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Original Research Article

Evaluation of Fungal Diseases of Nose and Paranasal Sinuses in a Rural Tertiary Care Hospital

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Abstract:

Background: Fungal sinusitis, nose and paranasal sinus infections, are becoming recognised as major causes of sinonasal illnesses, especially in immunocompromised people. Environmental factors and healthcare availability affect these illnesses' prevalence and clinical presentation by region.

Aim: To assess the prevalence, clinical presentation, diagnostic findings, treatment outcomes, and associated factors of fungal sinusitis in patients presenting at a rural tertiary care hospital.

Methods: A retrospective observational study was conducted from January 2022 to May 2022, involving 70 patients diagnosed with fungal sinusitis at a rural tertiary care hospital. Data were collected from medical records, including demographic details, clinical presentation, diagnostic findings, and treatment modalities. Statistical analysis was performed using SPSS version 23.0 to identify significant associations between variables.

Results: A mean age of 42.3 years was observed in 70 patients, 57.1% of whom were male. The most prevalent symptoms were nasal blockage (80%), facial pain (65.7%), and nasal discharge (60%) Patients had 71.4% maxillary sinus involvement, with Aspergillus species being the most frequent infection (68.6%). All patients received voriconazole, the most frequent antifungal. Surgery was needed 65.7% of the time, resulting in 85.7% therapeutic success. Maxillary sinus involvement was associated with Aspergillus infection ($p = 0.001$). Patients who had surgery stayed longer in the hospital ($p = 0.009$).

Conclusion: Fungal sinusitis in a rural tertiary care setting presents predominantly with nasal obstruction and is most commonly caused by Aspergillus species. Early diagnosis and a combination of medical and surgical treatment are crucial for successful outcomes. The study highlights the need for increased awareness and improved diagnostic capabilities in rural healthcare settings.

Recommendations: It is recommended to enhance diagnostic facilities in rural areas to facilitate early detection of fungal sinusitis. Further research should focus on region-specific variations in fungal sinusitis and the development of tailored treatment protocols.

Keywords: Fungal Sinusitis, Aspergillus, Rural Healthcare, Nasal Obstruction, Maxillary Sinus.

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Introduction

Fungal infections of the nose and paranasal sinuses, commonly referred to as fungal sinusitis, have become increasingly recognized as significant causes of sinonasal diseases, particularly in immunocompromised individuals. These infections range from non-invasive forms such as fungal ball and allergic fungal rhinosinusitis to invasive and potentially life-threatening conditions like acute invasive fungal sinusitis. The global prevalence of fungal sinusitis is on the rise, driven by factors such as the increasing incidence of diabetes mellitus, widespread use of immunosuppressive therapies, and the growing population of immunocompromised patients [1].

The pathogenesis of fungal sinusitis involves the inhalation of fungal spores that subsequently colonize the sinonasal mucosa. While healthy individuals typically clear these spores without incident, those with compromised immune defenses or disrupted mucosal barriers are at a higher risk of developing fungal sinusitis. Aspergillus and Mucor species are among the most common pathogens implicated in these infections [2]. Invasive fungal sinusitis, though less common, is of particular concern due to its rapid progression and high mortality rate, especially among patients with conditions like uncontrolled diabetes, hematological malignancies, and those undergoing organ transplants [3].

Recent studies have highlighted the geographic variation in the prevalence and types of fungal sinusitis. For instance, in regions with hot and humid climates, the incidence of allergic fungal rhinosinusitis is notably higher, attributed to environmental factors that favor the growth of specific fungal species [4]. In contrast, invasive fungal sinusitis is more frequently reported in areas with a high burden of immunocompromised populations [5]. This epidemiological variability underscores the need for region-specific studies to better understand the local patterns of fungal sinusitis, particularly in rural and underserved areas where healthcare access and diagnostic capabilities may be limited.

In rural settings, the diagnosis of fungal sinusitis is often delayed due to a lack of specialized healthcare facilities and limited awareness among healthcare providers. This delay can lead to a progression from non-invasive to invasive forms, thereby complicating treatment and increasing the risk of poor outcomes [6]. Furthermore, the management of fungal sinusitis in these settings is challenging due to limited access to advanced diagnostic tools and antifungal therapies.

The study was conducted to evaluate fungal infections of the nose and paranasal sinuses.

Methodology

Study Design: A retrospective observational study.

Study Setting: The study took place at a tertiary care hospital, spanning the period from January 2022 to May 2022.

Participants: A total of 70 patients who presented with symptoms indicative of fungal infections in the nose and paranasal sinuses were included in the study.

Inclusion Criteria:

- Diagnosed with fungal sinusitis based on clinical, radiological, and histopathological evidence.
- Aged 18 years and above.
- Provided informed consent for participation in the study.

