

A Clinical Study of Otomycosis

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Abstract: Otomycosis is a fungal infection of the external auditory canal; middle ear and open mastoid cavity that is frequently encountered by otolaryngologists. It presents with nonspecific symptoms of itching, earache, ear discharge, hearing loss, aural fullness, and tinnitus. Otomycosis is seen more frequently in immunocompromised patients as compared to immunocompetent persons. Recurrence rate is high in immunocompromised patients and they need longer duration of treatment and complications are more frequent in these patients. In recent years, opportunistic fungal infections are gaining greater importance as a result of possibly increasing number of immunocompromised patients.

We performed mycological analysis of fungal debris from external auditory canal of 200 patients clinically diagnosed with otomycosis. The objectives of our study were to recognize the commonest mode of presentation, predisposing factors, categorize the fungal species, sex distribution, complications, and the treatment outcome both in the immunocompetent as well as immunocompromised patients.

Methods: We conducted a prospective type of study which includes 200 cases of clinically diagnosed otomycosis, of which 60 patients were immunocompromised. After a detailed history and clinical examination, required investigations were carried out to confirm the diagnosis. All patients were treated with topical Clotrimazole and 20 of them who did not respond to it were treated with Fluconazole. The patients were followed up at the end of every week for 4 weeks for follow-up of relief of symptoms and clinical examination.

Results: In this study, otomycosis was found to be more common among males(53%) and majority in the age-group 21-30 years(42%). The disease was predominantly unilateral(89%), but bilateral involvement was seen more in the immunocompromised group. Aspergillus species(77%) was the most commonly isolated fungus in the immunocompetent group while Candida(53.4%) was commonly isolated in the immunocompromised group. All the patients were treated with Clotrimazole eardrops. Twenty of the immunocompromised patients who did not respond to it were successfully treated with Fluconazole. Six of the immunocompromised patients had TM perforation due to otomycosis.

Conclusion: Otomycosis is fungal infection of the external ear and infrequently affects the middle ear. It presents with symptoms of itching, ear discharge, blocking sensation, and earache. The major predisposing factors for otomycosis are trauma to the EAC, use of ab/ab-s eardrops, and immunocompromised status. The disease is predominantly unilateral with bilateral involvement more in the immunocompromised patients. Aspergillus species and Candida are the most commonly isolated fungi among the immunocompetent and immunocompromised patients respectively. Otomycosis is successfully treated with topical Clotrimazole and Fluconazole. Complications occur in the immunocompromised patients.

Key words: Otomycosis; debris; predisposing factors; fungus

I. Introduction

Otomycosis is fungal infection of the external auditory canal and its associated complications sometimes involving the middle ear¹. It occurs because the protective lipid/acid balance of the ear is lost². Fungi cause 10% of all cases of otitis externa². In recent years, opportunistic fungal infections have gained greater importance in human medicine, perhaps because of the increasing number of immunocompromised patients³. However, such fungi may also produce infection in immunocompetent hosts¹. In immunocompromised patients, treatment of otomycosis should be vigorous to prevent complications such as hearing loss and invasive temporal bone infection^{4,5}. Its prevalence is greatest in hot humid and dusty areas of the tropics and subtropics. Andral and Gaverret were the first to describe fungal infections of the ear; although a wide spectrum of fungi are involved, Aspergillus and Candida are the most common species encountered. In 1960's studies by Geaney and by Lakshmi pathi and Murthy revealed that all cases observed by them had been caused by either Aspergillus or Candida species^{3,6}.

Fungi are abundant in soil or sand that contains decomposing vegetable matter. This material is desiccated rapidly in tropical sun and blown in the wind as small dust particles. The airborne fungal spores are carried by water vapours, a fact that correlates the higher rates of infection with the monsoon, during which the relative humidity rises to 80%.

A fungal mass does not protrude from the EAC, even in most chronic cases. This is because the fungus does not find its nutritional requirements outside the EAC. In the present study, the Aspergillus growth rate was

found to be higher at the temperature of 37 degree C, a fact that is clinically supported by the predilection of fungi to grow in the inner one-third of the EAC.

