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STUDY OF OCCUPATIONAL PREDISPOSITION OF FUNGAL RHINOSINUSITIS CASES IN A TERTIARY CARE HOSPITAL

Microbiology

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ABSTRACT

Fungal rhinosinusitis (FRS) is one of the important health care problems and its incidence and prevalence are increasing. Rhinosinusitis is defined as the inflammation of nasal and paranasal sinus mucosa which is associated with mucosal alterations ranging from inflammatory thickening to gross nasal polyp formation. Fungi are increasingly being implicated in the etiopathogenesis of rhinosinusitis. Out of the 110 clinically suspected cases of FRS was most common in farmers (25.4%) followed by students (20.9%), housewives (19.9%), business class (14.5%) and service class (12.7%). Least number of cases were of unemployed (5.4%) and labourer class (1.8%).

KEYWORDS

Fungal Rhinosinusitis, nasal polyp, paranasal sinus

INTRODUCTION

Fungus has been associated with the history of human civilization from time immemorial. In the BC era, Egyptians utilized of fungus for making bread and wine. Eversince that time, fungus has been useful to man in different ways. The fungal infections in paranasal sinuses are becoming common day-by-day. Fungal rhinosinusitis (FRS) is one of the important health care problems and its incidence and prevalence are increasing from past few decades that significantly impacts the quality of life.[1] Rhinosinusitis is defined as the inflammation of nasal and paranasal sinus mucosa which is associated with mucosal alterations ranging from inflammatory thickening to gross nasal polyp formation.[2] Rhinosinusitis is a common disease affecting 135 per 1,000 population. Rhinosinusitis is a significant health problem and results in a large financial burden on society.[3] Rhinosinusitis is a common disorder affecting approximately 20% of the population at some time of their lives.[4] It has been estimated to affect approximately 31 million patients (4% of adult population) in the United States each year.[5] Plaignaud first reported fungal sinusitis in 1791 AD. Since then it has been brought into being the foremost challenges for clinicians, clinical microbiologists and basic scientists.[6] The exact aetiology of FRS is not known. Various agents including bacteria, viruses and fungi have been introduced as aetiological origins of the disease.[7] It is more common in atopic individuals that occurs most common in areas with high temperature and high humidity. It was postulated that young adult males who commonly go to the field in a hot, dry climate sustain frequent mucosal injuries of paranasal sinuses and acquire the agent from the field.[8] The incidence of paranasal sinus mycoses (fungal sinusitis) is significantly higher in Sudan, Saudi Arabia and south western states of USA and north India, which have hot and dry climate. North India has been identified as an endemic zone of paranasal sinus mycoses.[9]

OBJECTIVES

1. To study of Occupational Predisposition of Fungal Rhinosinusitis cases
2. To study the demographic profile of cases

MATERIAL AND METHODS

This prospective study was conducted over a period of one and a half year in the Department of Microbiology, Dayanand Medical College & Hospital, Ludhiana. Clinically suspected cases of fungal rhinosinusitis of any age, either gender, positive by fungal smear and/ or culture were included.

Data collection:

The following data was collected: -

- Patient's details including name, age, sex, admission number, history (present, past, personal, family, treatment)
- Presenting features like nasal polyposis, proptosis, headache, cheek swelling, diminished vision, blindness, seizures, vomiting, and altered sensorium.
- Investigation details

Sample collection and transportation:

Specimens like nasal mucosa & crusts/ nasal scrapings/ excised nasal polyp/ biopsy were collected and transported in saline in a sterile, screw capped container. The specimens received in the Department of Microbiology were processed as per standard procedures.

PROCESSING OF SPECIMEN

Samples that were received in the department of Microbiology were processed as follows:

1. The direct microscopic examination of the samples was done by potassium hydroxide (KOH) mount preparation.
2. The samples were inoculated on two tubes of Sabouraud's dextrose agar (SDA) with antibiotics (chloramphenicol 50mg and gentamicin 20mg) and two tubes of SDA with antibiotics (chloramphenicol 50mg and gentamicin 20mg) and cycloheximide (500mg). Two tubes, one each of SDA with and without cycloheximide were incubated at 25ºC. Similiarly, other two tubes were incubated at 37°C. The inoculated media was kept for a minimum period of three weeks.
3. The growth obtained was identified on the basis of colony morphology, pigment production and microscopic examination by lactophenol cotton blue (LCB) preparation.

The wet mount of KOH was prepared by the following two methods:-

a) Slide KOH method:-

b) Tube KOH method:-

Observations of KOH mount preparation**: -** Septate or aseptate fungal hyphae, with or without branching and budding yeast like cells were seen.

