

A Cross Sectional Study on Prevalence and Management of Fungal Sinusitis

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ABSTRACT

Fungi are present everywhere in the environment and during normal respiration they get deposited in the nose, paranasal sinuses and respiratory tract. Sinonasal fungal disease was previously assumed to be a rare disease. There has been a dramatic increase in the cases reported in the past two decades. Fungal sinusitis may present in different forms and usual presentation is generally similar to that chronic rhinosinusitis. They are generally resistant to antibiotic therapy. Any age group can be affected but the presentation of the symptoms varies with the immune status of the patient. They can cause a wide spectrum of clinical outcomes ranging from nasal symptoms to intracranial complications and death. The diagnosis is generally confirmed intraoperatively or during pathological or microbiological evaluation. Fungi are ubiquitous eukaryotes. Most of them grow on soil and few as parasites of animals and humans. Fungal infections in human are opportunistic and there is increased prevalence in immune compromised patients. To assess the prevalence of fungal sinusitis in a selected population, the mode of presentation of fungal sinusitis in our study.

Keywords: Fungi, rhinosinusitis, Sinonasal fungal, fungal sinusitis

1. INTRODUCTION

Almost twenty percentage of our population are affected by rhinosinusitis and fungi are increasingly involved in the etiopathogenesis (1-3). Although infrequent earlier, they are now being diagnosed with increasing frequency worldwide.

Fungal infections can be easily acquired because fungal spores are constantly inhaled into the sinuses and lungs (4-5). Patients who have anatomical abnormalities of the paranasal sinuses are at increased risk of fungal colonization. They represent a spectrum of disorders under the categories invasive and non invasive. The invasive fungal sinusitis includes 1) acute invasive 2) chronic invasive 3) chronic granulomatous. Non invasive includes 1) fungal ball 2) allergic rhinosinusitis 3) saprophytic infection. Invasive type is more commonly encountered in people who are immunocompromised whereas non invasive is a chronic condition occurring commonly in allergic and immunocompetent individuals. The symptoms can vary from mild to intracranial involvement and death (6-8). The most commonly mycetes involved in sinus disease are aspergillus species. They are found in many of the moulds on plants, grain seeds, fruits and food (9-11). Spores of aspergillus are present in dust which can be inhaled and can become pathogenic under warm moist climate which is common in our geographical area. Due to poor viability of fungi, they fail to grow at times from the fungal material obtained during surgery (12-17).

The radiologist can play a critical role in alerting the clinician to use appropriate diagnostic techniques for confirmation if they have a thorough understanding of the different types of fungal sinusitis and their specific radiologic features. To avoid a protracted or fatal outcome, prompt diagnosis and initiation of appropriate therapy are critical. We decided to conduct the research because of the lack of recognition and scarcity of reports.

2. MATERIALS AND METHODOLOGY

This is a prospective study in which 40 patients of chronic sinusitis presented to our ENT department with characteristics suspicious of fungal etiology, based on their clinical presentation, were taken as subjects for the study from December 2017 to January 2019.

Proper history and evaluation was done for every patient using a proforma before the patient was undertaken for surgery. Any significant past history like DM, tuberculosis, leukemia or treatment history that includes use of steroids or chemotherapeutic agents were elicited. Patients were taken into the study based on symptoms like headache, nasal discharge, nose block, hyposmia with features of sinusitis radiologically and who did not improve on medical management.

INCLUSION CRITERIA :

1. Patients of age 13 -60 years involving both sexes.
2. Patients with features of chronic sinusitis with suspicion of fungal etiology.
3. Patients giving consent for the surgery.

EXCLUSION CRITERIA :

1. Patients of age less than 12 years.
2. Patients who are not giving consent for the study.

CLINICAL EVALUATION:

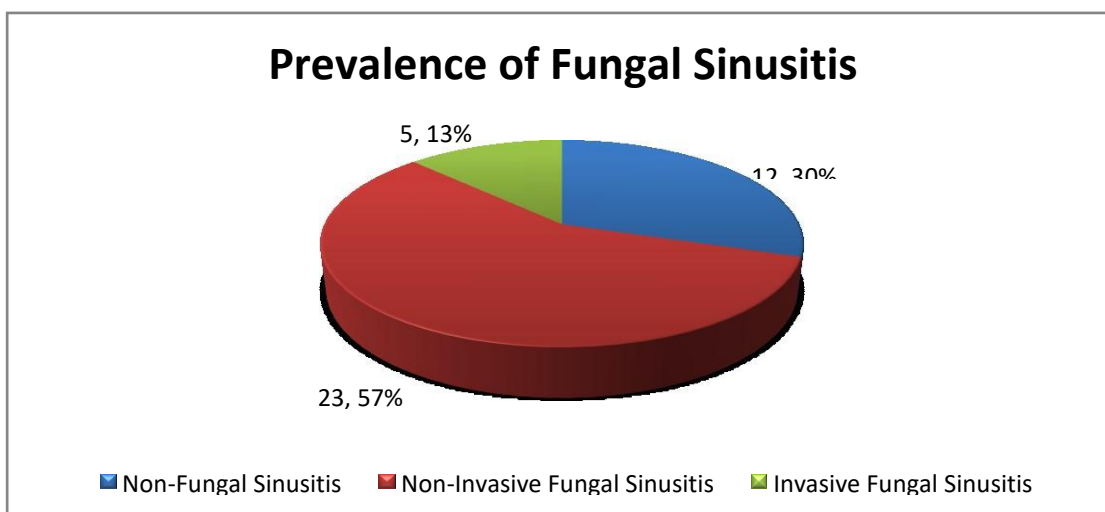
Patients were evaluated using a standard proforma and the following investigations were done.

