A Clinicomycological Analysis of Fungi Involved in Otomycosis

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ABSTRACT

Introduction

Otomycosis is a common infective condition of the external auditory canal caused by fungal species. It has a worldwide distribution yet its prevalence is greater in the tropical and subtropical region due to the climatic conditions.

Materials and Methods

Samples were collected from 200 patients who were suspected clinically of otomycosis and were subjected to mycological analysis. The study group included patients attending the ENT outpatient department in our institution.

Results

Of the 200 clinical samples that were evaluated, otomycosis was confirmed in 57% .The commonest symptoms were otalgia and aural pruritus. Injudicious use of antibiotic eardrops was the common predisposing factor followed by use of oil in the ear. Aspergillus niger was identified as the most common fungal species involved followed by Candida albicans.

Conclusion

Otomycosis is a very common diagnosis in the ORL (Otorhinolaryngology) outpatient department and highly refractory to treatment and associated with a variety of fungal agents. This clearly demonstrates that more studies related to otomycosis are necessary to provide effective treatment strategies directed at the individual agents.

Keywords

Otomycosis; Aspergillus; Fungi; Otalgia; Pruritus

Otomycosis refers to the superficial fungal infection of the external auditory canal.[1] Though it has a global distribution, the hot, humid and dusty environment of the tropical region makes it a more prevalent disease in these regions.[2,3] Otomycosis is mainly characterised by aural pruritus, otalgia, ear block, watery ear discharge[4] and is commonly seen in individuals with low socioeconomic status maintaining poor hygiene. The other predisposing factors include use of oil in the ear, injudicious use of ear drops,[5] history of prior ear infection and the habit of ear probing. Common etiological fungal agents include Aspergillus, Mucor and Candida while Aspergillus species are the most common causative agents.[6,7] The disease poses challenge to both the patient and the ENT (Ear Nose Throat) specialist since it requires long term treatment and follow up and moreover there could be recurrences.[8] Various factors related to the microorganism and the general and local characteristics of the patient are contributory factors of recurrence. The external auditory canal contains cerumen which is composed of lipids, proteins, free aminoacids, lysozyme and immunoglobulins which account for its antimycotic and bacteriostatic properties. The normal flora of external auditory canal includes a variety of bacteria as well as fungal species like Aspergillus and Candida. These floras of commensals are not pathogenic until the balance

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between fungi and bacteria are maintained. Alterations in the humidity, temperature, pH of EAC (external auditory canal), alteration in cerumen, systemic diseases, drug intake, environmental factors, previous history of ear infection or ear surgery all contribute to the disturbance of balance between bacteria and fungi.[9] Despite the fact that our climatic condition may favour otomycosis, literature search reveals that inadequate data exists on certain aspects of otomycosis like early resolution of symptoms, fungi specific treatment protocol and about preventing recurrences. In view of the high prevalence of otomycosis in our outpatient department, the study was planned to be carried out on the clinical features, predisposing factors and identification of fungal agents involved in otomycosis.