An immunocompromised host is more susceptible to otomycosis. Patients with diabetes, lymphoma, or AIDS and patients undergoing or receiving chemotherapy or radiation therapy are at increased risk for potential complications for otomycosis³.

Pathologically, fungal infection of the EAC and TM lead to small intradermal abscess. Hemorrhagic granulations can cause thrombosis of adjacent blood vessels leading to avascular necrosis and perforation of TM⁴.

Otomycosis presents with nonspecific symptoms like pruritis, discomfort and pain in the ear, aural fullness, tinnitus, hearing impairment, and sometimes discharge and also recurrence is common^{7,8,9}. Predisposing factors for otomycosis include habitual instrumentation, dermatitis, unhygienic habits, immunocompromised individuals, pre-existing ear disease etc^{10,11,12}. Studies have revealed that there has been an increase in the prevalence of otomycosis in recent years that has been linked to the extensive use of antibiotic eardrops,^{9,10} widespread use of steroids, broadspectrum antibiotics, and chemotherapeutic agents. There is substantial variation with respect to clinical features, presentation, and treatment outcome seen among immunocompetent and immunocompromised individuals.

Otomycosis may be refractory to the treatment prescribed hence challenges the clinician to determine whether it is an isolated entity or related to any other systemic disorder or the result of an underlying immunodeficiency disorder. Accurate diagnosis of otomycosis requires a high index of suspicion. The diagnosis is clinical and accompanied by microbiological confirmation. Blotting paper appearance of matted mycelia can be seen on otoscopic examination while characteristic appearance of fruiting bodies or conidiophores can be seen on microscopy. But mere microscopic evidence can become an evidence of negativity for fungal presence and should be accompanied by culture.

Mainstay of treatment involves removal of debris, thorough toileting of the external ear and the use of antimycotic agents such as clotrimazole. Clotrimazole is a broadspectrum antifungal agent and effectively controls fungal isolates attributed to otomycosis (*Aspergillus* and *Candida*)^{14,15,16}. It is worth stressing that there are no reports on the toxicity of antifungal drugs in literature. Other components of treatment include keeping the ear dry and aiming to restore the physiology by avoiding maneuvers in the EAC¹.

In this study, we describe the commonest mode of presentation, predisposing factors, the spectrum of fungi, sex distribution, complications, and treatment outcome of otomycosis both in immunocompetent and immunocompromised individuals.

Material and Methods: A prospective study was conducted on 200 patients who were clinically diagnosed with otomycosis and presented to our Outpatient Clinic at Sri Venkateswara ENT Institute, Victoria Hospital and Bowring and Lady Curzon Hospital attached to Bangalore Medical College and Research Institute during the period from October 2010 to September 2012.

Inclusion Criteria: The study included patients of all age group and either sex with a clinical diagnosis of otomycosis.

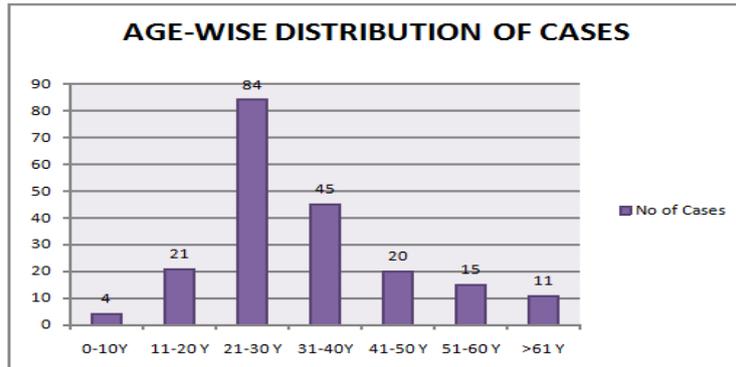
Exclusion Criteria: Only new cases of otomycosis will be included in the study. The patients who were already on treatment for otomycosis were excluded from the study.

