highest in Chronic granulomatous fungal sinusitis (47.06%)
- No significant association between diagnosis group and KOH positivity ( $p = 0.295$ )



Graph : Age group vs Gender distribution

## DISCUSSION

In the present study, a total of 117 histopathologically confirmed cases of sinonasal fungal lesions were analyzed, revealing a broad spectrum of invasive and non-invasive fungal diseases.

The most commonly encountered lesion in this study was allergic fungal rhinosinusitis (29.91%), consistent with reports from other Indian and international studies, which describe AFRS as the predominant non-invasive fungal sinusitis in warm and humid climates. The high eosinophilic infiltration observed in AFRS cases in our study reflects a hypersensitivity-mediated immune response, a hallmark feature described in previous literature.

Acute invasive fungal sinusitis constituted 25.64% of cases, highlighting the increased burden of invasive fungal disease in the post-COVID period. Extensive necrosis and bone invasion were most frequently observed in this group, correlating with the aggressive angioinvasive nature of fungi such as Mucorales and *Aspergillus* species. Similar findings have been documented by Turner et al., who reported poor survival outcomes associated with delayed diagnosis and extensive tissue invasion.

Chronic granulomatous invasive fungal rhinosinusitis accounted for 14.53% of cases and showed prominent granuloma formation with giant cells, consistent with patterns reported from endemic regions of Asia and Africa. These lesions typically exhibit a more indolent course but require accurate histopathological diagnosis for appropriate management.

The lack of significant association between KOH positivity and fungal subtype reaffirms the limitations of KOH mount as a standalone diagnostic tool.

Overall, early histopathological evaluation remains essential for accurate classification and timely management.

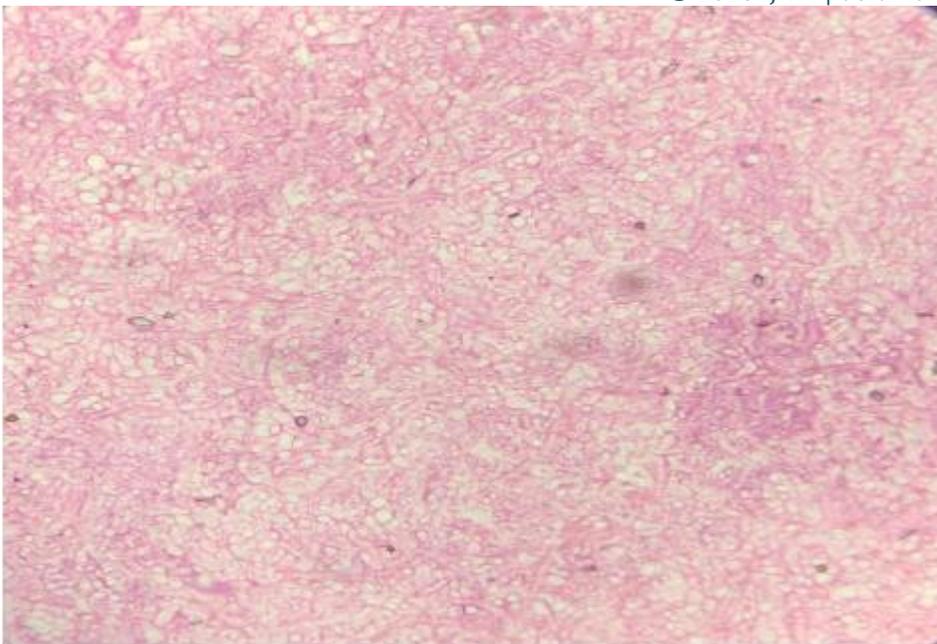


Figure 1: 40x H&E showing interspersed broad aseptate fungal hyphae

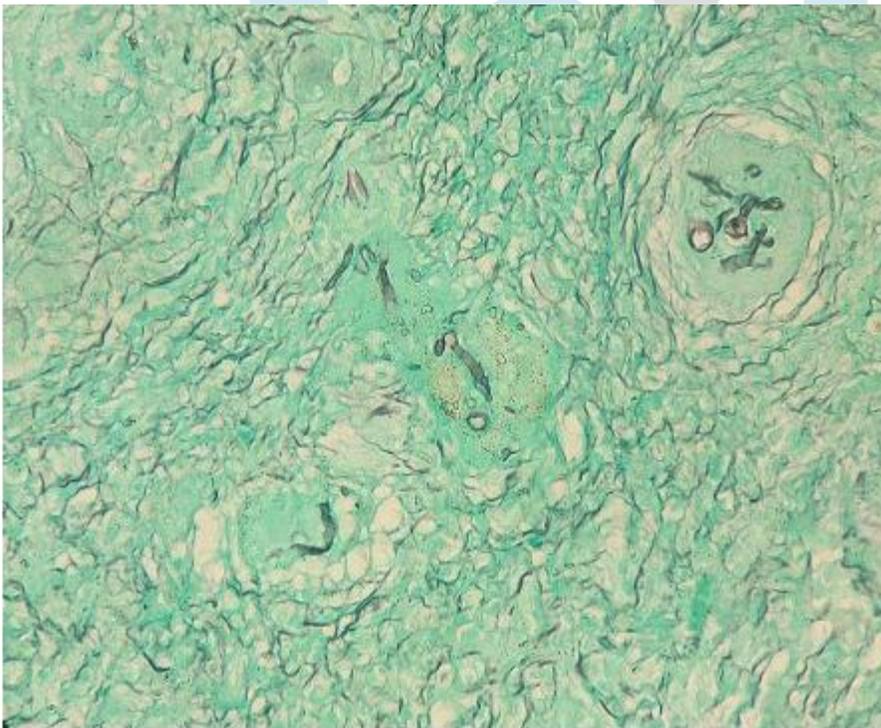


Figure 2:40x GMS showing angioinvasion by fungi , hyphae are broad, pauciseptate,right angled suggestive of mucormycosis.

