Chauhan & Surender | J Pure Appl Microbiol | 15(2):813-818 | June 2021
Article 6856| https://doi.org/10.22207/JPAM.15.2.35

Print ISSN: 0973-7510; E-ISSN: 2581-690X

RESEARCH ARTICLE OPEN ACCESS

Clinico-Mycological Profile of Otomycosis in Chronic Suppurative Otitis Media Patients Attending a Tertiary Care Teaching Hospital

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Abstract

Chronic Suppurative Otitis Media (CSOM) is commonly encountered chronic inflammation of middle ear as well as the mastoid cavity due to dysfunction of Eustachian tube followed by microbial infection. Fungal infection in CSOM is now a major otolarynological problem in India not only in children but in adults too. Excessive use of steroids, antibiotics, cytotoxic chemotherapies and immunosuppressive diseases has increased the incidence of otomycosis in recent years. To define the aetiology of clinically diagnosed otomycosis. To isolate and identify fungal agents and their association with different factors (age, sex, predisposing factors). A total of 100 clinically diagnosed patients of CSOM with suspicion of otomycosis were included in the study. Patients where passing swab is difficult as with canal stenosis were excluded. Samples were taken using sterile swabs and studied for microbial profile. Male to female ratio in study was 1.6:1. The most common fungi isolated in CSOM cases was *Aspergillus fumigatus* followed by *Aspergillus niger*. Other fungus isolated were *Aspergillus flavus*, *Penicillium* species, *Mucor* species and *Candida* species. 04 samples showed mixed growth of *Aspergillus* species and *Candida* species. In our study we concluded that *Aspergillus complex* was most commonly isolated fungi in CSOM cases.

Keywords: CSOM, Otomycosis, *Aspergillus* spp

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(Received: January 14, 2021; accepted: May 14, 2021)

Citation: Chauhan S, Surender. Clinico-Mycological Profile of Otomycosis in Chronic Suppurative Otitis Media Patients Attending a Tertiary Care Teaching Hospital. *J Pure Appl Microbiol.* 2021;15(2):813-818. doi: 10.22207/JPAM.15.2.35

INTRODUCTION

Otomycosis has a worldwide distribution. Its prevalence in CSOM cases can be high as 77%[1]. However it is more prevalent in warm, humid climates as compared to arid or cold. Recent years have reported an increase in not only prevalence of otomycosis but also an increase in therapeutic failure. Excessive use of steroids, indiscriminate use of antibiotics, cytotoxic chemotherapies and immunosuppressive diseases has increased the incidence of otomycosis in recent years[2].

Otomycosis in CSOM presents with non specific symptoms that include intractable itching, irritation, discomfort, pain and discharge from ear. *Aspergillus* and *Candida* species are the most common fungal genera responsible for otomycosis. *Aspergillus* alone accounts for 75 % of cases with *Aspergillus niger* being the commonest followed by *A. flavus* and *A. fumigatus*[3].

Several predisposing factors like increased and indiscriminate use of topical antibiotics,instillation of hot oil/water in the ear,unhygienic mopping of ear,use of hearing aids,swimming in contaminated water etc are associated with Otomycosis[2].

The present study was undertaken with the aim of defining the aetiology of clinically diagnosed otomycosis, in CSOM patients, to isolate and identify fungal agents and also their association with different factors (age,sex, predisposing factors).

Table 1. Gender-wise distribution of study population

Sex	Percentage (%)
Male	61
Female	39

Table 2. Age-wise distribution of study population

Age group	Percentage(%)
0-10	0
11-20	7
21-30	45
31-40	28
41-50	9
51-60	4
61 and above	7

MATERIAL AND METHODS

The study was conducted in the Department of Microbiology and Department of ENT of Muzaffarnagar Medical College. The study was initiated after obtaining approval from Institutional ethical committee. A total of 100 clinically diagnosed patients of CSOM were included in the study. Patients where passing swab is difficult as with canal stenosis were excluded. Demographic details age, sex, occupation and history of associated risk factors was collected from each study participant.History of Immunocompromised state like diabetes, pregnancy, HIV, autoimmune disorders etc was also recorded in the case recording form.

Samples were taken using sterile swabs. Three swabs were collected and transported immediately to the laboratory. One swab was used for Gram staining, second swab for direct examination of fungal elements using 10% potassium hydroxide and third swab was processed for fungal culture.