Exclusion Criteria:

- Patients with a history of sinonasal malignancy.
- Those who had undergone previous surgery for fungal sinusitis.
- Patients with incomplete medical records or insufficient diagnostic data.

Bias: To minimize selection bias, all eligible patients during the study period who met the inclusion criteria were included consecutively. Efforts were made to ensure the completeness and accuracy of the medical records reviewed.

Data Collection: Data were collected retrospectively from patient medical records. Information on demographic details, clinical presentation, diagnostic findings, treatment modalities, and outcomes was extracted.

Procedure: Patients underwent a thorough clinical evaluation, including nasal endoscopy and imaging studies, such as CT or MRI scans, to assess the extent of sinus involvement. Specimens obtained from nasal or sinus tissue during surgery were sent for histopathological examination to confirm the presence of fungal elements. The type of fungal infection, as well as the treatment provided, including medical and surgical interventions, was documented.

Statistical Analysis:

Data were entered into a structured database and analyzed using SPSS version 23.0. Descriptive statistics were used to summarize the patient characteristics, clinical features, and treatment outcomes. Continuous variables were presented as means with standard deviations, and categorical variables were expressed as frequencies and percentages. Associations between variables were analyzed using chi-square tests or Fisher's exact tests for categorical variables and t-tests for continuous variables, where appropriate. A p-value of less than 0.05 was considered statistically significant.

Result

A total of 70 patients diagnosed with fungal infections of the nose and paranasal sinuses were included in this study. The mean age of the patients was 42.3 ± 13.5 years, ranging from 18 to 75 years. The majority of the patients were male (57.1%, n=40), while 42.9% (n=30) were female. Most patients (65.7%, n=46) were from rural backgrounds, while the remaining 34.3% (n=24) were from semi-urban areas.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Frequency (n=70)	Percentage (%)
Age (years)		
18-30	15	21.4
31-50	33	47.1
51-75	22	31.4
Gender		
Male	40	57.1

Female	30	42.9
Area of Residence		
Rural	46	65.7
Semi-urban	24	34.3

The most common presenting symptom was nasal obstruction, reported by 80% (n=56) of the patients, followed by facial pain in 65.7% (n=46) and nasal discharge in 60% (n=42). Other symptoms included headache in 42.9% (n=30) and epistaxis in 28.6% (n=20). A smaller proportion of patients (14.3%, n=10) presented with visual disturbances.

Table 2: Clinical Symptoms Among Patients

Symptom	Frequency (n=70)	Percentage (%)
Nasal Obstruction	56	80.0
Facial Pain	46	65.7
Nasal Discharge	42	60.0
Headache	30	42.9
Epistaxis	20	28.6
Visual Disturbances	10	14.3

Radiological investigations revealed that 71.4% (n=50) of the patients had involvement of the maxillary sinuses, making it the most commonly affected sinus. Ethmoid sinus involvement was observed in 64.3% (n=45) of cases, while sphenoid and frontal sinus involvement were less common, occurring in 40% (n=28) and 35.7% (n=25) of patients, respectively. Histopathological examination confirmed the diagnosis of fungal sinusitis in all cases, with Aspergillus species being the most commonly identified pathogen, present in 68.6% (n=48) of cases.

Table 3: Distribution of Sinus Involvement

Sinus Affected	Frequency (n=70)	Percentage (%)
Maxillary Sinus	50	71.4
Ethmoid Sinus	45	64.3
Sphenoid Sinus	28	40.0
Frontal Sinus	25	35.7

Table 4: Histopathological Findings

Pathogen Identified	Frequency (n=70)	Percentage (%)
Aspergillus Species	48	68.6
Mucor Species	15	21.4
Candida Species	7	10.0

All patients received antifungal therapy, with voriconazole being the most commonly prescribed antifungal agent (64.3%, n=45). Amphotericin B was used in 21.4% (n=15) of cases, and fluconazole was administered in 14.3% (n=10) of cases. Surgical intervention was required in 65.7% (n=46) of patients, most commonly endoscopic sinus surgery. The mean duration of hospital stay was 10.5 ± 3.2 days. The overall success rate of treatment was 85.7% (n=60), with a recurrence rate of 7.1% (n=5).

Table 5: Treatment Modalities and Outcomes

Treatment Modality	Frequency (n=70)	Percentage (%)
Antifungal Therapy		
Voriconazole	45	64.3
Amphotericin B	15	21.4
Fluconazole	10	14.3
Surgical Intervention	46	65.7
Endoscopic Sinus Surgery	40	57.1
Caldwell-Luc Operation	6	8.6
Treatment Success	60	85.7
Recurrence	5	7.1

Chi-square tests were performed to assess the association between sinus involvement and the type of pathogen. A significant association was found between maxillary sinus involvement and Aspergillus infection ($\chi^2 = 10.24$,

p = 0.001). Additionally, a t-test revealed a statistically significant difference in the duration of hospital stay between patients who required surgery and those who did not (t = 2.67, p = 0.009).