Fungal species	common species	Associated clinical subtypes	Microscopy findings
Aspergillus	A.fumigatus, A.flavus	Fungal ball, AFRS, Chronic invasive fungal sinusitis	septate hyphae, acute angle branching
Mucorale	Rhizopus oryzae, Lichtheimia sp.	Acute invasive fungal sinusitis	Broad ,pausiseptae hyphae,right angle branching,angioinvasion,necrosis,bone invasion.
Candida	c.albicans,c.tropicalis	common in immunocompromised patients	Budding yeast with pseudo hyphae
Dermatiaceous fungi	Bipolaris, curvularia	Allergic fungal rhinosinusitis	pigmented septate hyphae in eosinophilic mucin

Table 1: common fungal agents infecting sinonasal region.

## CONCLUSION

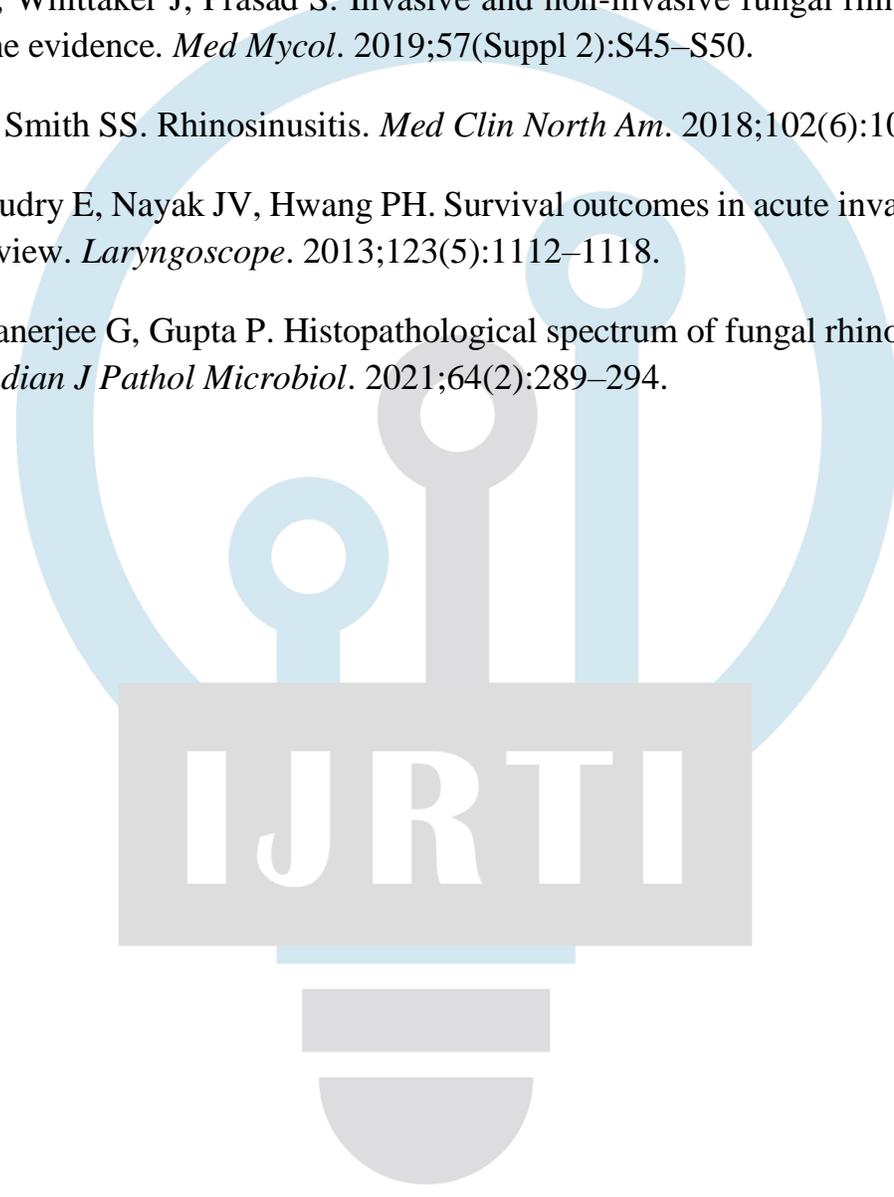
Sinonasal fungal lesions present with a wide histopathological spectrum ranging from non-invasive to invasive forms, with significant clinical implications. Accurate histopathological evaluation plays a crucial role in differentiating between fungal species, determining the extent of tissue invasion, and guiding appropriate management. This study highlights the importance of early diagnosis, to prevent morbidity and mortality there by promoting optimal patient outcome.

## LIMITATIONS

- Single-center study
- Lack of fungal culture correlation in all cases.

# REFERENCES

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