

A comparative study of fungal vs non-fungal rhinosinusitis in immunocompetent individuals

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ABSTRACT

OBJECTIVES

To find out the prevalence of fungus in immunocompetent patients presenting with CRS and to compare common clinical manifestation

METHODS

A total of 76 immunocompetent patients presented with chronic rhinosinusitis with polyposis were included in this study. All the relevant information about their presenting symptoms was recorded in a proforma. On OPD basis polypoidal tissue was sent for KOH and fungal culture. Later the findings of KOH and culture reports were recorded and analysed.

RESULTS

There were 44 males and 32 females among the 76 patients. The underlying fungus was found in 9 (11.8%) of the participants, 5 (55.5%) of whom were males and 4 (44.5%) of whom were females. Nasal blockage (88 percent), headache (63 percent), post-nasal drip (57 percent), nasal discharge (34 percent), odour disturbance (33 percent), and sneezing were the most common symptoms in this study (30 percent). The average age was 43.83 +/- 14.82. The most common organism discovered was Aspergillus.

CONCLUSIONS

A considerable number of individuals with chronic rhinosinusitis with polyposis have underlying fungus, with Aspergillus being the most frequent organism detected.

KEYWORDS

chronic rhinosinusitis with polyposis, Fungus, Aspergillus

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INTRODUCTION

Polyp is a Greek word that means "many-footed" (poly, many; pous, footed). In cadaveric studies, the prevalence of nasal polyps was shown to be as high as 32-40 %.(1)

Nasal polyps are the end-stage manifestation of a chronic inflammatory disease of the sinonasal tract. CRSwNP (chronic rhinosinusitis with nasal polyps) is a subtype of chronic rhinosinusitis with nasal polyps (CRS).(2)

Each year, CRSwNP affects between 1 and 20 persons per 1000 people.(3) Chronic rhinosinusitis (CRS) is an inflammation of the nose and paranasal sinuses that lasts for a long time.

The pathophysiology of CRS has been widely explored throughout the last two decades. The particular aetiology is uncertain due to a variety of host and environmental variables.

Fungi are the leading cause of a wide range of illnesses, including rhinosinusitis.(4) Fungal Rhinosinusitis (FRS) is becoming more well-known among people of all ages. FRS has an impact on the commercial and economic status of society. Acute invasive FRS patients have a significant rate of morbidity and mortality.(5)

To demonstrate the presence of fungal hyphae in sinus secretions, fungi stains such as Gomori's methenamine silver (GMS) or 10 percent potassium hydroxide (KOH) mount can be used. To confirm the diagnosis, a culture on Sabouraud dextrose agar (SDA) with antibiotics is utilised.

The fungi that cause rhinosinusitis are demographically heterogeneous; in the west, dematiaceous fungi are the most common cause of rhinosinusitis, whereas in India, Aspergillus is the most common cause. Over the last few decades, numerous studies have sought to unravel the exact aetiology of this condition, and while many have uncovered aspects that are thought to be connected and associated, none have come to a definite conclusion about cause.

The goal of this study is to find out how common fungus is in people who have chronic rhinosinusitis with polyposis. The polypoidal tissue and nasal secretions samples were obtained, and the samples were analysed for the presence of fungus using KOH mount and Fungal Culture.

METHODOLOGY

The present study was conducted in the department of ENT, KIMS, Bhubaneswar.

Study Period

September 2019 to August 2021

Sample Size

All Clinically proven cases of chronic rhinosinusitis with polyposis presenting in ENT OPD, Kalinga Institute of Medical Sciences, Bhubaneswar. A total of 76 cases of ethmoidal polyps were included.

Study Design

Cross sectional study

Inclusion Criteria

Clinically proven cases of chronic rhinosinusitis with polyposis

Patients who have given written informed consent.

Exclusion Criteria

Unwilling to give consent

Sino-nasal malignancy

Immunocompromised patients

Evaluation: All patients were worked up based on a proforma. The diagnosis was confirmed by fungal culture and KOH examination of the specimen. The data collected from the patients was analysed by Pearson's Chi-Square. Patients were treated with endoscopic sinus surgery, medicinal therapy, or a combination of the two.

RESULTS

A fungal aetiology was found in 11.8 percent of instances of chronic rhinosinusitis with polyposis in our investigation of 76 cases. The most prevalent isolate was *Aspergillus flavus*, followed by *Aspergillus fumigatus*, with *Candida* being the least common. The majority of CRSwNP patients (27.6%) were in the age bracket of 31-40 years, followed by 41-50 years (21.1 percent). The average age was 43.83 +/- 14.82. Males made up 44 percent of the total patients, while females made up 32 percent.