For fungal culture two sets of Sabouraud's dextrose agar were incubated at 37 & 25°C. These were examined for any growth everyday on first week and twice a week for next three weeks. Growth was observed for rate of growth,morphology of colonies, texture and surface pigmentation. Microscopic examination using Lacto phenol cotton blue and slide culture were done to identify the fungi. Gram staining, germ tube test were performed for *Candida* species. A negative fungal culture report was given after 4 weeks.

RESULTS

Age, Sex, Occupation and Socioeconomic Status: The study population consisted of 39%

Table 3. Distribution of study population according to occupation

Occupation	Percentage(%)
Agricultural labourer	27
Housewife	17
Manual labourer	20
Retired	6
Student	13
Teacher	9
Sales Job	8

Table 4. Distribution of study population according to predisposing factors

Predisposing factors	Percentage (%)
Use of hot oil/water in ear	49
Bath in river/pond	9
Use of topical antibiotics/steroids	17
Diabetes	5
Post mastoidectomy	2
Not significant	18

Table 5. Different fungi isolated from study population

Fungus isolated	Percentage (%)
Aspergillus fumigatus	37
Aspergillus niger	20
Aspergillus flavus	12
Candida spp.	18
Mucor spp.	2
Penicillium spp.	4
Candida spp+ *Aspergillus fumigatus*	3
Candida spp+ *Aspergillus niger*	1
No growth	3

females and 61% males(Table 1). The highest incidence was in the age group of 21-30 years while none of the patient was reported in paediatric age group of 0-10 years(Table 2). Maximum number of male patients were involved in agricultural and other associated work. Most of the females were housewives (Table 3).

Side and laterality: Of study population, 39% had otomycosis of left ear, 53% of right ear and only 8% had bilateral otomycosis.

Predisposing factors: The most common predisposing factor in our study came out to be instillation of ear drops with 49% followed by use of topical antibiotics(17%). (Table 4).Other predisposing features seen were Swimming in ponds/river, diabetes and post surgery (Table 4).

Microbiology: Amongst 100 patients 3 did not show any fungal growth. *Aspergillus* species was most common fungus isolated, seen in 69% cases. *A. fumigatus* complex was the commonest (37%) followed by *A. niger* (20%) and *A. flavus* (12%). *Candida* species (18%), *Mucor* species (2%) and *Penicillium* (4%) were other fungi isolated. 3 cases showed mixed infection by *Candida* spp and *A.fumigatus* while 1 case had mixed growth of *Candida* and *A.niger* (Table 5).

DISCUSSION

Incidence of fungal infections has shown an increasing trend in recent years. Increased number of immunocompromised patients and indiscriminate use of topical antibiotics renders individuals more susceptible to Otomycosis. Such patients land up in therapeutic failure to antibiotic treatment,hence knowing the causative fungi is desirable for effective treatment in all CSOM cases.

In our study male to female patient ratio came out to be 1.6:1. The highest incidence of otomycosis in CSOM was seen in young males. This is in accordance with studies by many authors[4, 5, 6, 7]. These young males were mainly involved in agricultural work and labour work. Highest incidence in these may be attributed to the fact that they are more exposed to saprophytic fungal spores as compared to elderly. Similar findings are also recorded in studies by various other authors[8, 9, 10]. Amongst females most of them(17%) were housewives who are usually involved in household work. Housewives sweep the house/floor/garden and so may have more chances of being exposed to fungal spores.

In our study only 8% of individuals showed bilateral involvement which corresponds to studies by Ho *et al* and Aggarwal *et al* who found bilateral involvement in 7% and 7.89% cases[10,11]. Unilateral involvement was as high as 92% which correlated with studies by Aggarwal *et al* and Paulose *et al* [11,12] .

The incidence of Otomycosis was seen highest in those individual who gave history of instillation of hot oil into the ear (49%) followed by the use of topical antibiotics and steroids(17%). This is in accordance to study done by Prasad *et al*[2].

Lack of knowledge and belief in certain myths that application of hot oil(Coconut or mustard usually) will be beneficial in curing ear problems may be the reason of increased in the incidence of Otomycosis.

Another important predisposing factor in our study came out to be the use of antibiotic drops/steroids for various ear ailments without valid medical consultation. Indiscriminate use of

antibiotics disrupt the commensal flora of external auditory canal, may change the pH favouring growth of fungus.