A total of 200 cases of clinically diagnosed otomycosis presenting to the above mentioned Department were subjected to a comprehensive history and clinical and laboratory investigation as per the proforma designed for this study. The outer part of the patients' EAC was cleaned using sterile swabs, and material from the deeper portion of the EAC was taken using sterile aural swabs and sent to microbiology department for processing. One swab was subjected to microscopic examination with 10% KOH and the other swab was inoculated over Sabouraud's dextrose agar media for culture.

Treatment was with aural toileting by suction aspiration and dry mopping of the debris in the EAC, microscopic suction clearance was done where required, and the patients were put on topical antifungal ear drops for 3 weeks. Our patients' initial treatment regimen consisted of clotrimazole eardrops for 3 weeks. Those whose otomycosis did not respond to clotrimazole were switched to fluconazole ear drops. Patients were advised to keep the ear dry. The patients were reviewed at the end of 1st week, 2nd week, 3rd week, and 4th week and the progress was noted in terms of reduction of signs and symptoms and by otoscopic examination.

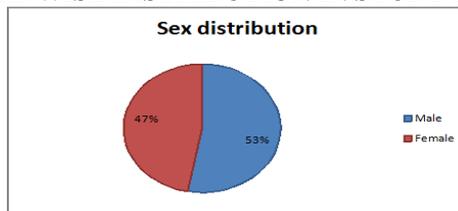
II. Results

GRAPH-1: AGE-WISE DISTRIBUTION OF STUDY POPULATION



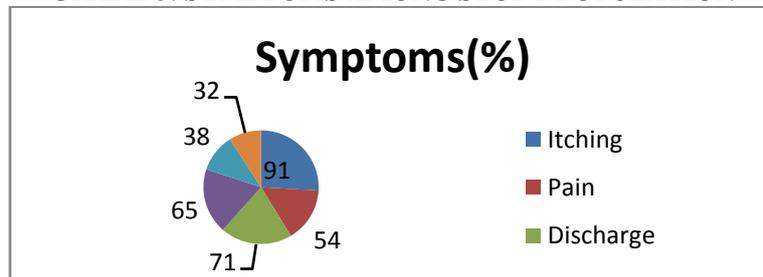
Our study included patients of age group ranging from 8-70 years. The youngest was an 8-year-old female patient and the eldest was a 70-year-old male patient. Maximum number of cases were between 21-30 years of age(42%).

GRAPH-2: SEX-WISE DISTRIBUTION IN STUDY POPULATION



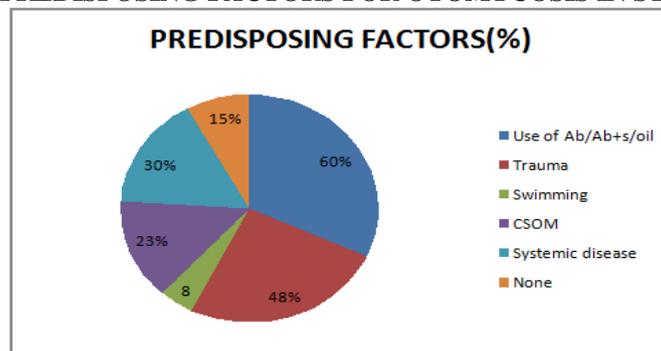
Our study showed increased incidence of otomycosis among males(53%).

