Fungal infections in Otorhinolaryngology: A Descriptive Study

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Abstract*—Fungal organisms are ubiquitous. A common location for these organisms to enter the human body is through the external acoustic canal, oral cavity, and pharynx and sino-nasal cavity. A study was conducted with clinical and mycological analysis of various fungal infections in ENT. Patients suspected for having fungal infections attending at Department of ENT were interrogated and analysed. Swabs collected from these cases were sent for direct microscopy by KOH mounts for fungal examination and fungal culture. Microbiological confirmed 100 cases were finally included in the study Histopathological examination of nasal mass and polyposis was also done. It was observed in this present study otomycosis was most common and accounted for 84% of the total cases followed by candidiasis in oral cavity and pharynx in 9%, allergic fungal rhinosinusitis in 4% and rhinosporidiosis in 3%. Aspergillus niger was that most common fungus isolated in 61% cases, followed by Candida albicans in 24% cases, Aspergillus flavus in 9% cases, Aspergillus fumigatus and Rhinosporodium seeberi in 3% cases each. All the cases of fungal infection of oral cavity and oropharynx were due to Candida albicans.*

Keyword: Fungal infection, Otomycosis, Aspergillus, Candida.

I. INTRODUCTION

Mycosis, an infection caused by fungi, generally depends on the route of exposure, state of the host defense system, and the virulence of the fungus.[1] The upper respiratory tract i.e. nose, oral cavity, pharynx and ear are constantly exposed to various air borne fungal spores. Immune system helps to prevent infection by these organisms. In those who do develop infection, a benign, non-invasive process usually occurs. In the present day medicine diabetes mellitus, use or cytotoxic drugs, long standing steroid treatment, and prolonged use of immunosuppressive drugs have resulted in an increased number of fungal infections.[2]

Otomycosis is a disease which is world-wide in distribution having a high incidence in tropical and sub-tropical countries during all season. However, the prevalence is more during the summer in temperate zones. The factors contributing to its high incidence are high temperature and relatively high humidity, facilitating easy and rapid growth of fungus and bacteria.[3]

Candida albicans is part of the flora of the oral cavity or oropharynx in 30-40% of normal individuals. For the organism to become pathogenic and to give rise symptoms there must be local or systemic changes in the host.[4, 5] Fungal infection of the paranasal sinuses is an increasingly recognized entity, both in normal and immunocompromised individuals. Aspergillus species are the most common causative agents of fungal sinusitis. The pattern of fungal infection of the sinuses has been traditionally divided into invasive and non-invasive, based on the presence of fungal hyphae in the tissue with associated granulomatous reaction or tissue necrosis.[6]

As most of the fungal infections are not highly infectious and run a relatively mild course in an unrecognized manner they often result in greater morbidity. The present study was undertaken to illustrate clinicomicological profile of fungal infection in ENT and to study various facilitator factors responsible.

II. METHODOLOGY

This hospital based descriptive study was conducted in the Department of Otorhinolaryngology, JLN Medical College and Hospital, Ajmer. This study was conducted from January 2011 to October 2012. Patients suspected for having fungal infections were selected from in and out-patient Department of Otorhinolaryngology. Microbiological confirmed cases were finally included in the study. The study was approved form the Institutional Ethical Committee.

An informed consent stating voluntary participation was taken from the patients before the start of the study. Once the clinical diagnosis of fungal infections in ENT were made after seeing spores or mycelial mass in the ear canal and mass in the nasal cavity, all the cases were subjected for mycological examination by sample collection from fungal mass seen in the infected area, sinus and nasal secretions using sterile cotton swabs. In the cases of oral or oropharyngeal fungal infection, swab/scrapping will be taken from affected site and subjected for mycological examination.

These samples were then sent immediately to the microbiology laboratory and subjected for direct microscopy by KOH mounts for fungal examination and fungal culture. Sabouraud's agar used for fungal isolation and identification by cultural characteristics and microscopy.