Repeat diagnostic nasal endoscopy was performed every month for at least six months to assess the presence of nasal discharge, polyps, or any other pathology in the nose. The follow-up period usually lasts between six months and a year.

OBSERVATION AND RESULTS

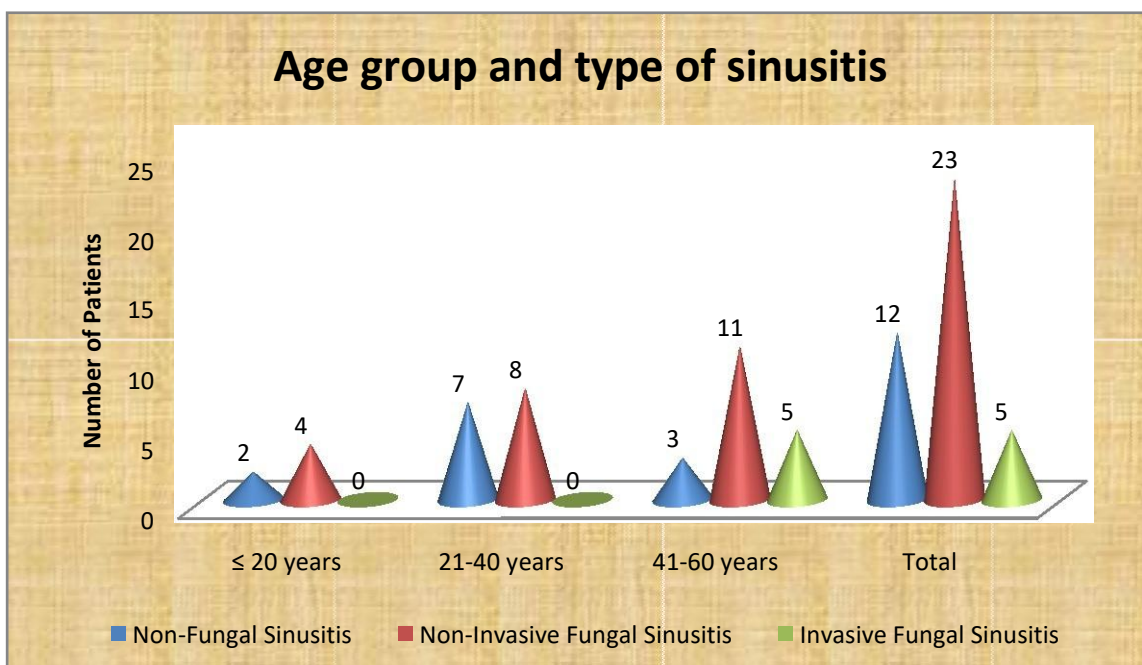
From December 2017 to January 2019, researchers analyzed 40 patients with fungal and chronic sinusitis in the Department of E.N.T. at SreeBalaji Medical College and Hospital to determine the prevalence of fungal sinusitis. The history, clinical examination, investigations, histopathology, and microbiology examinations were all thoroughly examined in each case. All cases were treated surgically or with a combination of surgical and medical treatments, and all cases were followed up on. The clinical information was gathered using a proforma, and the observations were analyzed using the Master Chart. The results were obtained after SPSS version 16 was used to analyze the data. Proportions and means were used to present descriptive statistics. Chi square tests were used to perform a bivariate analysis of proportions. Unpaired t test was used to determine whether the difference in means was significant. All statistical tests were two-tailed, with a 0.05 significance level.

Prevalence of Fungal Sinusitis



In our study of 40 patients of chronic sinusitis with features of fungal sinusitis, 70% (28 patients) of the cases turned out to be fungal out of which Non- Invasive fungal sinusitis (23 patients) was the commonest. (57% of Non - invasive and 13% of invasive) and 30% (12 patients) were non fungal.