GRAPH-3: SYMPTOMS AMONG STUDY POPULATION



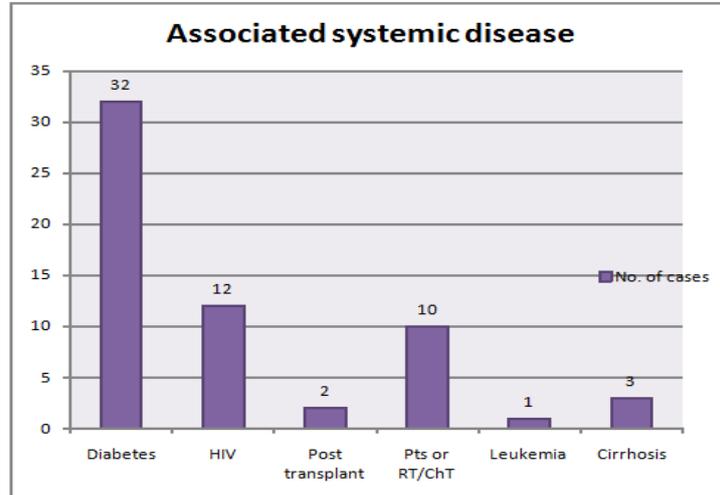
In our study the predominant complaints were itching and ear discharge, followed by earache, ear block, hearing loss and tinnitus. Twenty percent of the patients had all the symptoms. Clinical examination revealed canal skin erythema and fungus debris in all cases. Six of the immunocompromised patients had a small central perforation of the tympanic membrane behind the handle of malleus. They had not previously experienced ear pain or otitis media.

GRAPH-4: PREDISPOSING FACTORS FOR OTOMYCOSIS IN STUDY POPULATION



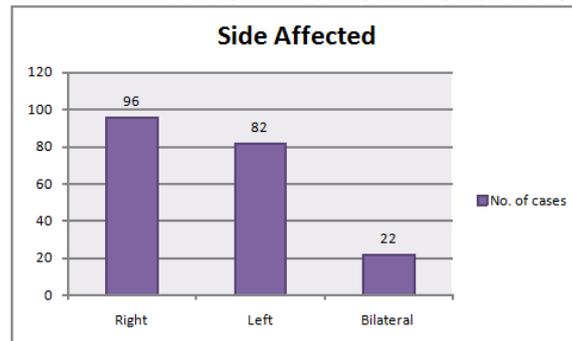
In our study 60% of the patients gave history of manipulation/trauma to the EAC with either stick, feather, metal picker, pin etc, 48% of the patients gave history of using either antibiotic ear drops, antibiotic-steroid ear drops, or use of nonsterile oil into ear. Also, 30% of our patients had associated systemic disease, 27% had associated CSOM, 8% of them had mastoid cavity and 15% had no predisposing factors.

GRAPH-5: ASSOCIATED MEDICAL HISTORY IN STUDY POPULATION



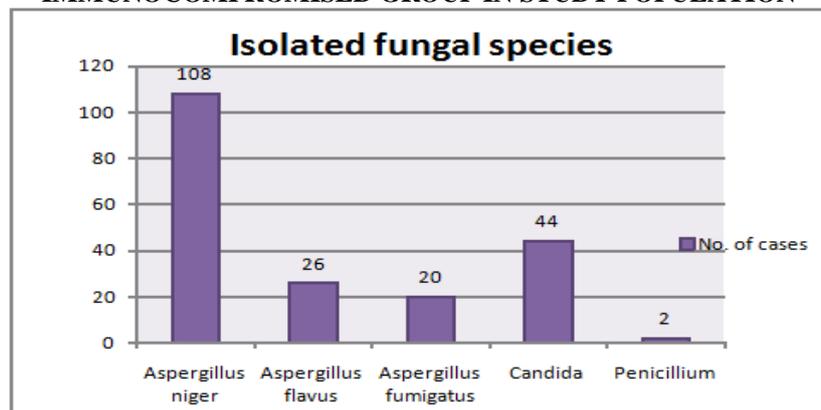
Graph-5 shows the list of associated medical conditions in our study population of which 32 of them had diabetes and 12 had HIV, 6 patients were on radiotherapy, 2 of them were postrenal transplant cases, 4 were on chemotherapy for cancer, 1 had leukemia, and 3 patients had cirrhosis.