Out of 76 CRSwNP patients, 7 (or 9%) had positive fungal culture results, while 69 (or 91%) had no indication of growth on fungal culture. Fungal elements were found in 9 samples (12%), while 67 samples (88%) were negative for KOH Mount. In total, 9 (11.8 percent) of the patients had a fungal aetiology. The most common isolate was *Aspergillus flavus* (57%) (4 cases), followed by *Aspergillus fumigatus* (29%) (2 cases), and only one instance of *Candida* was found.

Nasal blockage (88%), headache (63%), post-nasal drip (57%), nasal discharge (34%), odour disturbance (33%), and sneezing were the most common symptoms in this study (30%).

When compared to non-fungal rhinosinusitis patients, rhinorrhoea, headache, and snoring are more common in Fungal rhinosinusitis patients (p0.05).

In comparison to patients with non-fungal rhinosinusitis, all patients with fungal rhinosinusitis have a deviated nasal septum to some degree. And it was discovered that this was statistically significant (p0.05).

In our study, however, age, gender, socioeconomic position, olfactory disturbance, and sneezing were not shown to be significant in contrast to non-fungal rhinosinusitis shown in table

Age Group	Frequency	Percent
0-10	1	1.3
21-30	14	18.4
31-40	21	27.6
41-50	16	21.1
51-60	11	14.5
61-70	9	11.8
71-80	4	5.3
Total	76	100

Table 1. Age Distribution Of Patients With Crswnp



	Frequency	Percent
Male	44	57.9
Female	32	42.1
Total	76	100

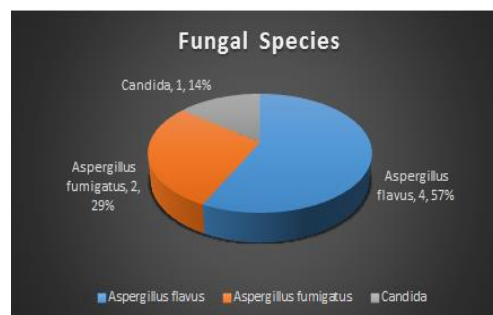
Table 2. Gender Distribution Of Patients With Crswnp

	Frequency	Percent
Aspergillus flavus	4	57
Aspergillus fumigatus	2	29
candida	1	14

Table 4 And Graph 2. Fungal Species Isolated In Patients With Crswnp

	Frequency	Percent
Fungal rhinosinusitis	9	11.8
Non-Fungal rhinosinusitis	67	88.2
Total	76	100

Table 3 And Graph 1. Overall Cases Of Fungal Rhinosinusitis In Patients With Crswnp



DISCUSSION

Nasal polyposis has long been considered of and treated as a simple and straightforward sickness, but new research has shown that it requires a great deal of attention. Because the exact cause of nasal polyposis is unknown, and a variety of factors have been blamed for its development and growth, it's vital to investigate the problem completely because it could be an indication of a more serious condition.

The incidence of fungal infection in the nose and PNS associated with nasal polyps is much higher than previously considered.

Fungal illnesses of the paranasal sinuses are frequent in India, not just in the south, but across the country (6). Their importance is expanding as a result of the morbidity and mortality caused by FRS.

A total of 76 patients with chronic rhinosinusitis with ethmoidal polyp (CRSwNP) were included in this study. The patients ranged in age from 8 to 80 years old. The majority of the patients were between the ages of 31 and 40. Only one patient was younger than ten years, while the others were between the ages of 41 and 50. (i.e. 8 years). The

patients with (CRSwNP) had an average age of (43.83 years) with a standard deviation of 14.8. Males outnumbered girls by a margin of 58 percent (42 percent). The ratio of males to females was (1.3:1).

In the United States, Montone et al. (2012) discovered that the average age of CRS patients was 45 years old, with a range of 18–88 years, and the male to female ratio was 1.2:1, which is similar to this study.(7) The majority of patients in Klossek et al study were between the ages of 30 and 59.(8) This is comparable to what we found in our research. In contrast to our study, this one revealed a female predominance.

This study's male preponderance matches that of Prateek et al.(2013)(9) (1.33:1) and Shone GR (1.8:1) investigations (10). Micheal et al.(2016)(11) and Dufour et al.(2016)(12) both found a female preponderance in their research. Males are more frequently exposed to pollutants from traffic, dust, and industry, which explains the findings of this study.