Materials and Methods

This was an observational study conducted in patients attending Otorhinolaryngology (ORL) Outpatient Department (OPD) in our institution. The study was carried out over a period of 12 months from January 2016 to December 2016. The study began after obtaining approval from the institutional ethical committee. Patients attending the OPD with ear complaints were examined using an otoscope. Clinically, diagnosis of otomycosis was established based on the presence of otomycotic debris in the EAC. Among these clinically suspected cases of otomycosis, 200 patients of age 18 years and above of either gender were selected by simple random sampling for the study. These patients were then enquired on history of watery ear discharge, ear block, aural pruritus, otalgia and hard of hearing. History of predisposing factors like swimming in ponds/lakes, injudicious use of antibiotic ear drops, use of oil in the ear and history of probing the ear canal using buds and pins was also obtained. Inclusion criteria included patients who satisfied the criteria for establishing a clinical diagnosis of otomycosis with otoscopic examination revealing grey white or curdy white discharge suspicious of otomycotic debris. Patients with history of trauma to the ear, ear surgery in the past, prior ear infection and immunocompromised state were included in the study. The samples were collected from the ear canal of these clinically suspected otomycosis patients using a sterile cotton swab. The samples were transported with the maintenance of the sterile condition to the microbiology lab for further mycological investigation. The fungal elements were identified by microscopic examination using 10% potassium hydroxide(KOH) preparation. Each sample was then inoculated on Sabaourad's Dextrose Agar media and growth on the media was confirmed by Lactophenol Cotton Blue Preparation. Outcomes measured were the clinical features, predisposing factors and identification of fungal agents involved in otomycosis. Statistical analysis was carried out in Microsoft excel and the prevalence of symptoms, prevalence of predisposing factors and the incidence of the fungal agents were expressed in percentage. Percentage estimation with 95% confidence intervals was carried out. Sample size in our study was taken in reference to the study done by Anwar K et al.[1]

Results

Of the 200 clinically suspected cases of otomycosis who were included in the study(number of patients) n =114 (57%) were microbiologically confirmed as otomycosis. Among these n = 69 (60.52%) were males and n = 45(39.47%) were females. Of the suspected otomycosis patients, n = 86 (43%) of the patients showed no growth in culture inspite of the symptomatology and presence of debris suspicious of otomycosis. The demographic characteristics are shown in Table I and gender distribution in patients who were positive for otomycosis is shown in Table II.

Table I : Demographic characteristics

AGE OF THE PATIENT (IN YEARS)	NUMBER (N=200)	PERCENTAGE OF TOTAL POPULATION
18-30	71	35.5%
30-50	97	48.5%
50 and above	32	16.0%
Gender		
Males	102	51.0%
Females	98	49.0%

Table II: Gender distribution in patients who were positive for otomycosis

POSITIVE FOR OTOMYCOSIS	NUMBER (N = 114)	PERCENTAGE
Males	69	60.52%
Females	45	39.47%

On analysing the clinical symptoms that these patients presented with, n = 111 (55.5%) of the patients had otalgia, n = 86 (43%) of the patients presented with aural pruritis and n = 80 (40%) of the patients with ear blocking sensation. n = 64 (32%) of the patients presented with ear discharge and n = 26 (13%) of the patients had hard of hearing which is shown in Table III.

Table III - Prevalence of symptoms

SYMPTOM	PREVALENCE IN %
Otalgia	n = 111 (55.5%)
Aural pruritis	n = 86 (43%)
Ear block	n = 80 (40%)
Ear discharge	n = 64 (32%)
Hard of hearing	n = 26 (13%)
Others (tinnitus)	n = 2 (1%)

*n stands for number of patients given in numerical number

Table IV : Prevalence of predisposing factors

PREDISPOSING FACTORS	PREVALENCE IN %
Use of antibiotic ear drops	n = 69 (34.5%)
Use of oil	n = 66 (33%)
Swimming	n = 35 (17.5%)
Prior ear infection	n = 22 (11%)
Diabetes	n = 19 (9.5%)
Trauma	n = 14 (7%)
Ear surgery	n = 8 (4%)
Immunocompromised state	n = 1 (0.5%)

*n stands for number of patients

The most common predisposing factors for an otomycotic infection of the ear canal in the study was identified to be the injudicious use of antibiotic ear drops contributing to n = 69 (34.5%) followed by the use of oil in the ear which contributes to n = 66 (33%). n = 35 (17.5%) had history of swimming, n = 22 (11%) had history of prior infection and n = 19 (9.5%) were diabetics. Those with prior history of ear trauma and ear surgery accounted to n = 14 (7%) and n = 8 (4%) respectively which is shown in Table IV.

Among the fungal species that were isolated n = 73 (36.5%) was Aspergillus niger (A. niger) and n = 59 (29.5%) was Candida albicans (C. albicans) and were the most commonly identified fungal species in our study. Candida non-albicans was cultured in n = 3 (1.5%). Of these n = 20 (10%) was Aspergillus flavus(A. flavus) and n = 3 (1.5%) was Yeast. Aspergillus niger coexisted with Candida in n = 2 (1%) and with Aspergillus flavus in n = 2 (1%). Aspergillus terreus was identified in n = 1 (0.5%) of the fungal cultures which is shown in Table V.

Table V - Incidence of fungal agents

FUNGAL SPECIES	INCIDENCE (%)
Aspergillus niger	n = 73 (36.5%)
Candida albicans	n = 59 (29.5%)
Aspergillus flavus	n = 20 (10%)
Candida non albicans	n = 3 (1.5%)
Yeast	n = 3 (1.5%)
Candida and Aspergillus niger	n = 2 (1%)
Aspergillus flavus and Aspergillus niger	n = 2 (1%)
Mucor	n = 2 (1%)
Aspergillus terreus	n = 1 (0.5%)
Clodosporium	n = 1 (0.5%)

*n stands for number of patients

Discussion

Otomycosis is superficial fungal infection of the external auditory canal. Though it has worldwide distribution, it is

more prevalent in the tropical and subtropical region because of the humid and warm climate. The disease is common during the rainy season compared to summer due to the moist conditions which favours the growth of fungus.[9-11] Majority of otomycosis presents as acute otitis externa but can persist to be a chronic presentation because of its refractoriness to treatment due to the involvement of various fungal agents. The fungi causing this infection are usually saprophytes and act as secondary invaders of tissue which become susceptible due to ear canal trauma, use of antibiotic ear drops, use of oil and other traditional medications. Other fungal infections in the body, poor nutritional status and hormonal changes can precipitate the infection or can cause flare-ups.[12,13]

200 cases of clinical otomycosis were included in our study, out of which 114 had positive fungal cultures contributing to n = 114 (57%). Paulose et al., had 171 positive isolates among 193 patients. Pradhan et al., had 87 positive samples out of 107 (79.45%).[14] Pahwa et al., cultured fungi in 47 samples out of 56 cases contributing to 83.9%.[15] Whereas Ahmed et al showed results similar to our study. Their study had 39 confirmed cases of otomycosis among 97 patients contributing to 40.2%.[16]

In our study, otalgia was the commonest symptom which was observed in n = 111 (55.5%) followed by aural pruritus in n = 86 (43%), ear block in n = 80 (40%) of patients and n = 64 (32%) had ear discharge. This matches the results of other studies. A study by Gokale et al., showed similar results with otalgia being the commonest symptom and aural pruritus as the second commonest.[16,17] A study by Pankti panchal et al., also showed otalgia and aural pruritus as commonest symptoms compared to other symptoms[18].

The most common predisposing factors in our study was the frequent and injudicious use of antibiotic ear drops followed by the use of oil in the ear contributing to n = 69 (34.5%) and n = 66 (33%) respectively. A similar study by Prasad et al., reported ear oil usage n = 63 (42%) as the commonest predisposing factor followed by history of self cleaning in n = 48 (32%) and use of ear drops in n = 30 (20%).[19]

In our study, fungal culture showed Aspergillus niger (A. niger) in 73 samples contributing to n = 73 (36.5%) followed by Candida albicans (C. albicans) species in 59 persons contributing to n = 59 (29.5%). Aspergillus terreus, Mucor and Clodosporium were detected each in n = 1 (0.5%), n = 2 (1%) and n = 1 (0.5%) respectively, Candida and A.niger in n=2(1%), A. flavus and A.niger in n = 2 (1%), Yeast and C. albicans in n = 3 (1.5%) respectively.

This matches the results of other studies by Martin et al., who also showed A. niger as the commonest followed by Aspergillus flavus (A. flavus) and Candida species.[20] Joy et al., carried out a study in 185 patients. A. niger was the most common fungal species in n = 82 (44.3%).[21]

In the study by Pahwa et al., 47 out of 56 samples tested positive for otomycosis and they isolated Aspergillus niger as the commonest in n =10 samples, Aspergillus fumigatus in n = 10 samples, A. flavus in n = 3 samples and Candida species in n = 2 samples. Paulose et al., reported 171 positive among 193 samples in which A. niger and A. fumigatus were the most commonly isolated fungi.

Similar to our study, a study by Kumar A et al., also showed A. niger as the commonest fungal species and was found in n = 53 (52.43%) samples. A. Fumigatus was cultured in n = 28 (34.14%), Candida albicans in n = 9 (11%), Candida pseudotropicalis in n = 1 (1.21%) and the remaining had Mucor species (n = 1).[22]

Co-infection with bacteria has also been reported and the commonly isolated bacterial species include Staphylococcus aureus, Coagulase negative staphylococci (CONS), Pseudomonas sp., Klebsiella and E.coli species. But bacterial isolation can be missed due to the use of antibiotic ear drops prior to taking the sample for culture. Kumar et al showed bacterial co-infection in 44 patients. The bacteria isolated were Coagulase negative staphylococci (CONS), Staphylococcus aureus, Pseudomonas sp., Escherichia coli and Klebsiella species. Some have reported the growth of other organisms as cause such as Acremonium sp., Fusarium sp., Penicillium sp., C. parasilosis, C. gulliermondi.[22]

Literature search reveals that there are variations between different studies in terms of presenting symptoms, predisposing factors, species identified, rate of recurrence and the response to treatment which has been reflected in our study values as well. These can be attributed to the effects of climatic and geographical conditions, social and economic differences which in turn influences the habits and hygiene of an individual within a society.[23]

Otomycosis is usually treated by suctioning out or syringing out the debris followed by the use of antifungal ear drops. These otomycosis patients can also present with a tympanic membrane perforation which becomes noticeable only after treating the disease and clearing the debris raises a question on the reaction of the tympanomeatal epithelium to the fungi.[24] Impaction of fungal debris in the most medial regions of EAC and avascular necrosis of tympanic membrane are attributed to as the reasons for tympanic membrane perforation in some cases. Both ears can be involved in immununo-compromised patients. External auditory canal osteitis has also been seen in these patients. Prior otological surgeries especially a mastoid cavity also acts as a risk factor for recurrent otomycosis. There is no specific treatment protocol and many medications are tried to treat this difficult to treat disease. Most fungal agents are responsive to clotrimazole[25-27] and fluconazole ear drops, yet the sensitivity varies depending of the type of fungi, the canal pH and previous treatment options employed. A similar study by Saraswathy et al., where antifungal susceptibility testing was done showed Candida isolates 100% sensitive to fluconazole and 95% to nystatin. Thus identifying the fungal agent by culture and establishing the antifungal susceptibility can help in promptly treating the disease thereby minimising hospital visits for treatment trials and in preventing recurrences.[28]

Limitations of the study are that bacterial isolates were not cultured from the obtained samples and bacterial co-infection was not studied. Though fungal species were identified, antifungal susceptibility testing was not carried out.

Conclusion

Otomycosis is a frequently witnessed condition in the outpatient department, still it remains challenging due to it's refractoriness to treatment and high incidence of recurrence and this is influenced by the hygiene status of the individual, work environment, the condition of the ear canal like the presence of cerumen, pH of ear canal and canal inflammation. Predisposing factors have to be enquired and proper awareness has to be given to the patient. Proper attention has to be given to all these factors while evaluating and treating a case of otomycosis. Fungi are ubiquitous in nature and the varied species involved in otomycosis necessitate the identification of the specific fungal agent so as to target the agent with highly sensitive antifungals in order to prevent the delay in complete resolution of symptoms and recurrence.

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