Another important predisposing factor (9%)came out to be swimming in pond/river. Swimming keeps the external auditory canal moist also removes the protective lipid layer lining the canal causing damage to the meatal wall thus favouring fungal growth. 5% patients in our study were diabetic. No other immunocompromised state or disease was identified in any of the study subjects. Thus there is a need to control the co morbid conditions as well so as to prevent recurrences and refractoriness to treatment.

2% cases were seen post mastoidectomy. This is similar to study done by Pradhan *et al*[5]. Surgeries may favour fungal growth because of use of antibiotics and steroids,also surgeries disrupt the anatomy, cause meatal damage which may be favouring fungal growth.

Amongst 100 cases, 3 samples did not show any fungal growth. Self-medication with antifungal agents, improper sample collection and stringent growth requirements by certain fungus may prevent their growth on culture media.

Out of remaining 97, the most commonly isolated organism was *Aspergillus* species (69%) followed by *Candida* species (18%). Amongst *Aspergillus*, *A.fumigatus* was isolated in 37%, *A.niger* in 20% and *A.flavus* in 12% samples. Most of the studies worldwide[13-17] and from India[18-21] have showed similar findings of *Aspergillus* species being commonest followed by *Candida* species.

Although *Aspergillus* has been the common causative agents in most of the studies but its species differ in different studies. While in our study we report *Aspergillus fumigatus* to be the predominant species isolated, many studies report *Aspergillus niger* as most common. The distribution of fungi is affected geographically. Kaur *et al* have also reported *Aspergillus fumigatus* (41.1%) to be most common isolated fungi followed by *Aspergillus niger* (36.9%)[9].

The other species isolated in our study were *Candida* species, *Mucor* species and *Penicillium* species. In a study by Prasad *et al Aspergillus* species was isolated in 80% of cases followed by *Penicillium* species (8%), *Candida albicans* (4%), *Rhizopus* species(1%) and *Chrysosporium* species (1%)[2].

4 samples in our study showed a mixed growth of two fungi. 3 samples showed growth of *Aspergillus fumigatus* and *Candida* species and 1 sample showed mixed growth of *Aspergillus niger* and *Candida* species. 6 cases in study by Prasad *et al* showed mixed growth of 2 fungi.3 had co-existing *Aspergillus niger* and *A. fumigatus* while 3 had *Aspergillus niger* and *A.flavus*[2]. Mixed infection of *Aspergillus niger* and *Candida albicans* was also reported in a study from Nigeria[22].

Also in a study by Priti *et al* 32 samples showed mixed growth of 2 fungi. 14 had dual growth of *Aspergillus niger* and *Candida albicans*, 8 showed *Aspergillus flavus* and *Aspergillus fumigatus,* 6 *Aspergillus niger* and *Aspergillus fumigatus* and 4 *Aspergillus flavus* and *Candida* species[23]. Mixed fungal infection though rare but are difficult to treat and usually occur in immunosuppressed individuals[24]. Therapeutic failure in these mixed infections is probably due to biofilm formation[25-27].

CONCLUSION

Otomycosis in CSOM cases is increasing worldwide. This is an alarm to otologists as well as a need to promptly evaluate patients who did not respond to antibacterial treatment.

In our study young males were most (61%) commonly affected population. It is usually a unilateral disease with 53% involvement of the right ear.

The incidence was seen high in individuals who gave history of instillation of hot oil into the ear (49%) followed by the use of topical antibiotics and steroids (17%).

The most commonly isolated etiological agent in cultures was *Aspergillus* species (69%) followed by *Candida* species (18%). Amongst *Aspergillus*, *A.fumigatus* was isolated in 37%, *A.niger* in 20% and *A.flavus* in 12% samples.

Mixed infection of two fungi was also seen in 4 cases.

Thus we conclude that it is necessary to go for laboratory examination of swabs collected from CSOM cases for fungal culture especially when patient have been using topical steroids or antibiotics for long time. Laboratory examination would also help in finding out mixed infections

which may otherwise be difficult to treat. Also educating people about myths and on the counter use of antibiotics should be stopped,only then Otomycosis cases in CSOM will be reduced.

ACKNOWLEDGMENTS

None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

FUNDING

None

DATA AVAILABILITY

All datasets generated or analysed during this study are included in the manuscript and/or the Supplementary Files.

ETHICS STATEMENT

Not applicable

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