Age

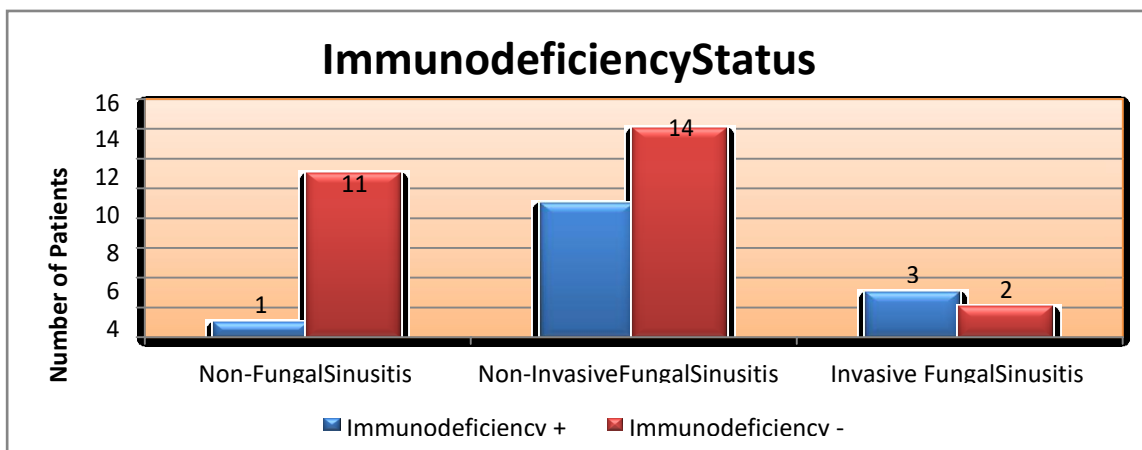


From the above table it is clear that

1. All invasive fungal sinusitis were in the age group 41 - 60years(100%).
2. Non-invasive fungal sinusitis were in the age group 41-60 years (48%) followed by the age group 21 -40 years(35%) and in age group less than 20years(17%)

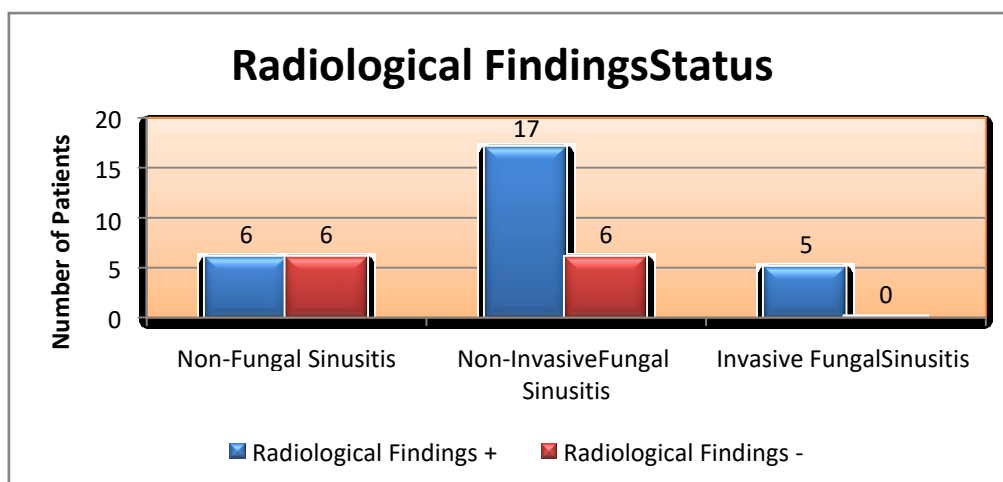
Mean age of patients who had invasive fungal sinusitis were significantly higher than mean age of patients in other categories.($P < 0.01$)

Immunity



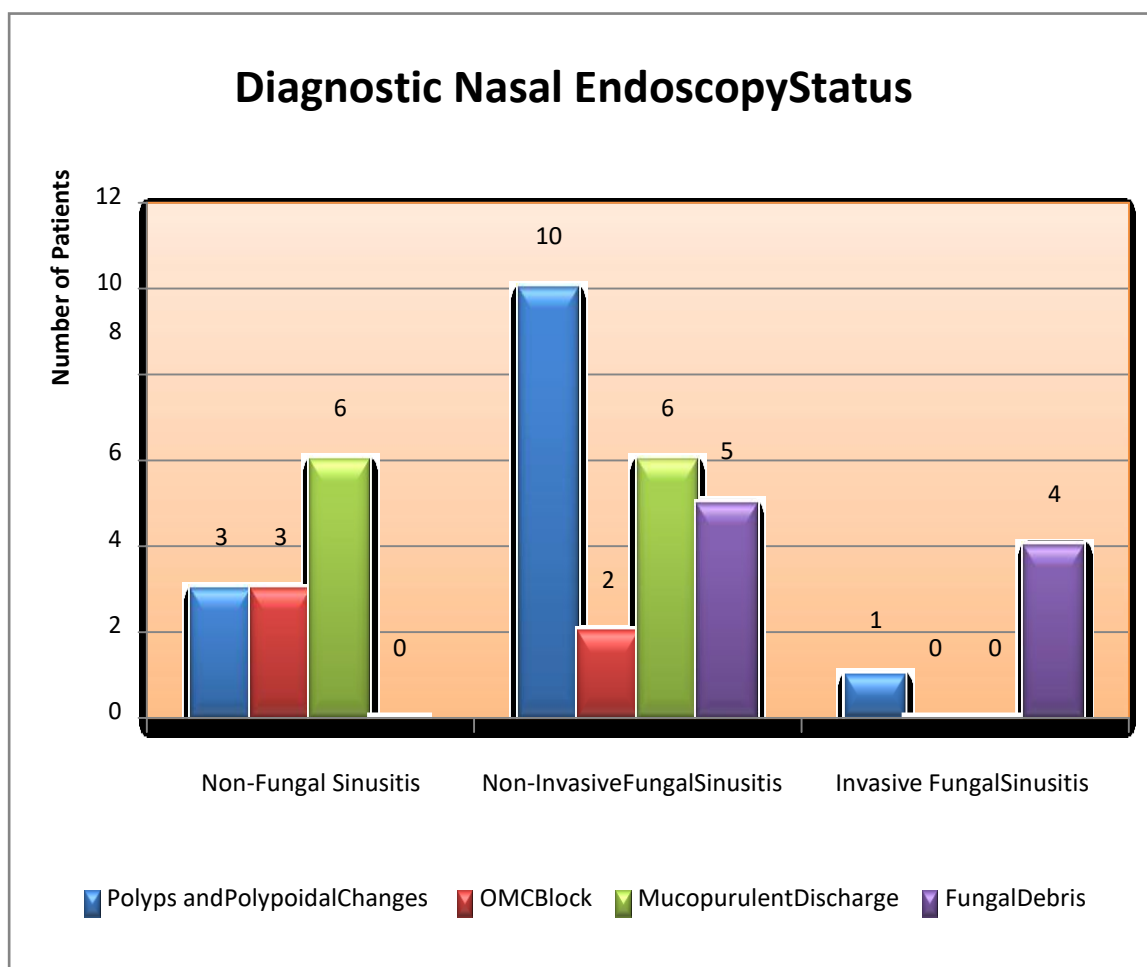
Greater proportion of patients with invasive fungal sinusitis, 60% had immunodeficiency and 40% of non-invasive patients were immunodeficient. Among patients with non-invasive fungal sinusitis, greater proportion (61%) and non-fungal sinusitis (92%) did not have immunodeficiency. This difference was not statistically significant ($P > 0.05$).

Radiological Findings



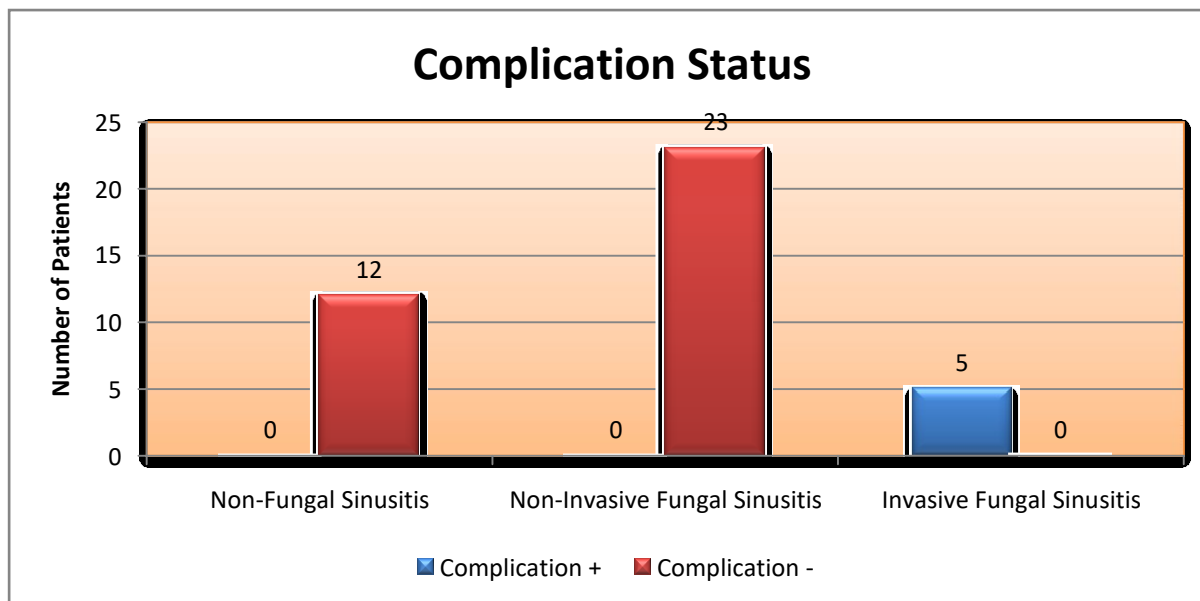
Among patients with invasive fungal sinusitis (100%) and greater proportion (74%) of non – invasive fungal sinusitis had radiological findings positive for fungal sinusitis. Among patients with non-fungal sinusitis 50% had radiological findings and 50% did not have positive radiological findings for fungal sinusitis. There is no statistically significant difference between presence of radiological findings and type of sinusitis. (P>0.05)

Diagnostic Nasal Endoscopy



DNE of patients with invasive fungal sinusitis had majorly fungal debris/eschar(80%). Among patients with non-invasive fungal sinusitis, greater proportion (44%) had polyps and polypoid changes in the sinus mucosa and turbinates . Among patients with non-fungal sinusitis, greater proportion had mucopurulent discharge. There is no significant difference between diagnostic nasal endoscopy status and type of sinusitis. (P>0.05)

Complication

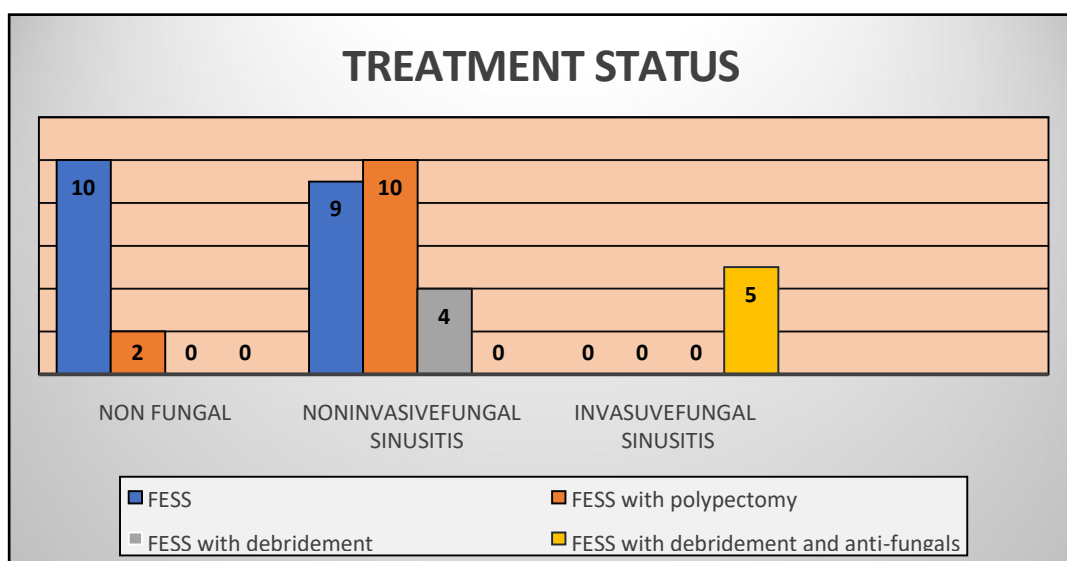


All invasive fungal sinusitis patients (100%) presented with complications and no complications were seen in patients with non- invasive and non-fungal disease. This difference was statistically significant ($p < 0.001$).

Complications of fungal sinusitis :

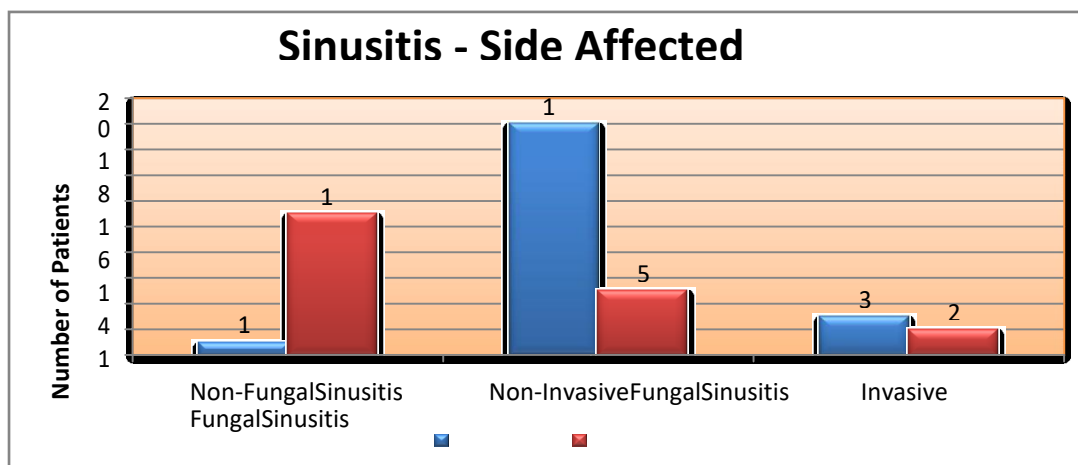
In our study, the most common complication of fungal rhinosinusitis was orbital cellulitis (11%) followed by cranial nerve palsy.(7%)

Treatment



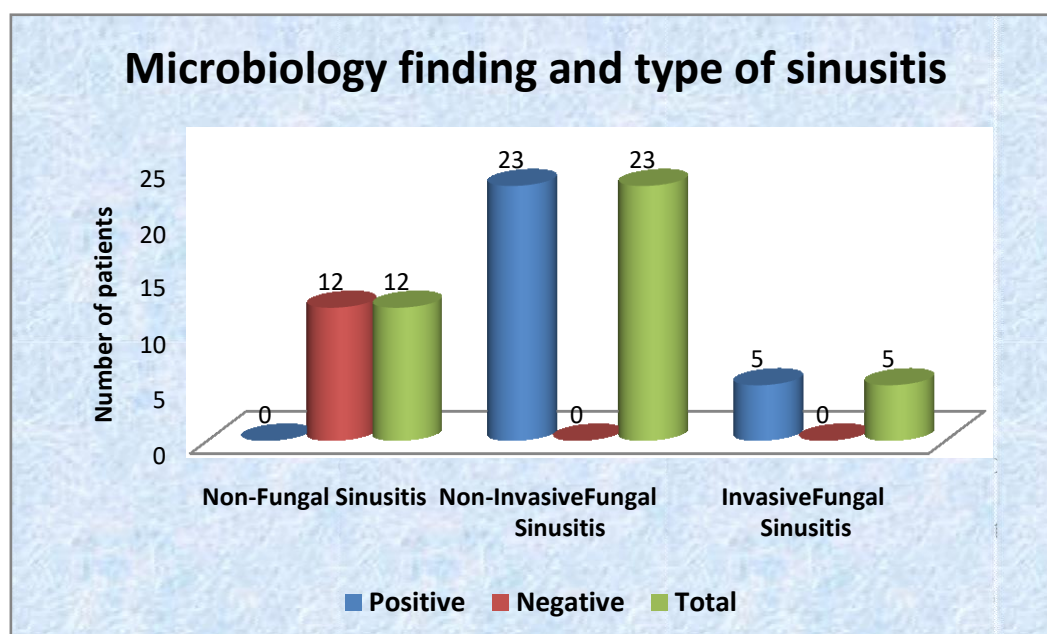
100% of patients with invasive fungal sinusitis required FESS with debridement and anti-fungals and 43% of non-invasive fungal sinusitis patients required FESS with polypectomy as the required treatment. This difference was statistically significant. ($P < 0.001$).

Sinusitis - Side Affected



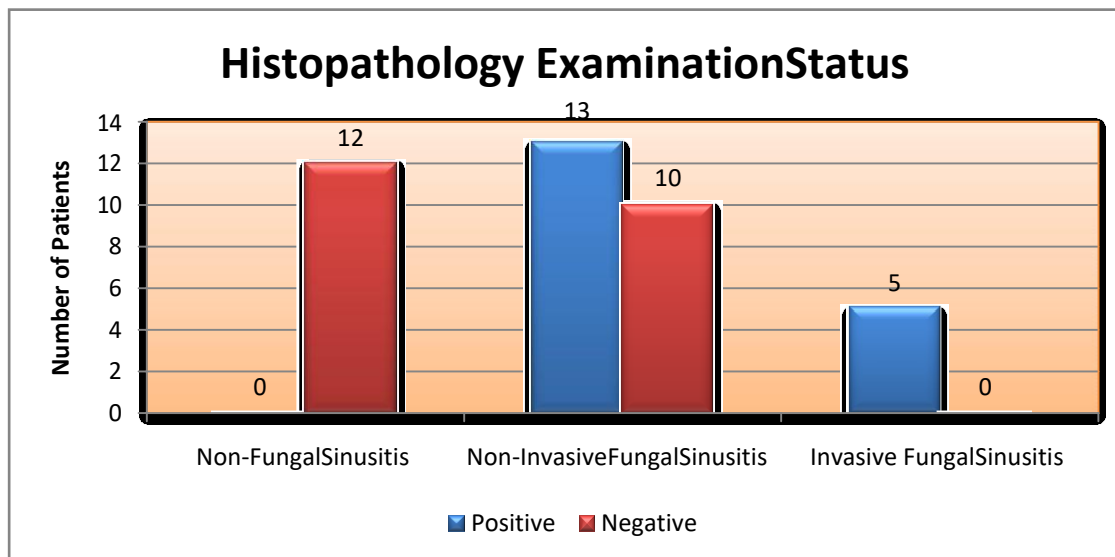
Comparing the side of the sinus affected greater proportion of patients who had non-invasive (78%) and invasive fungal sinusitis (60%) had unilateral sinusitis than non-fungal sinusitis patients (8.33%) in who bilateral sinusitis was common (92%). This difference was statistically significant ($p < 0.001$). From the above table it is clear that, the most commonly affected sinus is the maxillary sinus (82.5%) followed by ethmoidal sinus (50%).

Microbiology



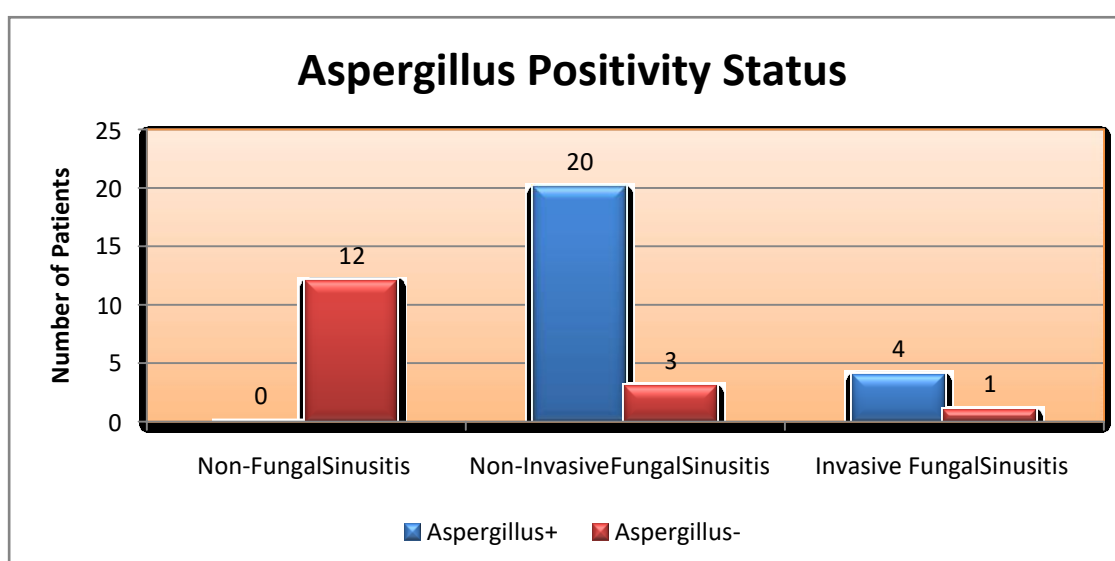
patients with non-fungal sinusitis, microbiological examination was negative in all patients (100%). This difference was statistically significant ($p < 0.001$).

