

Original Research Article

A prospective study of clinicopathological profile and outcome of otomycosis in patients presenting to a tertiary care center

Preetham A. Puthukudy*, Musarrat Feshan, Devipriya Muthu

Department of Otorhinolaryngology, Southern Railway Headquarters Hospital, Ayanavaram, Chennai, Tamil Nadu, India

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*Correspondence:

Dr. Preetham A. Puthukudy,
E-mail: preetham.ap@gmail.com

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ABSTRACT

Background: Otomycosis is reported all over the world and it accounts for 5 to 20 percent of all cases of infective otitis externa during rainy seasons. The article's main purpose was to study the predisposing factors, most common symptoms, different species of fungi involved, and the treatment outcome of otomycosis. A Chi-square test was used to analyze the association of various factors. Statistical package for the social sciences (SPSS) version 20 was used for statistical analysis.

Methods: In this prospective observational study, 100 patients with clinical evidence of otomycosis were evaluated and data regarding age, gender, risk factors, clinical appearance, fungal culture, and treatment modality received were taken. Response to treatment at the 1st follow-up (at 1 week), 2nd follow-up (at 2 weeks), and 3rd follow-up (at 3 weeks) were statistically analyzed.

Results: In our study we found the disease to be more common among the 51 to 60 years age group. Males were affected more than females. The most common occupation was housewife. The most common predisposing factor was ear picking and the symptom was otalgia followed by itching. The disease was predominantly unilateral. *Aspergillus niger* was found to be the most common organism. Clotrimazole was the effective drug for otomycosis and significant responses were seen at the end of the 3rd week of treatment.

Conclusions: *Aspergillus niger* was the most common organism causing otomycosis and responded well with clotrimazole ear drops.

Keywords: Otomycosis, *Aspergillus species*, *Candida species*, Otagia, Aural toileting, