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PHENOTYPIC FEATURES OF FUNGUS IN NOSE AND PNS INFECTION : OUR EXPERIENCE

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ABSTRACT **Introduction:** Rhinosinusitis (RS) is a common disorder affecting approximately 20% of the population1. The causes of RS are infections or inflammation occurring secondary to fungal or bacterial colonization, trauma, or iatrogenic factors including medication, surgery, nasal packing, etc. Allergic Fungal Rhinosinusitis (AFRS) is a distinct clinical subset of Chronic RS in which patients will have positive evidence of allergy to the fungus colonizing their "allergic mucin" in the majority of cases.**Material and Methods**: Prospective Cross-sectional descriptive study which constituted conventional fungal culture of 188 tissue specimens collected from clinically diagnosed as rhinosinusitis.**Results:** In our study of 188 specimens of clinically suspected rhinosinusitis, 32.97 % of cases turned out to have a fungal etiology. The maximum incidence of fungal rhinosinusitis (24.6%) was in the age group of 41-50 years age groups. The most common symptoms were facial/ periorbital swelling (60 cases) followed associated with facial pain (54 cases) and/ or headache (30 cases). In the case of orbital extension of the disease, the symptoms were diminution of vision (21 cases) and drooping of eyelids in 11 cases. The commonest fungus isolated was Aspergillus (50%). **Conclusions**: Fungal etiology should be kept in mind in patients with the above clinical presentation so that the prompt start of treatment gives a better outcome.

KEYWORDS : Rhinosinusitis, fungus, paranasal sinuses, aspergillosis, Mucormycosis

INTRODUCTION

Sinusitis or more accurately Rhinosinusitis (RS) is a common disorder affecting approximately 20% of the population.[1]This condition also causes significant physical symptoms, negatively affects routine quality of life, and can substantially impair daily functioning. Rhinosinusitis (RS) is a group of disorders characterized by inflammation of the nose and the paranasal sinuses. The RS is classified into acute RS(ARS) (7 days to ≤4 weeks), subacute (4–12 weeks), recurrent acute (≥4 episodes of ARS per year), chronic (≥12 weeks), and acute exacerbation of chronic (sudden worsening of Chronic RS (CRS) with a return to baseline after).[2-4] The causes of RS are infections or inflammation occurring secondary to fungal or bacterial colonization, trauma-primary or secondary, exposure to smoking, chronic or acute irritants or noxious chemicals, or iatrogenic factors including medication, surgery, nasal packing, or nasogastric tube placement.[5-7]. Apart from the numerous causes of the condition, many patients have seemingly idiopathic disease.

Allergic Fungal Rhinosinusitis (AFRS) is a distinct clinical subset of CRS in which patients will have positive evidence of allergy to the fungus colonizing their "allergic mucin" in the majority of cases. Patients with AFRS typically demonstrate [5] characteristics: gross production of eosinophilic mucin containing non-invasive fungal hyphae, nasal polyposis, specific radiographic findings, immunocompetence, and allergy to cultured fungi. The presentation of AFRS is often subtle, but it might be dramatic, giving rise to acute visual loss, gross facial dysmorphia, or complete nasal obstruction.

CRS accounts for >90% of all cases of rhinosinusitis, and it is important to correctly diagnose and categorize each cause of CRS for optimum therapy and for predicting the outcome.[8]The most common form of rhinosinusitis is AFRS (56%– 57%) followed by chronic invasive granulomatous FRS (2%–17%), fungal ball/ mycetoma (2%–4%), chronic invasive FRS (CIFRS; 1%–3%) in India[9]. Since the radiographic pictures and the clinical symptoms of FRS are nonspecific diagnosing FRS has been always a challenge. Demonstration of fungus helps in early diagnosis and effective treatment. Direct fungi identification is required for definitive diagnosis of FRS and hence culture and microscopic examination remain the gold standard.