HPE



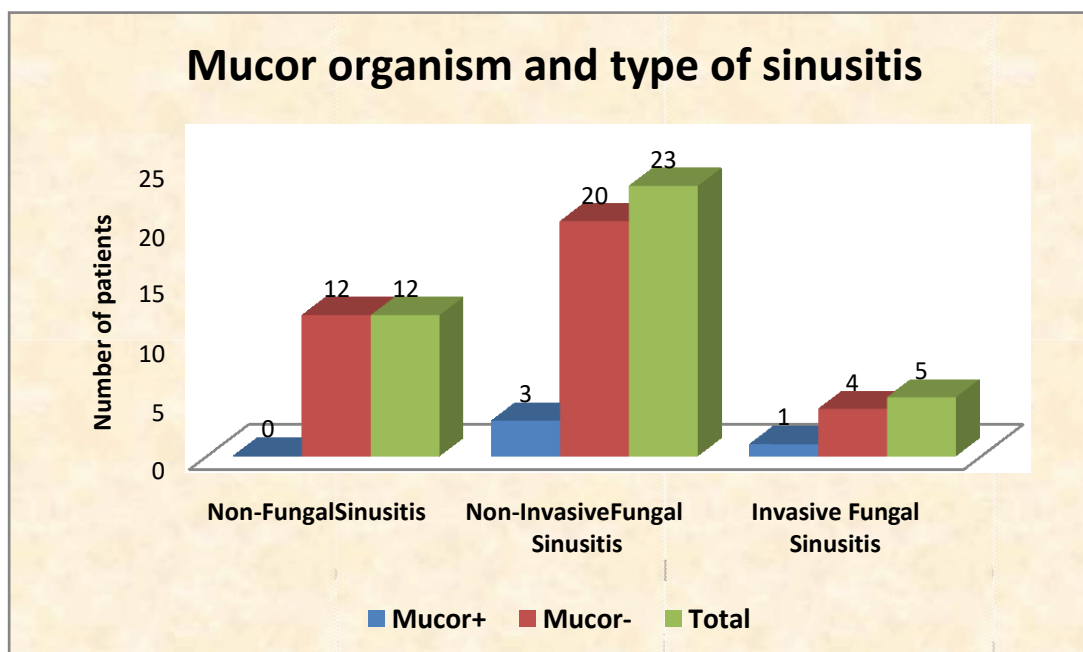
Major proportion of patients who had non-invasive (57%) and invasive fungal sinusitis (100%) had histopathological examination positive than patients who had non fungal sinusitis (0%). In patients with non-fungal sinusitis, histopathological examination was negative in all patients (100%). This difference was statistically significant ($p < 0.001$).

Aspergillus



Aspergillus was found to be present in Greater proportion of patients who had non-invasive (87%) and invasive fungal sinusitis (80%). In patients with non-fungal sinusitis, Aspergillus was negative in all patients (100%). This difference was statistically significant ($p < 0.001$).

Mucor



statistically significant ($p > 0.05$).

Of all the fungal cases it is evident from the above table that Aspergillus was the most common fungus identified (86%) of the cases and mucor was positive in 14% of the cases. Aspergillus fumigatus was the most common (71%) of the aspergillus species that was grown on fungal culture.

4. DISCUSSION

The predisposing factors for fungal rhinosinusitis are immune status of the patient, local anatomical variations of the nose and virulence of the fungal organism. Some parameters which lead to a high index of suspicion are recurrent polyposis, unilateral involvement, middle aged patients, inspissated viscid thick mucus in the sinonasal cavities and history of poor response to medical management. In our study of 28 patients,

eleven males (39.2%) and seventeen females (61%) were affected by fungal rhinosinusitis. Of 23 patients of non-invasive fungal rhinosinusitis, 15 patients were females (65%) and 8 were male(35%). Whereas of the 5 patients with invasive fungal rhinosinusitis greater proportion were males (60%) followed by 40% females (18-20).We come to conclude that in our study gender was not a statistically significant parameter.($p>0.05$) and this could be due to a smaller sample size.

MICROBIOLOGY AND HPE:

Fungus was identified in our study by fungal culture and histopathological examination. Axellson and Carlsson 22 have confirmed the diagnosis by microscopic examination of specimen and from fungal culture. In another study by P. Karthikeyan et al 3 HPE examination was found to be positive for fungus in 24 patients and fungal culture was positive in 24 of his 67 patients. In our case study, 57% of non-invasive and 100% of invasive fungal sinusitis cases were found to be positive for fungus on HPE. Therefore we observe that correlation of pathological examination and fungal positivity is statistically significant. ($p<0.05$). Microbiological examination in our case study revealed positive for fungus in all the 28 (100%) cases of fungal rhinosinusitis. From our study we conclude that microbiological examination in the diagnosis of FRS is statistically significant ($p<0.05$).