All confirmed fungal infection cases interrogated as per pre-designed semi structured performa containing details like their name, age, sex, religion, address, presenting complaints etc. The past histories, personal history, family history, environmental history, occupational history, drug history were also recorded in that proforma. The clinical examination included the thorough examination of ear, nose and oral cavity and pharynx regions and complete general physical examination were done and findings were recorded in that performa. Results of microscopy by KOH mounts for fungal examination and fungal culture were also recorded.

All cases of otomycosis underwent thorough cleaning of fungal debris in the external auditory canal either by dry mopping, syringing. Topical antifungal agents were applied i.e., clotrimazole drops for 1-2 weeks and was followed up for a minimum period of 1 month for observing clearance or recurrence of the disease. During this period patient was advised to avoid water entering into the ear while bathing or swimming. All cases of fungal infection of nose and paranasal sinuses were examined in detail. Then the patients were treated surgically and were followed up by medical treatment. All the infections of oral cavity were examined and attempts were made to find out the predisposing factors, then swabs were taken and sent for culture.

2.1 Mycological Examination

It was conducted in the Department of Microbiology, J. L. N. Medical College, Ajmer. Fungal studies were carried out by direct microscopic examination and culture of the material. A small part of fungal colony was placed over a glass slide with the help of wire loop and mounted in a drop of lactophenol cotton blue. Fungus separated with needles. After putting coverslip fungal study was done under microscope. Yeast like fungi were also examined by suspending a loopful culture in water covered with

coverslip. Gram's staining was done for identification of yeasts. Germ tube test was also done for identification of Candida albicans.[2, 6, 7]

2.2 Interpretation

Gregson et al.[8] (1961) have described the colonial characteristic of some important species which helped in identification of various fungi. Aspergillus fumigates sporulation was indicated *by a pale* blue colour which spread gradually over an otherwise white superficial growth; this colour deepened and changed to a greyish blue green with age. Aspergillus niger growth became gradually lemon yellow in patches at the onset of sporulation and then changed gradually to dark brown when conidia were mature. Aspergillus flavus white growth changed gradually to greenish yellow and then in due course to lime green. Candida albicans colonies were at first circumscribed and pellucid but in due course became more, irregular in outline and opaque milk white to creamy white.

2.3 Statistical analysis

Data thus collected was entered in Microsoft Excel 2007 as master chart. Continuous variables were expressed as mean ± standard deviation and frequencies were expressed in percentage.

III. RESULTS

Analysis of various fungal infections of Otorhinolaryngology in 100 patients was done. In which otomycosis was the most common and accounted for 84% of the total cases followed by oral cavity and pharynx in 9% and nose/ paranasal sinus in 7% cases. (Figure 1)