Anterior rhinoscopy being the basic tool of the physical examination, it is best to evaluate the patient after decongestion with nasal endoscopy[10] which helps to identify erythema, Oedema, polyps, crusting, eosinophilic mucin, and mucopurulent discharge or frank pus deep in the nasal cavity. Endoscopically obtained cultures are less invasive and associated with less morbidity.

Although rhinosinusitis can be diagnosed in the majority of patients by using only the history and physical examination (including endoscopy), patients with persistent sinus disease often require imaging studies like CT (to define anatomy and to aid diagnosis), MRI (excellent display of the mucosa).[11]

The present study will be undertaken to determine the prevalence, clinical patterns, and determinants of FRS patients in tertiary care hospitals.Currently, fungal identification relies on the conventional macroscopic and microscopic observation of colonies and is complicated because of inadequate knowledge of the whole fungal phylogeny connected with population biology, evolution, and ecology.

MATERIAL AND METHODS

It is a Prospective Cross-sectional descriptive study, that was carried out for 18 months from July 2022 to December 2023 at ENT and the Microbiology department of a tertiary health centre.

Necessary ethical approvals and permissions were obtained from the Institutional Ethical Committee of our Tertiary care hospital. A total of 188 specimens (tissue, crust, swabs) were collected from clinically suspected cases of CRS. Patients of this study mainly belonged 14 years and above age group and both genders were found to be affected.

Study Population

As per the statistical calculation: Sample size: n= 100 patients clinically diagnosed as Rhinosinusitis. (Sample Size for Frequency in a Population, Population size (for finite population correction factor or fpc) (N):120, Hypothesized % frequency of outcome factor in the population (p): 44%+/- 5,

Confidence limits as % of 100(absolute +/- %) (d):5%, Design effect (for cluster surveys-DEFF): 1,

- Confidence Level (%) Sample Size 95%= 92)
- Equation: Sample size n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1) +p*(1-p)]
- Results from Open Epi, Version 3, open-source calculator— SS Proportion]

Inclusion criteria:

- Age group> 14 years.

- Both genders.
- Established diagnostic criteria for chronic Rhinosinusitis
- Patients with at least two major or one major and two minor criteria were considered for inclusion as described by Lanza and Kennedy 1997).
- Major criteria include patients with Facial pain/fullness, nasal obstruction, postnasal discharge, hyposmia/anosmia, and fever;
- Minor criteria: Ear pain/fullness, headache, halitosis, fatigue, dental pain, cough.

Exclusion criteria:

- Age group < 14 years.
- Patients who were unwilling to comply with this study
- Patients diagnosed with underlying paranasal sinus malignancy.
- Patients who suffered from other diseases like congenital mucociliary disorder, and atrophic rhinitis were excluded from the study.

RESULTS

In our study, we received in total of 188 specimens of nasal tissue, nasal crust, and endoscopic sinus surgery specimens and nasal swabs of 118 patients with clinically suspected rhinosinusitis. Detailed evaluation of each case was done comprising of the history, microbiology examination, and radiological evaluation. In the study of 188 specimens of clinically suspected fungal rhinosinusitis, 32.97 % of cases turned out to have a fungal etiology.

This study noted the occurrence of the disease with a predominance of males (72.04%) and females (27.96%) in a population of age more than 14 years with the incidence of fungal rhinosinusitis (24.6%) in the age group of 41-50 years age groups (Table 1). The patients show more than one symptom facial/periorbital swelling being most common in 60 cases followed by facial pain in 54 cases and head ache in 30 cases. In the case of orbital extension of the disease, the symptoms were diminution of vision (21 cases) and drooping of eyelids in 11 cases. Among the associated co-morbid conditions, diabetes mellitus (32.02%) was the most common followed by hypertension (17.78%), Even in some cases new onset of diabetes (16.94%) was seen. While treating the patients of COVID-19 19 the use of steroids (42.38%), antivirals like remdesivir (22.8%), and oxygen support (11.86%) were found to be beneficial, they turned out to be one of the risk factors for causing rhinosinusitis. (Table 2) Radiological diagnosis showed involvement in paranasal sinuses (77.11%), followed by orbit (16.94%) and brain (5.90%) (Table 3)

Table 1: Age Distribution Of Fungal Rhinosinusitis Cases

Age In Years	Number Of Fungal Sinusitis Patients	Percentage (%)
14-20	1	0.8
21-30	7	5.9
31-40	26	22.1
41-50	29	24.6
51-60	27	22.9
61-70	25	21.2
>70	3	2.5
Total	118	100

Table 2: Various parameters of the patients.