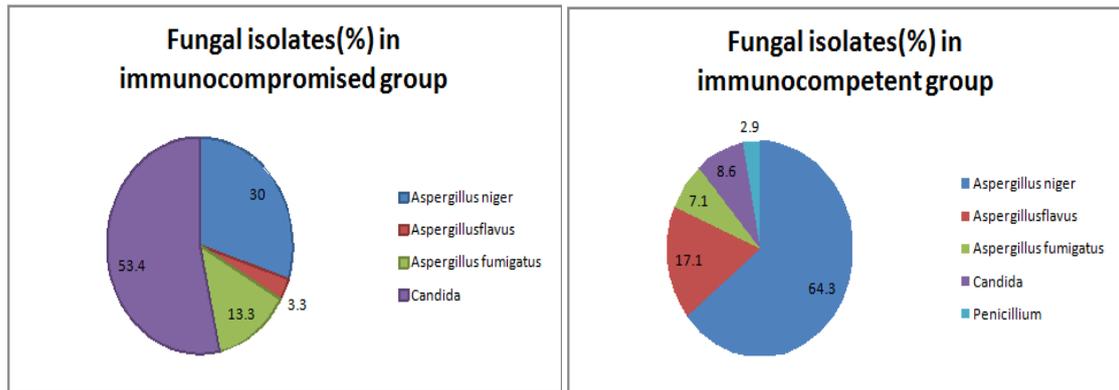
GRAPH-6: LATERALITY DISTRIBUTION IN STUDY POPULATION



In our study, the incidence of otomycosis was 89% unilateral and 11% bilateral. Among the unilateral cases, the right side(48%) showed predominance over the left side(41%). Bilateral involvement was seen more in 14(23.3%) of the immunocompromised patients compared with 8(5.7%) of the immunocompetentpatients.

GRAPH-8: VARIOUS FUNGAL ISOLATES IN THE IMMUNOCOMPETENT GROUP AND IMMUNOCOMPROMISED GROUP IN STUDY POPULATION





In our study, among the immunocompetent individuals, 64.3% were caused by *Aspergillus niger*, 17.1% by *Aspergillus flavus*, 7.1% by *Aspergillus fumigatus*, 8.6% by *Candida*, and 2.9% by *Penicillium* species. Among the immunocompromised; 53% of the cases were caused by *Candida* species, 30% by *Aspergillus niger*, 3.3% by *Aspergillus flavus*, 13.3% by *Aspergillus fumigatus*.

TABLE-9: TREATMENT OUTCOME

Topical Antifungal	No. of cases	1 st followup	2 nd followup	3 rd followup	4 th followup
Clotrimazole	180	Good response	Good response	Good response	NAD
Fluconazole	20	No response	Good response	Good response	NAD

All the patients in our immunocompetent group showed good response to treatment with clotrimazole ear drops and there were no recurrences. They were followed up at the end of every week for 4 weeks and evaluated for relief of symptoms and clinical examination. In our immunocompromised group, 20 patients did not respond to treatment with clotrimazole but they were successfully treated with fluconazole ear drops.

III. Discussion

Otomycosis is described as superficial mycotic infection of the EAC with infrequent complications involving the middle ear³. This infection can be acute or subacute, and is characterized by itching, earache, blocking sensation and discomfort. The fungal infection results in inflammation, exfoliation, accumulation of debris mass containing fungal elements, suppuration, and pain. This infection is worldwide in distribution, but it is more common in tropical and subtropical regions. Otomycosis is sporadic and caused by a wide variety of fungi, most of which are saprobes occurring in diverse types of environmental material.

An analysis of the age group revealed that otomycosis can affect any age from one year through 80 years. But the incidence was found to be low below 10 years and above 50 years. In our study the incidence was high in the age-group 21-30 years. The higher incidence in these patients may be due to the fact that these people are more exposed to the mycelia due to occupational exposure, travelling etc., where the older and younger age groups are not as exposed to these pathogens. The highest incidence in our immunocompromised patients was found in the age group 41-50 years. This may be due the fact that immunocompromised states are less common in younger age group³.