Figure 1

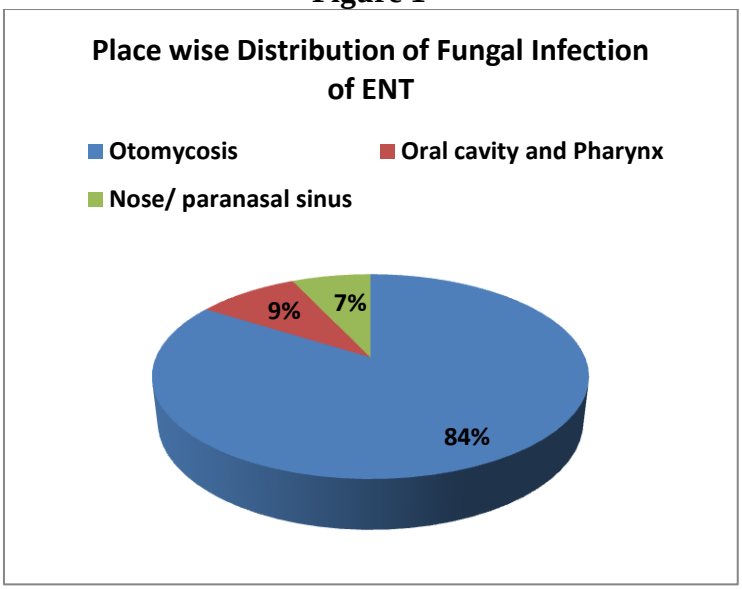
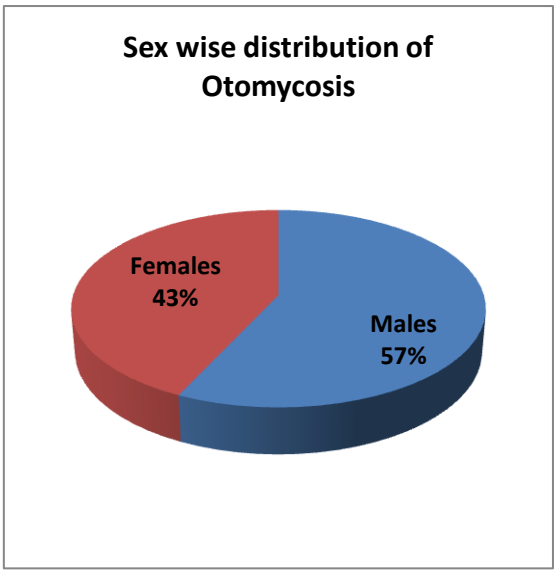


Figure 2



The maximum number of cases of fungal infections in Otorhinolaryngology i.e. 71% were from the age group of 16-30 years followed by 29% were from age group 31-45 year. Out of total out of 84 cases of otomycosis, 57% were males and 43% cases were females. Male to female ratio was 1.33:1. (Figure 2)

In present study 57% cases were from urban and 43% cases were from rural areas. Labourers formed the largest group of suffers in 27% cases of the total number of cases. 25% cases were students, 21% cases were Housewives, 16% cases were farmers, and 11% cases were salaried employees. 11% patients were having with chronic illness and 6% were immunocompromised.

Aspergillus niger was that most common fungus isolated in 61% cases, followed by *Candida albicans* in 24 % cases, *Aspergillus flavus* in 9% cases, *Aspergillus fumigatus* and *Rhinosporodium seeberi* in 3% cases each. All 9 cases of fungal infection of oral cavity and oropharynx were due to *Candida albicans.* (Figure 3)

Otomycosis was most commonly presented in rainy season (50%) and summers (31%). Unilateral involvement of ear was seen in 68% cases. While 32 presented with the bilateral involvement. Trauma to ear canal was the most common predisposing factor seen in 48 cases (57.14%) followed by history of instillation of ear drops was present in 30 cases (35.71%), history of syringing was present in 6 cases (7.14%), history of swimming was present in 5 cases (5.95%), history of previous attacks of otomycosis was present in 2 cases (2.38%) and operated mastoid cavity was present in 2 cases (2.38%). (Figure 4)

