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Original Research Article

Fungal Disease of the Nose and Paranasal Sinuses

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Abstract:

Background: Because fungi are so common in nature, it is impossible to avoid coming into contact with the Sino nasal and respiratory epithelium. The spectrum of the disease varies from noninvasive disease to acute and fulminant infection, each with specific clinical and histopathologic symptoms (Table I). Inhalation of these organisms can induce both acute and chronic rhinosinusitis. In the care of patients with invasive fungal rhinosinusitis, topical or systemic antifungal therapy can play a key role and should be combined with surgical intervention. However, these treatments have a limited impact in the treatment of noninvasive infections. Only dermatophytes are transmissible from host to host among the majority of fungal species that are harmful to humans and cause opportunistic illnesses. It has been severely understated how often fungus cause illnesses and deaths.

Aim: to research the prevalence of nasopharyngeal and paranasal sinus fungus in our area. to research the pathological and clinical effects of nasopharyngeal and paranasal sinus fungus.

Material and Method: Patients who visited the ENT outpatient department provided the materials for the current investigation. A total of 50 patients were evaluated using a standard proforma and completed the following investigative techniques systematically as and when necessary in order to rule out fungal infections of the nose and paranasal sinuses. As part of the initial investigations, complete hemograms, blood sugar levels, serum electrolytes, serum proteins, blood grouping, etc., were performed to examine the patient's overall health state and rule out any underlying illnesses. All patients had the necessary X-rays of their noses and paranasal sinuses taken, and those who had fungal granulomas were also given contrast-enhanced CT scans of their noses, paranasal sinuses, and brains.

Results: There were 50 individuals studied, and of those, 18 were men and 32 were women. They were all of Indian descent. In this survey, there were more women than men. In this study, females made up 64% of all the cases. Nasal symptoms were present in 100% of the individuals in our research. They are post-nasal discharge and nasal discharge blockage. frequent sneezing, nasal hemorrhage, and a diminished or absent sense of smell (Hyposmia or Anosmia). In our study, 16% of participants had ocular symptoms like proptosis, epiphora, and diplopia, which cause vision impairment. According to our study, out of 50 patients, 22 had Aspergillus flavus, 6 had Aspergillus fumigatus, 3 had Aspergillus niger, and 2 had Aspergillus terreus. Histopathology revealed that all cases were Aspergillus fungal cultures.

Conclusion: The term "fungal rhinosinusitis" refers to a variety of fungal diseases, from asymptomatic colonization of the sinus cavities to infections that advance quickly and are eventually lethal. The long-term prognosis for patients with invasive fungal rhinosinusitis is poor, necessitating debridement in up to 43% of cases due to extensive morbidity from

extension to the palate, maxilla, orbit, and cranium. However, more recent data suggest that rapid multidisciplinary treatment may have significantly reduced morbidity.

Keywords: Paranasal Sinuses, Fungal Infections, Dermatophytes, Broad Spectrum Antibiotics, Cytotoxic Drugs, Para-Nasal Sinuses.

Introduction:

We are constantly bombarded by the spores of fungi since they are so common in nature. In affluent nations, men rarely develop fungi infections of the nose and paranasal sinuses. However, in recent years, opportunistic infections caused by the use of potent cytotoxic medications as well as steroid and antibiotic therapy have increased, as have imported illnesses as a result of the considerably increased international traffic. [1] The lung, with or without hematogenous dissemination to other organs, is the most frequent location of fungal infections in humans. Only dermatophytes are transmissible from host to host among the majority of fungal species that are harmful to humans and cause opportunistic illnesses. It has been severely understated how often fungus cause illnesses and deaths. Additionally, the number of fungal species that might cause infections in people with impaired immune systems is growing quickly. [2] Fungal infections are rising in frequency and variety in a time of AIDS, broad-spectrum antibiotics, cytotoxic medicines, and organ transplantation. Candidiasis, Rhinosporidiosis, Aspergillosis, Phycomycosis, Actinomycosis, Coccidioidomycosis, Histoplasmosis, Cryptococcosis, Blastomycosis, Sporotrichosis, and Nocardiosis are common fungi that affect the nose and sinuses. Martin and Berson observed a significant frequency in South Africa and specifically linked malnutrition to it. [3] Sudan has produced the biggest number of instances involving the nose and sinuses. [4,5] The drainage of the paranasal sinuses is hampered by anatomical anomalies, which puts the patient at risk for fungal colonization. The pooling of mucus and colonization by fungi can also result from comorbidities that have damaged the mucosa; however, this colonization rarely has clinical consequences, patients are frequently asymptomatic, and fungi discovered during procedures carried out for other reasons shouldn't be treated because many species, including Aspergillus species, are frequently found in the sinonasal passages. [6]