Overview of literature reveal that otomycosis is more common in males than in females. Our study correlates with the study of Than et al¹⁷ which showed 52% in males and 48% in females whereas in our study, 53% of males were affected while 47% of females were affected. Otomycosis is predominantly unilateral. Our study showed unilateral involvement in 89% which correlates with Paulose K et al⁶ study(87%). Right ear involvement(89%) was more common in our study which corresponds to the studies as described in the above table. Bilateral involvement was seen in 14 cases of the immunocompromised patients and 8 cases of immunocompetent patients. Immunocompromised individuals are more susceptible to fungal infection, bilateral involvement and recurrence is also common among them³. Common symptoms of otomycosis are itching and ear discharge followed by ear pain, blocking sensation, decreased hearing, and tinnitus^{6,7,8}. Itching and ear discharge were seen more in the immunocompetent patients than in the immunocompromised patients, while ear pain was present more in the immunocompromised patients³. A blocked sensation, decreased hearing, and tinnitus were seen more in the immunocompromised group. Overview of literature shows that among the fungus isolates, *Aspergillus niger* and *Candida* were the most common species causing otomycosis worldwide. In the present study we recorded 54% of *Aspergillus niger* species which correlates with the study of Paulose et al⁶

which showed 54.4% of *Aspergillus niger* species. Of the *Aspergillus flavus* species, our study showed 13% which correlates with the study of Yehia et al¹⁸. Among the immunocompromised patients in our study, *Candida* was seen in 53.4%. This correlates with the study by Viswanatha B et al³. The difference in isolation of fungi in the present study when compared to other studies may be due geographical variation.

Bassiouny et al¹⁸ studied the effects of anti-fungal agents and found that clotrimazole and econazole were effective antifungal agents in the treatment of otomycosis. In our study also, all the patients were treated with topical Clotrimazole drops and followed up weekly for 4 weeks and evaluated for relief of symptoms and clinical examination, and 180 showed good response to it. Twenty of the immunocompromised patients who did not respond to Clotrimazole were successfully treated with Fluconazole. Many studies have shown that clotrimazole and flucanazole are very effective drugs in the treatment of otomycosis^{13,14,15}.

Tympanic membrane perforation may occur as a complication of otomycosis that starts in an ear with an intact ear drum⁴. In the study by Kumar⁴, the incidence of tympanic perforation in otomycosis was found to be 11%. He also stated that perforations were more common with otomycosis caused by *Candida albicans*. Most of the perforations were behind the handle of malleus. The mechanism of perforation was attributed to mycotic thrombosis of the tympanic membrane blood vessels, resulting in avascular necrosis of the tympanic membrane. Six patients in our immunocompromised group experienced tympanic membrane perforation. The perforations were small and situated in the posterior quadrant of the tympanic membrane. They healed spontaneously with medical treatment. Rarely, fungi can cause invasive otitis externa, especially in immunocompromised patients. Aggressive systemic antifungal therapy is required in these patients, and a high rate of mortality is associated with this condition⁵.

IV. Conclusion

Otomycosis is fungal infection of the EAC that is frequently encountered in patients attending otolaryngology clinics. It presents with predominant symptoms of itching, ear discharge, ear ache, blocking sensation, followed by hearing impairment and tinnitus. In our study, we found the disease to be more common in males. The major predisposing factors for otomycosis are trauma to the EAC, use of ab/ab-s eardrops, unsterile oil, and immunocompromised status. The disease is predominately unilateral, but bilateral involvement is seen more in the immunocompromised group. Though the disease can be diagnosed clinically, microscopic examination and fungal culture is required for confirmation of the diagnosis. *Aspergillus niger* was the predominant fungal species isolated in immunocompetent patients while *Candida* was predominantly seen in immunocompromised patients. Clotrimazole is an effective treatment for otomycosis, and Fluconazole is a good alternative for patients in whom Clotrimazole is not effective. Rarely, tympanic membrane perforation can occur as a complication of otomycosis in immunocompromised patients.

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