Figure 3

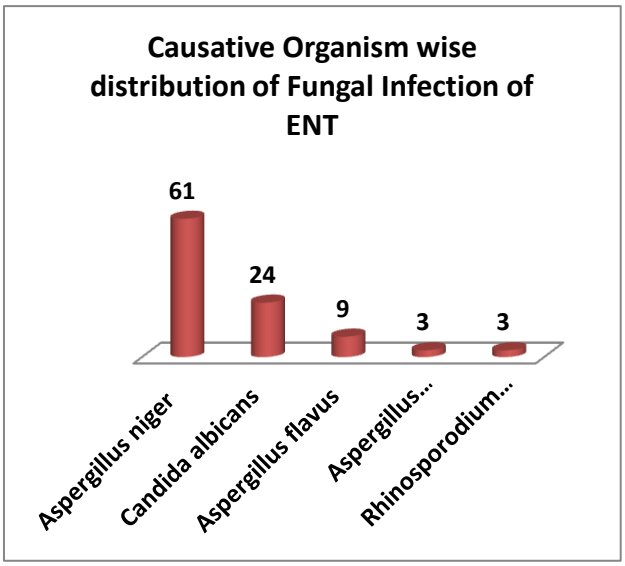
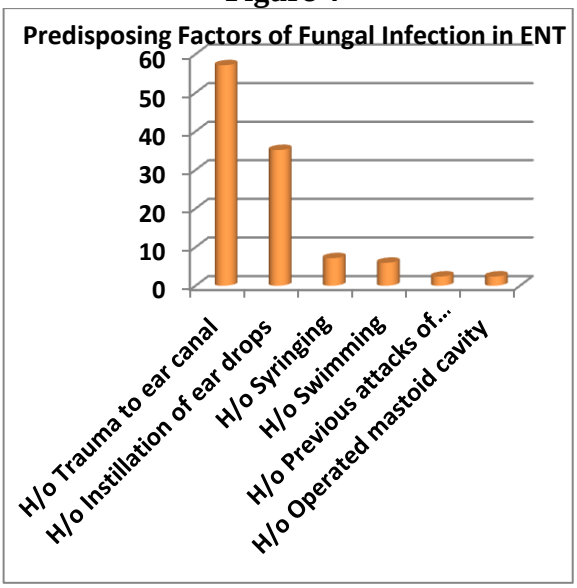


Figure 4



Pain in ear was the most common symptom observed in 56 cases (66.66%), followed by Itching in ear in 43 cases (51.19%), sensation of fullness in ear in 40 cases (47.62%), ear discharge in 20 cases (23.80%), decreased hearing in 18 cases (50%), and tinnitus in 12 cases (14.28%). Fungal debris in EAC was the most common presentation observed in 80 cases (95.23%), followed by tenderness of pinna in 58 cases (69.04%), conductive hearing loss 42 cases (50%), congested/ retracted drum in 30 cases (35.71%), and discharge from the ear in 20 cases (23.80%).

Wet news paper like fungal mass was the most common appearance seen in 50% of otomycosis cases followed by plug of wet debris (mycelial plug) in 21 cases 25%, soft debris in 16 cases 19.05% and dry thin file (dry mycelial mat) in 5 cases 5.95% of otomycosis. The local treatment was very effective with cure achieved in 78 cases (92.85%), relapse of disease in 5 cases (5.95%) and there was no response to the treatment in one case (1.20%) within initial 4 weeks of treatment period.

The most common symptom of oral and pharyngeal candidiasis was burning sensation in mouth seen in 8 cases (88.88%), difficulty in swallowing in 3 cases (33.33%) and hoarseness in 1 case (11.11%) of oral candidiasis. Clinical appearance of oral candidiasis cases were presence of multiple, creamy, white, movable plaques which when removed, leaves an erythematous patch. These plaques are Pseudomembranous or Oral thrush type. White curdy plaques like lesions were seen in all the 9 cases of fungal infections of oral cavity and pharynx. These were associated with erythematous lesions in tongue

and buccal mucosa. Associated predisposing factors for oral and pharyngeal candidiasis were immunocompromised host in 66.6%, trauma due to teeth 55.55%, and smoking in 22.22% cases. Diabetes mellitus, post radiotherapy, prolonged antibiotic use, prolonged steroid use and use of spacer for asthma was associated factor in one patient each (11.11%). Local application of Clotrimazole/ Nystatin was advised in all 9 cases. In 7 patients oral Fluconazole was given for 2 weeks.

Allegic fungal rhinosinusitis was diagnosed in 4 patients. They presented with bilateral nasal obstruction and nasal discharge. On endoscopic examination there was bilateral ethmoid polyposis. Computerized tomography scan was done in all cases. Predisposing factors for fungal infection of nose and paranasal sinus were allergy in 4 (57.14%), prolonged use of topical steroids in 1 patient. FESS followed by topical and oral antifungal treatment of 2-3 weeks was advised. Histopathological examination confirmed allergic fungal sinusitis.

