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Clinico-Epidemiological Analysis of Acute Invasive Fungal Rhinosinusitis in a Tertiary Care Setting

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Abstract

Background: Acute invasive fungal rhinosinusitis (AIFRS) is a rapidly progressive and often fatal condition, predominantly affecting immunocompromised patients, including those with diabetes mellitus. Understanding its clinical and epidemiological characteristics is crucial for early diagnosis and management.

Material and Methods: A prospective observational study was conducted at a tertiary care center in India including 150 patients diagnosed with AIFRS. Detailed demographic, clinical, radiological, and histopathological data were collected and analyzed. All patients underwent surgical debridement and antifungal therapy according to institutional protocols.

Results: Of the 150 patients, 98 (65.3%) were male and 52 (34.7%) were female. The most common comorbidity was diabetes mellitus (73.3%). Facial pain (66.7%), nasal obstruction/discharge (43.3%), and palatal involvement (45.3%) were the most frequent presenting symptoms. Mucor species accounted for 68% of cases. Early diagnosis, aggressive surgical management, and antifungal therapy were critical for favorable outcomes.

Conclusion: Timely recognition, multidisciplinary management, and preventive strategies focusing on glycemic control and rational corticosteroid use are essential to improve patient outcomes.

Keywords: Acute invasive fungal rhinosinusitis, Mucormycosis, Diabetes mellitus, COVID-19, Epidemiology

Introduction

Acute invasive fungal rhinosinusitis (AIFRS) is a rapidly progressing and often fatal infection characterized by fungal invasion of the nasal and paranasal sinus mucosa, bone, and adjacent structures. It primarily affects immunocompromised individuals, including those with uncontrolled diabetes mellitus, hematological malignancies, solid organ transplants, or prolonged corticosteroid use [1-4].

The most common causative fungi include members of the *Mucorales* order, particularly *Rhizopus* species, and *Aspergillus* species, although mixed infections have been reported [5,6]. Clinically, patients often present with nonspecific symptoms such as facial pain, nasal congestion, headache, and fever, which can progress rapidly to periorbital swelling, vision disturbances, cranial nerve palsies, and tissue necrosis [7]. Early diagnosis is critical, as the mortality rate remains high despite aggressive medical and surgical management [8].

Imaging plays a pivotal role in diagnosis, with computed tomography (CT) and magnetic resonance imaging (MRI) helping to assess the extent of disease and guide surgical intervention [9]. Definitive diagnosis requires histopathological confirmation and fungal culture, which also aids in selecting appropriate antifungal therapy [10]. Despite recent therapeutic advances, outcomes depend largely on early detection, aggressive debridement, and optimization of underlying comorbidities.

Given the evolving epidemiology of AIFRS and its rising incidence in India there is an urgent need to better understand the clinical and epidemiological characteristics of affected patients. This study aims to evaluate the clinical features, risk factors, imaging findings, and outcomes of AIFRS patients treated at a tertiary care center, providing data to improve early diagnosis and management.

Material and Methods

This prospective observational study was conducted at a tertiary care center in India. A total of 150 patients diagnosed with acute invasive fungal rhinosinusitis (AIFRS) were included in the study. Among them, 98 were male, and the remaining 52 were female.

Patients were enrolled consecutively after obtaining informed consent. Inclusion criteria were patients aged ≥18 years with clinically suspected AIFRS confirmed by radiological imaging and histopathological or microbiological evidence of fungal infection. Patients with chronic fungal sinusitis or fungal colonization without tissue invasion were excluded.

Detailed clinical evaluation was performed for all patients, including assessment of symptoms such as facial pain, nasal congestion, periorbital swelling, headache, vision disturbances, and cranial nerve involvement. Epidemiological data, including age, sex, comorbidities (such as

diabetes mellitus, immunosuppression, were recorded.

Radiological investigations (CT and/or MRI) were conducted to assess the extent of disease, including orbital and intracranial involvement. Histopathological examination and fungal culture of biopsy specimens were performed for definitive diagnosis.

All patients were managed according to institutional protocols, which included surgical debridement and administration of appropriate antifungal therapy. Data was analyzed to assess the distribution of clinical and epidemiological features, imaging findings, management strategies, and treatment outcomes.

Results

Table 1 shows the demographic profile, associated comorbidities, and histopathological evaluation of the 150 patients included in the study. There was a clear male predominance, with 98 males (65.3%) and 52 females (34.7%). Diabetes mellitus emerged as the most prevalent comorbidity, affecting 110 patients (73.3%), highlighting its strong association with AIFRS. Other notable comorbid conditions included hypertension (23.3%), chronic kidney disease (12.0%), hypothyroidism (2.7%), renal transplant (2.0%), cardiac disease (2.0%), and a single case of meningioma (0.7%), emphasizing the diverse underlying health risks in this population.