CULTURE MEDIA: - Media used were:

1. Sabouraud dextrose agar (SDA) with antibiotics and without cycloheximide [10]

2. Sabouraud dextrose agar (SDA) with antibiotics and cycloheximide [10]

Inoculation: - After processing of the clinical specimens inoculation was done on SDA media. Inocula were gently implanted into agar at well spaced intervals on each tube having a sterile cotton stopper.

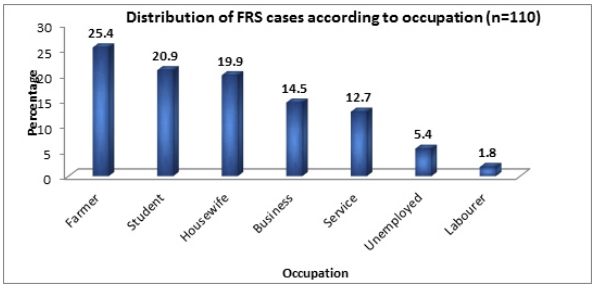
Incubation: - Inoculated tubes containing SDA with antibiotics and cycloheximide were kept at two temperatures, 25ºC and 37ºC. All tubes were examined for growth and incubated for upto 3 weeks before recording no growth.[11]

The gross appearance of the colony served as the first important step in the recognition and identification of a fungus. The following characteristics were noted:-

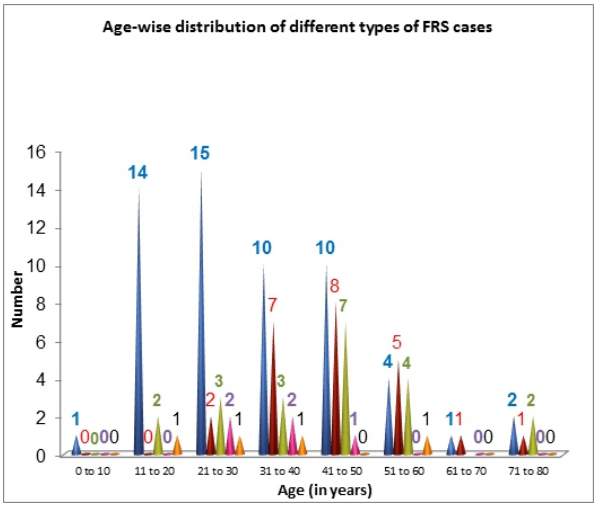
- Rate of growth of the colony
- Texture, colour and shape of the upper thallus
- The production of pigment on the underside.

OBSERVATIONS AND RESULTS

The present study involved clinico-mycological analysis of one hundred and ten consecutive clinically suspected cases of fungal rhinosinusitis from department of ENT, Dayanand Medical College & Hospital, Ludhiana. Detailed clinical history was taken. Samples like nasal mucosa & crusts/ nasal scrapings/ excised nasal polyp/ biopsy were collected and transported to the Department of Microbiology, DMC & H, Ludhiana. One portion of the sample was used for direct KOH examination and remaining portion was used to inoculate SDA medium for culture. Cases of fungal rhinosinusitis (FRS) were characterized into allergic fungal rhinosinusitis (AFRS), acute invasive fungal rhinosinusitis, chronic invasive fungal rhinosinusitis, granulomatous invasive fungal rhinosinusitis and fungal ball on the basis of duration of disease, immune status of the patient, histopathological examination findings and clinical presentation. The observations and data obtained from the study were compiled and analyzed. All the results are depicted in the tables and graphs that follow.



Out of the 110 clinically suspected cases of FRS was most common in farmers (25.4%) followed by students (20.9%), housewives (19.9%), business class (14.5%) and service class (12.7%). Least number of cases were of unemployed (5.4%)labourer class (1.8%).



Most common age group affected with allergic fungal rhinosinusitis was 21-30 years (26% cases) followed by 11-20 years (24% cases). The number of cases of AFRS seen in age group of 31-40 years and 41-50 were same (17% cases). Acute invasive form of disease was most common among the age group of 41-50 years (34% cases) followed by 31-40 years (30% cases) and 51-60 years (21% cases). The age group which was least affected by fungal rhinosinusitis was 0-10 years.

DISCUSSION

During the recent decades, paranasal sinus mycosis has been recognized more frequently in different parts of the world due to the increased awareness of physicians. A significantly higher incidence is reported in restricted areas that have warm and dry climate.[8,12,13] Its incidence in recent years has shown marked increase specially in north Sudan, in southwestern states of USA and in north India.