In contrast to our results, Sandeepsureshet al 12 have observed that HPE was superior to microbiology. They have also observed that *Mucor* sp. was the most common fungal species isolated in cases of invasive fungal rhinosinusitis. In North India Chakrabarti et al 4 *Aspergillus* was the most commonly isolated fungal species. *Aspergillus flavus* was the most commonly isolated among the *aspergillus* species in his study. CelsodallIgnaet al have reported *aspergillus* as the most common species on fungal culture in their study results. In yet another study by Rajiv C Michael et al 6, Saravanan et al 25 of in Tamil Nadu and by S. Prateek et al 20, *Aspergillus flavus* was the common fungal species followed by *fumigatus* in their specimens. The reasons could be due to the difference in environment of the population living in urban and rural areas although the exact reasons are still a matter of speculation. In India, houses in the rural areas are often open and people are continuously exposed to fungus in environment (21-22).

Our study results were favourable to the above studies wherein *Aspergillus* was found in 87% of non-invasive cases and in 80% of invasive fungal rhinosinusitis. *Aspergillus flavus* was the most

common (71%) of the aspergillus species followed by fumigatus (7%) and niger (2%). This difference was statistically significant. ($p < 0.05$) McNutly and Blitzer 23 have echoed that factors causing stress could lead to growth of mucormycotic infection in patients like patients in immunocompromised state. Due to less proportion of patients in immunocompromised state in our study, mucormycosis was seen in only 20% of our invasive cases.

IMMUNITY :

In our study , 60% of cases diagnosed with invasive fungal rhinosinusitis and 40% of the non invasive cases were immunodeficient. The immunodeficiency state in all our patients were due to diabetes mellitus. Our results were comparable with the study done by Emmons et al which states that infection of maxillary sinus by aspergillus infection can be found in general good health and among nutritionally deficient persons. Immunodeficiency was more common in invasive fungal disease but this parameter was statistically insignificant which could be due to our small sample size (23).

COMPLICATIONS :

Complications observed in our cases were orbital cellulitis and cranial nerve palsies. Complications were seen in 5 cases of the 28 fungal rhinosinusitis cases. All invasive fungal rhinosinusitis cases presented with complications (100%) and no complications were seen in non invasive cases. The most common complication was orbital cellulitis seen in 11% of cases. Aspergillus caused complications in 4 cases followed by mucor in one case. Comparable to our study, Cho et al 26 and Sandeep et al 12 have observed that orbital cellulitis and cranial nerve palsies were the most common complications.

TREATMENT :

Ferguson et al 13 in their study proved endoscopic sinus surgery was the main stay of treatment for non invasive cases. This was comparable with our study where twelve of twenty three (52.7%) non-invasive fungal rhinosinusitis cases required FESS as treatment. FESS helps in reducing the fungal burden in the sinus cavity, ventilate the sinus cavity and also decrease the antigenic stimulation from the fungus in case of AFRS. Non-invasive fungal rhinosinusitis patients were treated with steroids topically and systemically. Topical intranasal steroids were effective in preventing recurrence of the disease and help in maintaining a healthy sinus cavity. This correlates with strategy that was created by Georgia Nasal and Sinus institute and study by Sandeep et al 12 which comprises of FESS with

tapering doses of steroids for non invasive fungal rhinosinusitis (24).

Stringer and Ryan²⁴ suggested a combined modality approach that includes surgery and anti-fungal therapy for invasive cases (25). In our study, all five cases (100%) of Invasive fungal rhinosinusitis cases required FESS with debridement of fungal debris/eschar and anti-fungals as treatment. Intravenous liposomal Amphotericin B (1.5 -2g) was given for a period of six weeks which was gradually tapered. All our patients were counselled for regular follow up, medications and nasal douching. Post surgery endoscopy is important to prevent recurrence of the disease. Patients with invasive disease were followed up for a period of 1 year and non-invasive patients for a period of 6 months. However, two patients were lost for follow up post-surgery.

CONCLUSIONS

This study was aimed to analyze the prevalence of fungal sinusitis in selected population of chronic sinusitis. In the overall assessment of our study, following conclusions can be drawn: In our study, the prevalence of fungal rhinosinusitis is 70%. Most common was non invasive fungal rhinosinusitis which includes 23(58%) of 28 patients diagnosed with fungal rhinosinusitis and 5 (12%) of them had invasive fungal rhinosinusitis. The prevalence of fungal rhinosinusitis was higher in the age group 41 -60 years for both invasive and non-invasive fungal rhinosinusitis. There was a clear female preponderance with 60% and males constituted 40%. Headache was the main presenting complaint in 89% of our cases. 23 patients (82%) presented with nasal discharge as a complaint followed by nose block in 21 patients (75%) and did not correlate with the study.

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Ethical approval: The study was approved by the Institutional Ethics Committee

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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