Three cases of Rhinosporodiosis of nose were observed. They presented with unilateral nasal obstruction, watery, nasal discharge and bleeding per nose (off and on) in all 3 patients. The nasal lesion appeared as polypoid, red coloured, friable mass and surface was studded with minute pale, white dots. Endoscopic identification of base followed by wide surgical excision with cauterization of the base of lesion was done. Diagnosis was confirmed by histopathological examination in 3 cases of Rhinosporodiosis of nose.

IV. DISCUSSION

Fungal organisms enter the human body through the ear, oral cavity and sino-nasal cavity. Luckily, our immune system helps to prevent infection by these organisms. In those who do develop infection, a benign, non-invasive process usually occurs.[2, 3] However, in some patients, invasive disease does occur. Invasive fungal infections can lead to serious morbidity and mortality. The incidence of infection and deaths due to fungi has been grossly underestimated.[9]

Otomycosis has a worldwide distribution and is estimated that approximately 10-20% of total external otitis cases are due to otomycosis. Otomycosis is prevalent worldwide but more common in tropical and subtropical countries.[3] The higher incidence of otomycosis is young adult age group 16 to 45 years in the present study can be explained in presumption that the patients in this age group being more active, stay longer outside which exposed them to the atmosphere containing fungal spores and also makes them more prone to upper respiratory tract infections i.e. eustachian tube catarrh which forces them to scratch the ear there by making canal abrasion thus more prone to otomycosis.[3,7]

Otomycosis is more prevalent in warm humid climate. Predisposing factors for otomycosis are failure in the ear's defense mechanisms (changes in the coating epithelium, changes in pH, quantitative and qualitative changes in ear wax), bacterial infection, self-inflicted trauma, instrumentation of ear (hearing aids, foreign body, cleaner abusers), immunocompromised host (diabetes mellitus, malignancies, AIDS, renal transplant, long term administration of corticosteroids and antibiotics), low socioeconomic conditions (poor hygiene), use of oils, ear drops (antibiotic and antiseptic agents), steroid (local and systemic), swimming (wetness predispose to fungal infection), allergy to topical agents (neomycin), contact dermatitis (hair sprays) and abnormal anatomy of external auditory canal (stenosis, osteoma).[3, 7, 10] Conley[11] stated that ear canal provide all the growth requirements for fungi. Fungus flourish in warm, humid environment, and ear canal is the ideal site.[10]

In immunocompromised patients malignant otitis externa can, rarely, present as an aggressive angioinvasive fungal infection of the temporal bone.[10, 12] Invasive Aspergillus otomastoiditis resulting from a tympanogenic source is a rare entity but is being found with increased frequency in immunocompromised hosts. Invasive Aspergillosis is most commonly observed in patients with lymphoproliferative disorders, but it may occur in variety of diseases characterized by defective humoral or cell-mediated immunity.[12] Aspergillus and Mucor, have a propensity to invade arterial walls in immunocompromised patients, especially uncontrolled diabetes mellitus, leading to thrombosis and tissue infarction.[1]

The mycological picture of otomycosis depends on various factors, such as the type of species, duration and degree of fungal development and growth at the time of examination. Species of Aspergillus and Candida are the most commonly identified germs causing otomycosis. Studies found a greater prevalence of Aspergillus (*Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus flavus*) as otomycosis agents. Several studies showed *Aspergillus niger* as major agents of otomycosis.[3] Ozcan *et al*.[14] reported *Aspergillus niger* as a major etiologic agent of otomycosis in Turkey and Australia. Other species of Aspergillus that have been associated with otomycosis are *Aspergillus flavus* and *Aspergillus fumigatus*. *Aspergillus fumigatus is* major agent, followed by *Aspergillus niger*.[3, 11, 14]