PARAMETERS	**VALUES (%)**
MALE: FEMALE	2.5:1(72.04%:27.96%)
CLINICAL PRESENTATION	**CASES**
FACIAL / PERIORBITAL SWELLING	60
FACIAL PAIN	54
HEADACHE	30
DIMINISION OF VISION	21
DENTAL PAIN	20
FEVER	12
DROOPING OF EYELID	11
NASAL DISCHARGE	2
ASSOCIATED CO-MORBID CONDITIONS	
DIABETES MELLITUS	38(32.20%)
NEW ONSET DM	20(16.94%)
HYPERTENSION	21(17.78%)
RENAL FAILURE	6(5.08%)
HEMATOLOGICAL MALIGNANCY	4(3.37%)
PULMONARY TB	2(2%)
ASTHMA	1(0.08%)
NO COMORBIDITIES	26(22.03%)
RISK FACTORS (USE OF)	
STEROIDS	50(42.38%)
ANTIVIRAL	27(22.88%)
OXYGEN SUPPORT	14(11.86%)
NONE	27(22.88%)

Table 3. Radiological Findings In Fungal Rhinosinusitis Cases:

RADIOLOGICAL FINDINGS	NO. OF CASES	PERCENTAGE
PANSINUSITIS	91	77.11
MAXILLARY	16	13.55
ETHMOID	7	5.90
SPHENOID	2	1.60
FRONTAL	2	1.60
ORBILTAL	20	16.94
INTRACRANIAL	7	5.90

Out of 188 specimens received, 62 fungal cultures were positive (32.97%), Aspergillus spp. (50%) predominated followed by Mucor spp. (33.87%) and Candida spp. (11.20%). A single isolate of Fusarium spp., Scedosporium apiospermum, and Syncephalastrum racemosum was also grown (figure1).

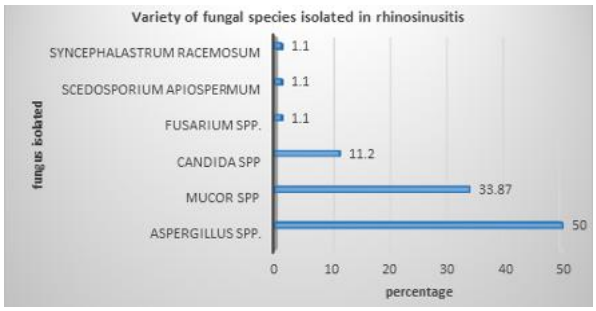

Figure 1: Various fungi isolated during fungal culture from fungal rhinosinusitis cases

Figure 2 shows Complications in fungal rhinosinusitis, 25 cases developed complications, Orbital cellulitis was the most common complication of fungal rhinosinusitis (18.6%), followed by cranial nerve palsies (4.23%).

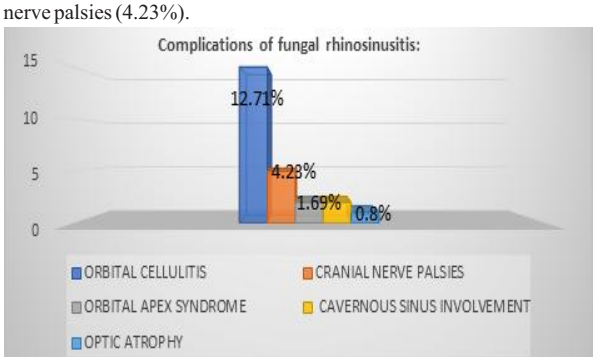

Figure 2: Complications in fungal rhinosinusitis

In the study, mortality was noted in 21 cases (33.87%) which was more with mucor species (25.80%) followed by Aspergillus species (2.66%) (figure 3).