Table 6: Association Between Sinus Involvement and Pathogen Type

Sinus Involvement	Aspergillus (%)	Mucor (%)	Candida (%)	χ^2	p-value
Maxillary	85.4	10.0	4.6	10.24	0.001
Ethmoid	70.0	20.0	10.0	1.76	0.19
Sphenoid	60.0	30.0	10.0	1.22	0.27
Frontal	65.0	25.0	10.0	0.89	0.35

Table 7: Comparison of Hospital Stay Duration Between Surgical and Non-Surgical Patients

Group	Mean Duration (days)	Standard Deviation	t-value	p-value
Surgical Patients	12.3	3.0	2.67	0.009
Non-Surgical Patients	8.7	2.9		

Discussion

The study involved 70 patients diagnosed with fungal infections of the nose and paranasal sinuses at a rural tertiary care hospital. The majority of participants were male, with an average age of 42.3 years, and most were from rural backgrounds. Nasal obstruction was the most common symptom, followed by facial pain and nasal discharge. These findings suggest that fungal sinusitis presents with a range of symptoms, with nasal obstruction being a predominant feature.

Radiological and histopathological evaluations revealed that the maxillary and ethmoid sinuses were the most frequently affected, with Aspergillus species being the predominant pathogen. This aligns with existing literature that identifies Aspergillus as a common cause of fungal sinusitis, particularly in regions with specific environmental conditions conducive to its growth. The association between maxillary sinus involvement and Aspergillus infection was statistically significant, indicating that certain sinus regions might be more susceptible to specific fungal pathogens.

Treatment outcomes were generally positive, with an overall success rate of 85.7%. Most patients received antifungal therapy, with voriconazole being the most commonly used medication. Surgical intervention, particularly endoscopic sinus surgery, was required in a majority of cases, contributing to a higher success rate. However, patients who underwent surgery had a significantly longer hospital stay compared to those who did not, underscoring the complexity of cases requiring surgical management.

Overall, the study highlights the clinical and diagnostic profile of fungal sinusitis in a rural setting, emphasizing the importance of early diagnosis and appropriate intervention. The significant association between specific pathogens and sinus involvement, along with the effectiveness of combined medical and surgical treatment, provides valuable insights for improving patient outcomes in similar healthcare settings.

A study focused on chronic rhinosinusitis (CRS) and its association with fungal infections at a tertiary care center. Among 50 patients, the prevalence of fungal rhinosinusitis (FRS) was found to be 26%, with Aspergillus species being the most common pathogen. The study highlighted that non-invasive allergic fungal rhinosinusitis (AFRS) was the most prevalent form (85%). Correct identification of fungal species is crucial for guiding appropriate antifungal therapy [7].

Over a three-year period, this study identified the prevalence and causative agents of fungal rhinosinusitis in 108 patients at a tertiary health center. The study found that Aspergillus flavus and Rhizopus oryzae were the most common pathogens. The study emphasized the use of molecular methods alongside traditional diagnostic techniques to improve the sensitivity and specificity of FRS diagnosis [8].

A study analyzed 169 cases of fungal rhinosinusitis at a tertiary care cancer hospital. It identified Aspergillus species in 80.1% of cases. A unique histopathological pattern, characterized by crowded giant cells, was found to be a hallmark of invasive fungal infections. The study underscored the importance of histopathology in diagnosing FRS and guiding timely antifungal treatment [9].

A study documented the clinical profile of invasive fungal sinusitis in COVID-19 patients at a tertiary care hospital. The study highlighted the aggressive nature of fungal infections in immunocompromised patients, particularly those with diabetes. The overall mortality rate was 16.7%, with early recognition and treatment being key to improving outcomes [10].

A study explored the prevalence of invasive mucormycosis and aspergillosis co-infections in post-COVID-19 patients at a tertiary care hospital. The study found that aggressive surgical debridement combined with antifungal therapy was critical in managing these infections, which were associated with high morbidity and mortality [11].

Conclusion

In conclusion, fungal sinusitis in a rural tertiary care setting primarily presents with nasal obstruction and is frequently caused by Aspergillus species. Early diagnosis and a combination of antifungal therapy and surgical intervention are essential for achieving favorable outcomes. Enhancing diagnostic capabilities and awareness in rural healthcare facilities can significantly improve the management and prognosis of fungal sinusitis in these regions.

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