Aspergillus is a saprophytic mould and is one of the primary colonizers of the man-made substrata. Its rapid growth and production of large number of small, dry, easily aerosolised conidia make it a significant contaminant with regard to air quality and potential human exposure-related illness. Aspergilli are common in air borne dust, and their heavy growth is aided by cerumen. Furthermore, the normal ear canal has a pH towards the acidic side, the common pathogenic aspergilli experience optimal growth at a pH of 5–7.[3, 10, 13]

Application of appropriate topical antifungal agents coupled with frequent mechanical debridements usually results in prompt resolution of symptoms. Topical antifungal (Clotrimazole) agents coupled with frequent mechanical debridement usually results in prompt resolution of symptoms. This statement was very effective with complete cure achieve in 92.85% on one week to three weeks duration of treatment although recurrence occurred only in 5.95% and in 1.20% no response was noted. Different authors reported 73% to 94% cure rate with similar strategy.[15, 16]

In present study wearing of denture, topical steroids, prolonged antibiotics, smoking were predisposing factors of oral cavity and pharyngeal candidiasis. Wearing of dentures produces a microenvironment conducive to the growth of Candida with low oxygen, low pH, and an anaerobic environment.[5]

Oral pain may occur with all types of oral candidiasis, but ranges from asymptomatic to marked soreness that can make eating and drinking difficult. Loss or altered sense of taste may occur. Oral pain caused by oral candidiasis can impair speech, nutritional intake, and quality of life. The presence of oral candidiasis in HIV infected persons carries a high risk for later development of AIDS.[3, 4, 5]

There are several clinical manifestations of oral candidiasis, the most common being the pseudomembranous, erythematous, angular cheilitis, hyperplastic and mucocutaneous forms. Gileva *et al.*[17] observed that pseudomembranous lesions occurred mainly on the oral mucosa, tongue, and corners of the lips, where the lesion is denominated angular cheilitis.

Topical Nystatin is recommended as first-line treatment. Nystatin suspension should be taken after food or drink and should be kept in contact with the affected areas for as long as possible. Fluconazole is

recommended as second-line treatment if oral candidiasis persists. Oral antifungal Fluconazole therapy should be used first-line in immunocompromised individuals or those at risk of widespread disease. Fluconazole 100 mg daily for 7–14 days is the usual treatment for oral thrush. Dentures should be removed before using topical antifungal therapy. Fluconazole is an effective treatment of oral candidiasis in people with HIV.[17, 18]

The warm, moist environment of the upper respiratory tract is an ideal environment for the proliferation of fungal organisms.[6,19] However, they are rarely pathogenic because host resistance is high except under favourable growth conditions in highly susceptible individuals. According to Corey JP[20] research, persistence of allergic fungal sinusitis with recurrence of sino-nasal symptoms (with or without polyposis) is common, particularly when there has been incomplete eradication of allergic fungal mucin. Even when the patient is clinically disease free, recurrence can occur, presumably from re-exposure to fungal antigens. Therefore close clinical, endoscopic, and radiographic follow-up is important. Hyper-reactivity to fungal organisms could be one of the mechanisms underlying the development of nasal polyposis according to Ricchetti study.[21]

V. CONCLUSION

It was concluded from this present study that otomycosis was most common and accounted for 84% of the total cases followed by candidiasis in oral cavity and pharynx in 9%, allergic fungal rhinosinusitis in 4% and rhinosporidiosis in 3%. Aspergillus niger was that most common fungus isolated in 61% cases, followed by Candida albicans in 24% cases, Aspergillus flavus in 9% cases, Aspergillus fumigatus and Rhinosporodium seeberi in 3% cases each. All the cases of fungal infection of oral cavity and oropharynx were due to Candida albicans.

CONFLICT OF INTEREST

None declared till now.

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