However, observations of specific fungi inducing an eosinophilic inflammation in the absence of type I hypersensitivity have raised questions about the pathogenesis of AFRS. IgE specific for Staphylococcus aureus superantigens have been strongly linked to the development of nasal polyps, chronic rhinosinusitis, and atopic dermatitis in most patients, which has led some to speculate that superantigens may be a cofactor necessary for the onset of AFRS. These findings further contradict the aforementioned hypothesis. [7,8] Following widespread exposure, fungus can then survive in this setting and start a loop of harmful immunological reactions, with further inflammation and inadequate drainage leading to remodeling of the sinonasal passageways. Increasing evidence has also linked bacterial biofilms to the persistence and recalcitrance of chronic rhinosinusitis, albeit it is yet unknown how these biofilms affect the pathogenic process and ongoing inflammation. [9]

The process of invasion of the sinus tissues takes place over a period of weeks or

months rather than hours in patients with chronic invasive fungal rhinosinusitis. Subtle immune system abnormalities brought on by diabetes mellitus, long-term low-dose corticosteroid usage, or other continuing immunosuppression are present in many people with this very uncommon illness. [10] Dematiaceous molds like Bipolaris, Curvularia, and Alternaria species, as well as other hyaline molds like Pseudallescheria boydii and mucormycosis, are the most frequent causes of this asymptomatic infection. [11] The ENT Department, which is a referral center in this instance and has cutting-edge facilities, offers numerous opportunities for conducting a study on fungal diseases with a primary focus on opportunistic infections of the nose and paranasal sinuses. We decided to do the study because this ailment is not widely known and there are few reports of it. [12]

Material and Methods

The study was conducted in the department of Otolaryngology. Patients who visited the ENT outpatient department provided the materials for the current investigation. A total of 50 patients were evaluated using a standard proforma and completed the following investigative techniques systematically as and when necessary, in order to rule out fungal infections of the nose and paranasal sinuses.

Hematological Investigations:

As part of the initial investigations, complete hemograms, blood sugar levels, serum electrolytes, serum proteins, blood grouping, etc., were performed to examine the patient's overall health state and rule out any underlying illnesses.

b) **Radiological Procedures:**

All patients had the necessary X-rays of their noses and paranasal sinuses taken, and those who had fungal granulomas were also given contrast-enhanced CT scans of their noses, paranasal sinuses, and brains.

c) **Immunological Procedures**

The prick test was used to determine the cutaneous responsiveness to Aspergillus species. d) Diagnosis of the Pathology The following is how the biopsied materials were arranged in three sterile vials. Staining normal saline for use with 10% potassium hydroxide is contained in Bottle A. Fungal culture bottle B contains sterile normal saline.

A 10% potassium hydroxide mount was applied to the Bottle A specimen. When viewed as a wet preparation with fungal elements coloured black and plainly apparent, this dissolves or makes the tissue elements translucent and the fungus are easily observed.

A sample from bottle B was sent for fungi culture. It was raised on agar with potato and dextrose (PDA). White potatoes of the highest quality should be utilized. They need to be cleaned, cut into slices, and then peeled at a rate of 250 g/l of water while steaming for an hour in an autoclave with the exhaust open. The filtrate ought to be clearly turbid. The filtrate should not be clear. Agar and dextrose were combined in a tube, autoclaved, and dyed before being introduced one at a time to create a serial concentration of 2% of each. Each tube was well constructed and had a little bit of sediment in the base. Making potato-dextrose agar in this way produces an excellent medium; occasionally, this process can be sped up by lowering the dextrose concentration to 1%.