Table 2 shows the clinical presentation and symptomatology of the patients. Facial pain was the most frequently reported symptom, seen in 66.7% of patients, followed by palatal involvement (45.3%), nasal obstruction or discharge (43.3%), and dental pain (36.7%). Headache (28%), vision-related symptoms such as diminution of vision (18.7%) and proptosis (13.3%), as well as diplopia (6.7%), were also observed. Less common but clinically significant symptoms included altered sensorium (2.7%), change in voice (0.7%), giddiness (0.7%), and skin

involvement (0.7%), indicating the spread of extensive disease.

Figure 1 shows the age distribution of the study population. The majority of cases were concentrated in the 51–70 years age group (52%), followed closely by the 31–50 years group (40%). The 11–30 years and >70 years groups each accounted for 4% of cases, while no cases were recorded in the <10 years group. This distribution underscores the vulnerability of middle-aged and older adults, particularly those with underlying health conditions.

A striking 50% of patients developed symptoms within the first week after discharge, reflecting the aggressive nature of the infection and the need for vigilant monitoring during this period. The percentage dropped to 23.3% by the second week, with 13.3% each in the third and fourth weeks, highlighting the importance of continued surveillance for up to one month post-discharge.

Table 1: Demographic data, associated comorbidities and histopathological evaluation.

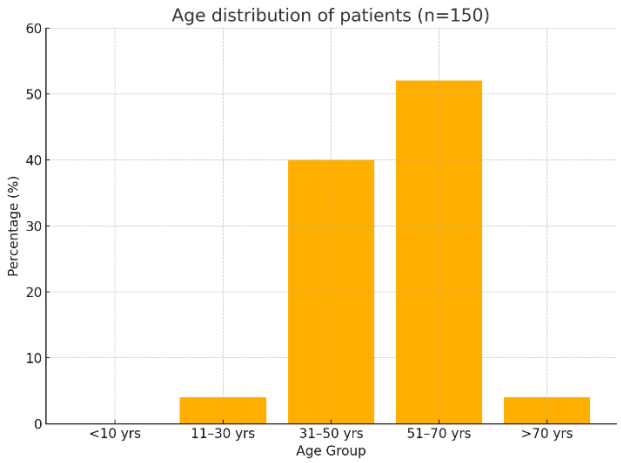
Variable	No.	Percentage (%)
Total cases	150	100
Sex (male/female)	98 / 52	65.3 / 34.7
Comorbidities		
Diabetes mellitus	110	73.3
Hypertension	35	23.3
Chronic kidney disease	18	12.0
Hypothyroid	4	2.7
Renal transplant	3	2.0

Cardiac disease	3	2.0
Meningioma	1	0.7

Table 2: Data of clinical features, symptoms of AIFRS.

Presenting Complaints	**No. of Patients**	**Percentage (%)**
Facial pain	100	66.7
Facial swelling	26	17.3
Nasal obstruction/discharge	65	43.3
Palatal involvement	68	45.3
Dental pain	55	36.7
Headache	42	28.0
Diminution of vision	28	18.7
Proptosis	20	13.3
Diplopia	10	6.7
Altered sensorium	4	2.7
Change in voice	1	0.7
Giddiness	1	0.7
Skin involvement	1	0.7

Figure 1: Age distribution of patients.



Discussion

Acute invasive fungal rhinosinusitis (AIFRS) has emerged as a serious and often life-threatening infection. In our study of 150 patients, a clear male predominance (65.3%) was observed, reflecting trends reported in prior studies, where males often present with higher exposure to risk factors such as diabetes, corticosteroid use, and immunosuppressive therapy [11].

Diabetes mellitus was the most common comorbidity (73.3%), reinforcing its central role in AIFRS pathogenesis. Poor glycemic control impairs neutrophil function and promotes fungal growth in an acidic, hyperglycemic environment [12,13].

Clinically, facial pain, palatal involvement, and nasal obstruction were the predominant presenting symptoms, consistent with the invasive nature of the disease. These symptoms are hallmarks of early angioinvasion and tissue necrosis [14].

Radiological and histopathological findings revealed that Mucor species were responsible for the majority of cases (68%), aligning with global trends but also drawing attention to the increasing frequency of mixed fungal infections [15]. Although Aspergillus was less common, it is clinically significant given its distinct antifungal sensitivity patterns,

which necessitate a tailored therapeutic approach.

The cornerstone of AIFRS management remains early surgical debridement and antifungal therapy, with amphotericin B as the mainstay. Emerging antifungal agents such as isavuconazole and posaconazole have shown promising results, particularly in refractory or amphotericin-intolerant cases. The findings of this study highlight the urgent need for early diagnosis, rapid intervention, and multidisciplinary management to reduce morbidity and mortality associated with AIFRS.

Conclusion

This clinicoepidemiological study of 150 patients with AIFRS highlights the significant burden of disease among middle-aged and elderly patients. Public health initiatives aimed at increasing awareness and improving early access to care are critical in controlling the impact of this emerging health threat.

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