Rhinosinusitis is a common disorder affecting approximately 20% of the population at some time of their lives. Over one and a half year period, 110 patients that presented with clinical suspicion of fungal sinusitis were studied. The overall prevalence of FRS among the patients with clinical suspicion was 50%. In a study done in USA prevalence of fungal rhinosinusitis was 93%.[5] The reasons for this difference are a matter of speculation but several factors may be involved.

In the present study age of patients ranged from 9 years to 80 years. The most affected age group was 41-50 years with 22.7% cases while the least affected age group was of 0-10 years with 0.9% cases (Table 1). Our finding is nearer to the observation of Michael *et al* in which the age group 11-79 years was found to be more commonly affected.[14] However, in other studies the affected median age was 30 years.[15,16] This is possibly due to risk factors like diabetes, chemotherapy which are common in older age group.

Majority of cases of FRS were farmers by occupation (25.4%) followed by students (20.9%), housewives (19%) and businessmen (14.5%). Least number of cases were of unemployed and labourer class (5.4% and 1.8%) respectively (Figure 2). Reason being the persons who go to the fields in a hot and dry climate sustain frequent mucosal injury of paranasal sinus and acquire the agents from the field.[7,8,17]

The characterization of fungal rhinosinusitis cases into different types was done on the basis of duration of disease, immune status of the patient, histopathological findings, vascular invasion and the clinical presentations. Most of the cases of FRS presented with duration of disease of >4 weeks (76.3%) and 95.4% of the patients were immunocompetant. Most common finding on histopathological examination was inflammatory polyp with allergic mucin.

The most common type of fungal rhinosinusitis seen in our study was allergic fungal rhinosinusitis (51.3%). Next common to this type was acute invasive fungal sinusitis (21.6%) followed by chronic invasive fungal sinusitis (18.9%), least common types were fungal ball (4.5%) and granulomatous invasive fungal sinusitis (3.6%). This finding was similar to a 7 years audit done in a hospital in Tamil Nadu where also AFRS was the most common form of sinusitis (63%). This contrasts with finding of Chakrabarti *et al* [13] and Panda *et al* [18] who reported only small number of patients with allergic disease in their patient groups. Majority of cases of AFRS were males (62%) from rural background who were farmers by occupation. This result is similar to the study done by Chatterjee and Chakrabarti in north India.[19] The reason may be because in India, a large proportion of the population live in rural or semi-rural areas and so their exposure to certain fungi will differ from arguably a more urban population. One contributing factor may be related to the type of housing in India which are often open to the environment and have an open-plan style and this may lead to prolonged exposure to fungi that occur in outside environment.[14] The p-value obtained of difference in the incidence of various types of FRS among males and females in rural background was statistically not significant ($p>0.05$). This can be attributed to the fact that males who commonly go to the field in a hot, dry climate sustain frequent mucosal injuries of paranasal sinuses and acquire the agent from the field. Large number of *Aspergillus* conidia can easily settle on the injured mucosa and can lead to allergic from of disease.[8]

Although the AFRS cases among the females residing in urban areas were more (54.8%) as compared to females from rural set up (50%). Yet the difference in the incidence was statistically not significant ($p>0.05$). This could be due to the fact that the population residing in the urban area is more commonly exposed to the irritant pollutants of traffic, dust, factories residuals in comparison to the population in the rural region; these irritants cause rhinitis and lead to sinusitis. Other reason for the predominance of AFRS among females in urban set-up could be due to the frequent use of various types make-up products and fragrance products like body sprays and deodorants. All these products can trigger allergies, headache and various types of chronic allergic sinus conditions.

CONCLUSION

In conclusion, this study highlights the importance of paranasal sinus mycosis in North India. As fungal diseases are not notifiable infections like viral, bacterial or parasitic disease hence these are not given much attention and usually diagnosis is established very late. Therefore early diagnosis and recognition of fungal sinusitis is very important, not

only because it is curable in the early stages, but also to prevent progression of the disease in to the more serious and destructive invasive forms. The mycological assessment are essential to confirm the diagnosis. These mycological protocols if carried out in well-equiped microbiology laboratories having all advanced facilities available for the isolation and identification of the causative agents, the diagnosis can be simplified since there are no specific clinical and radiological indicators. Therefore our suggestion to clinicians is that all the rhinosinusitis patients should be screened for fungal aetiology. Treatment requires surgical debridement to remove the hypertrophic tissue and mucinous secretions, nasal and oral corticosteroids are often used to modulate the immune response. In refractory cases, systemic antifungal therapy may be warranted. The importance of the fungal infections should be recognized and the possible preventive and treatment guidelines should be formulated for the patients. Further long-term prospective studies may help to unravel the mystery of whether the two entities are in fact spectra of the same disease.

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