Culture Preparation:

These cultures were created by mixing a small amount of growth with agar on a slide. The slide was placed in a Petri dish and covered with a coverslip for incubation. The coverslip and the media were carefully removed after a week, when the spores had fully developed. The coverslip was changed after a 10% KOH

decrease was introduced. The slide is gently heated and let about 15 minutes to cool. After then, the preparation was looked at under a microscope. The spore heads, conidiophores, and other mycelia would still be intact and be arranged in their distinctive ways since some of the mycelia would have clung to the slide. The presence of characteristic conidiophores made it simple to identify different Aspergillus species.

Five key concepts guide our institute's effective care of fungal infections of the nose and sinuses.

- A prompt diagnosis is typically based on a high degree of suspicion.
- Control of the systemic and local risk factors.
- Surgical debridement according to the fungus's level of invasiveness
- Fungus-fighting medication
- Long-term monitoring
- Every patient in this research underwent

Endoscopic Sinus Surgery

Patients were instructed to visit for routine follow-ups following surgery. After the initial postoperative endoscopic evaluation and cleaning, on the fifth postoperative day, the nasal douching was administered to every patient. Antihistamines, vitamins, and beclomethasone aqueous nasal spray were used to treat the patients. The patients were asked to return for an endoscopic evaluation and cleaning on the 15th postoperative day and as often as feasible after that (usually once in a month). Antifungal medication was not necessary for patients with allergic aspergillus sinusitis. Based on the type of fungal infections and how invasive they were, anti-fungal therapy was administered (mucormycosis).

Statistical analysis

For the data analysis, the following statistical programs were used: SPSS 11.0, Stata 8.0, Systat 11.0, Medcalc 9.0.1, and Effect Size Calculator. Microsoft Word and Excel were used to create the graphs, tables, and other output.

Result

There were 50 individuals studied, and of those, 18 were men and 32 were women. They were all of Indian descent. In this survey, there were more women than men. In this study, females made up 64% of all the cases.

Table 1: Shows the Clinical symptoms of the patients.

Symptoms	No. of Patients	Percentage %
Nasal Nasal obstruction Nasal discharge Post nasal discharge	50	100%
Headache	35	76%
Ocular	6	16%

Nasal symptoms were present in 100% of the individuals in our research. They are post-nasal discharge and nasal discharge blockage. frequent sneezing, nasal hemorrhage, and a diminished or absent sense of smell (Hyposmia or Anosmia). In our study, 16% of participants had ocular symptoms like proptosis, epiphora, and diplopia, which cause vision impairment.

Table 2: Shows the Histopathology and fungal culture

Causative organism	No. of Patients	Percentage %
Aspergillus flavus	22	40
Aspergillus fumigatus	6	16
Aspergillus niger	3	8
Aspergillus terreus	2	4%
No Growth	17	32
Mucoromysis	NIL	Nil

According to our study, out of 50 patients, 22 had Aspergillus flavus, 6 had Aspergillus fumigatus, 3 had Aspergillus niger, and 2 had Aspergillus terreus. Histopathology revealed that all cases were Aspergillus fungal cultures.

Table 6: CT scan of nose and sinuses

Sinus Involvement	No. of Patients	Percentage %
Maxillary sinus	42	88%
Ethmoidal sinus	36	76%
Frontal sinus	22	48%
Sphenoidal sinus	23	52%
All sinuses	12	28%
Orbital involvement	8	20%

Discussion

There isn't just one disease that falls under the umbrella of "fungal diseases of the nose and paranasal sinuses," but rather a wide range of ailments. We have researched various disease-causing factors, including allergic aspergillus sinusitis (50 cases). Even though these diseases have quite distinct treatments, their presentations and clinical characteristics are relatively comparable, making it possible to study them together. The authors have made an effort to examine these illnesses under a single topic, highlighting significant variances as needed. Most of the cases in our study were between the ages of 20 and 35.

A study by Waxman et al.13 found that the average patient age in his series was 29 years old, and a study by Manning et al.17 found that the average patient age was 32 years old. According to Waman et al., allergic sinusitis affects more women than men, with women making up 64% of the overall incidence of allergic aspergillus sinusitis in our study. This makes sense in light of the earlier findings.