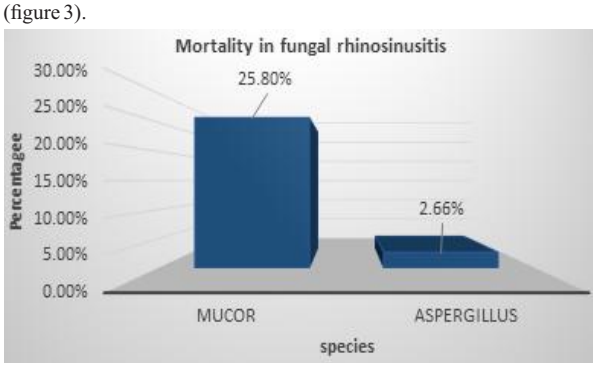

figure 3: Mortality in fungal rhinosinusitis

DISCUSSION

In our study out of 188 specimens of clinically suspected fungal

rhinosinusitis, 32.97 % of cases turned out to have a fungal etiology which collaborates with Sandeep Suresh et al[12] study showing30% cases of fungal rhinosinusitis with male preponderance

Milosev *et al*[13] found that *Aspergillus* rhinosinusitis occurred more frequently in male patients in their teens and twenties. In contrast, the majority of the patients (n = 29 [24.6%]) in our study were in the age group of 41–50 years.

Sigler L et al[14] show fungal rhinosinusitis is more common in immunocompromised patients with diabetes mellitus (DM), our study shows the same finding as patients with DM, Hypertension, and usage of corticosteroids were more susceptible to fungal rhinosinusitis.

Among these 62 fungal cultures positive specimens, the most common fungi isolated were Aspergillus species (50%), similar findings were noted in a study by Chakrabarti et al[15], followed by Mucor species then Candida species.

Among the Aspergillus species, Aspergillus flavus was most common, found in 25 specimens (40.32%) followed by Aspergillus fumigatus collaborated with Prateek S.et al[16] study.

According to Cho et al[17] and Sandeep Suresh et al[12] cranial neuropathy, visual loss, and orbital pain were the most common complications encountered in cases of fungal rhinosinusitis. Similarly, in our study, orbital cellulitis and cranial nerve palsies were the most common complications (Figure 2).

Similar to the work of Ferguson[18] in our study, functional endoscopic sinus surgery (FESS)was the mainstay of treatment of fungal rhinosinusitis. However, treatment of mucormycosis included surgical debridement with systemic amphotericin B which collaborates with the study of Gillespie and O'Malley[19].

Complications and mortality with Mucor species were more than with Aspergillus species **same as that, study of Keith Barton James [20].**

CONCLUSION

Fungal etiology should be kept in mind in patients with the above clinical presentation so that the early start of treatment gives a better outcome. Prompt diagnosis and early management are vital for a favourable outcome. It is crucial to identify infection at an early stage in order to notify treating physicians of this debilitating and lethal infection and possibly reduce morbidity and increase the daily life index of patients.

IMAGE PLATES

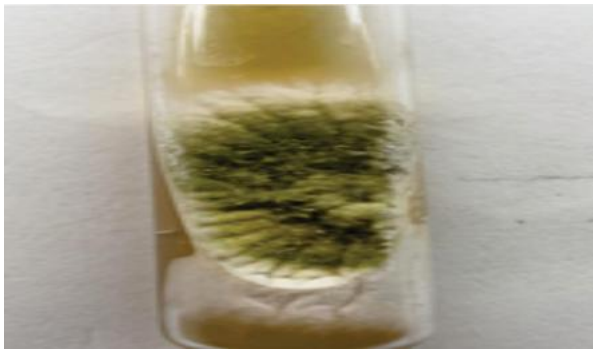

Image 1-Growth of A. flavus on Sabouraud dextrose agar (SDA)

Image 2-Growth of C. albicans on SDA

Image 3-Growth of Mucor spp. On SDA

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DECLARATIONS

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