The prevalence of fungal rhinosinusitis was determined to be 11.8 percent in this study, which included 76 patients of CRSwNP. By direct examination (KOH mount) or culture, fungal positive was observed in 9 individuals in this investigation. Seven of these were found to be positive by culture, and nine were shown to be positive by KOH mounting. The two were positive for KOH, but the culture was negative. This could be the result of a poor specimen or contamination of the sample

prior to cultivation.

Kavitha et al. (2016) discovered a prevalence of 11.3 percent for fungal rhinosinusitis, which is extremely close to our findings.(13)

The prevalence of fungal rhinosinusitis was determined to be 7.3 percent by Satish et al. (2013), which is lower than our study. (14)

Santhosh and his colleagues A study on 50 patients with nasal polyposis was conducted in 2016 at Government Medical College, Thrissur, and it was discovered that three specimens were positive for fungal elements with KOH testing and two cases with fungal culture. In sinonasal polyposis, the overall incidence of fungal elements was 6%. (15)

Klossek et al., on the other hand, discovered a substantially greater prevalence of fungal rhinosinusitis, with 33 out of 109 patients (30%) being culture positive and 76 out of 109 samples (69.7%) being culture negative.(8)

Bahrawy et al.(2020) observed that 13.9 percent of the patients studied had positive fungal stain in a study conducted at Zagazig University. This is comparable to what we found in our research. (16) In comparison to our and other similar studies, Swain et al. found a much higher prevalence of fungal rhinosinusitis: overall prevalence of FRS was 41 percent (n=16), with a higher prevalence in the third and fourth decades (n=10, 62.5 percent) of life, and a female predominance (n=11, 68.75 percent). (17)

Fungi appear to play a significant role in the severity and duration of mucosal inflammation in CRS, and FRS has only lately been more thoroughly classified.

The bulk of the fungus isolated in this investigation (86 percent) were *Aspergillus* species, particularly *A. flavus*. There were four *Aspergillus flavus* isolates and two *Aspergillus fumigatus* isolates among the six *Aspergillus* isolates. This was in line with the findings of Kavitha et al. in their research in Kerala, 2016.(18)

Michael and his colleagues A retrospective study conducted at CMC Vellore between January 2000 and August 2007 discovered that *Aspergillus flavus* is the most common fungus recovered from patients of fungal rhinosinusitis. (19) In a similar study conducted in Chandigarh by Saravanan et al. (2006), the most common culture isolate among the 32 patients in the AFRS group was *A.flavus* (81.3%), followed by *A.fumigatus* (8.9%), and *Bipolaris* spp (6.5 percent). (20) Srivani et al.(2016) found that *Aspergillus* species were the most commonly isolated fungi (17.3%) from nasal polyps, which is consistent with earlier investigations, although dematiaceous fungi are more prevalent causative agents in western studies. (21) In a study published in 2019, Bahrawy et al. discovered that 80 percent of the isolates on fungal culture were *Aspergillus Fumigates*, whereas 20% were *Candida Albicans*. This research corroborates our findings. (16)

In this study, no dematiaceous fungus was discovered among our isolates. This could be due to the fungi's diverse geographical spread, which is influenced by local climatic temperature and humidity.

In North America, dematiaceous fungi such as *Bipolaris* spp. and *Curvularia* spp. have been found to predominate in allergic sinusitis. (22)

The causes of this difference are unknown, however several factors could be at play. Because a major portion of India's

population lives in rural or semi-rural areas, their fungal exposure will be different than that of a more urban population in developed countries.

Another difficulty could be the two countries' differing housing types. Houses in India are generally open to the outside environment, potentially exposing residents to fungus. Despite the fact that fungal rhinosinusitis has long been recognised as a serious disease, current findings and research are being used to further our understanding of its epidemiology and medical microbiology.

CONCLUSION

The incidence of fungal infection in the nose and PNS associated with nasal polyps is much higher than previously considered. Because the source of nasal polyposis is unknown, it's vital to investigate the problem completely because it could be a symptom of a more serious condition.

Patients with CRS who exhibit signs and symptoms such as nasal obstruction, nasal polyps, rhinorrhoea, and headache should be suspected of having fungal sinusitis. The diagnosis of CRSwNP has become easier with the use of microbiological investigation of sinus specimens, CT scans, and Diagnostic Nasal Endoscopy.

CRSwNP is a disease that significantly reduces one's quality of life. It can be difficult to determine an underlying cause due to the disease's varied nature.

Otorhinolaryngologists should keep fungal infections in mind during their everyday practise due to the growing occurrence of fungal infections of the paranasal sinuses.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com. Financial or other competing interests: None. Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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