Nasal complaints were seen in every subject in our investigation. Nasal blockage, nasal discharge, frequent sneezing, a diminished sense of smell (hyposmia), a complete loss of smell (anosmia), and nose hemorrhage were among the nasal symptoms. In 76% of our participants, a headache was the next most frequent complaint. The following most prevalent symptoms, which made up roughly 16% of all cases, were ocular symptoms such epiphora, proptosis, diplopia, and blurred vision.

The majority of previous research, including those by Waxman et al. [13] and Jonathan et al. [14], demonstrated that chronic nasal obstruction and postnasal discharge are the most typical symptoms of allergic Aspergillus sinusitis. These results contrast positively with those of our research. In a different study by Isha Thagi et al. [15], headache was the primary symptom experienced by all of his patients, followed by ocular symptoms and then nose symptoms (Nasal obstruction and nasal discharge). This makes sense in light of the earlier findings. Four of the instances involved wheezing symptoms.

14 patients with aspergillus fungal sinusitis brought on by various fungi were reported by Ence et al. [16] in 1990. Aspergillus, Alternaria, and Cuvularia lunata, as well as Bipolaris spicifera B. Australians. The ability of microbiology laboratories to recognize the various hyphae with differences in the Conically spores has likely improved, which may be related to the identification of these fungus.

According to Manning et al. [17] 1989, there is a signal void in T2 weighted MRI imaging that corresponds to surgically verified areas of thick inspissated allergic mucin. According to CT and MRI data, Morning et al. also assert that allergic fungal sinusitis is a unique clinical entity with a highly distinctive radiographic appearance.

50 cases had endoscopic sinus surgery as part of our study. Endoscopic sinus surgery has lower morbidity and mortality, complete clearance, and an almost negligible recurrence rate in our study. Even though there were no problems in our instances after functional endoscopic sinus surgery, recurrence was only reported in 4 cases. The patients were released the following day without experiencing any difficulties. This is consistent with the earlier research.

In none of our cases of allergic Aspergillus sinusitis, antifungal medications were administered. Many authors, including Allphin et al. [18] and Jonathan et al. hold the same opinion and believe that treating allergic aspergillus sinusitis with antifungal medications is unnecessary. Numerous writers have written studies that are similar to this one, claiming that the endoscopic procedure is the only method for treating allergic aspergillus sinusitis. However, other experts believe that the external approach undoubtedly has a place in the management of this disorder, particularly in instances when the disease has spread to the orbital or cerebral regions.

In our study, there were no CSF leaks and 4 incidences of intraoperative bleeding (8%) were seen as complications. Pneumocephalus and other significant issues have been noted Orbital hematoma is included in Markmay et al. [19] Vision loss, diplopia, epiphora, meningitis, brain abscess, and localized brain hemorrhage—all of which were absent from our study—as well as other conditions.

It is uncommon for intraoperative hemorrhage to be severe enough to require blood transfusion. In our review of Markmay et al. [19] we found that none of them needed blood transfusions. The sphenopalatine artery is interrupted when it crosses the face of the sphenoid sinus, immediately above the arch of the posterior nasal choanae, according to the authors, who concur with other documented investigations. The use of suction and cautery to stop bleeding was advised by Markmay et al. [19] in 1993, but the author does not concur. The following minor consequence, which accounts for 8% of cases, is periorbital ecchymosis. These side effects were observed following the endoscopic sinus procedure. The lamina papyracea is typically violated, which causes this to happen. The authors concurred with other published studies that uncinectomy during endoscopic sinus surgery is the most frequent cause of lamina papyracea violation. [20]

Conclusion

The term "fungal rhinosinusitis" refers to a variety of fungal diseases, from asymptomatic colonization of the sinus cavities to infections that advance quickly and are eventually lethal. Colonization is incredibly frequent, prospective pathogen separation from the nasosinusal passages necessitates knowledge of host risk factors, and illness syndromes are treated with dramatically different approaches for these overlapping disorders. The long-term prognosis for patients with invasive fungal rhinosinusitis is poor, necessitating

debridement in up to 43% of cases due to extensive morbidity from extension to the palate, maxilla, orbit, and cranium. However, more recent data suggest that rapid multidisciplinary treatment may have significantly reduced morbidity.

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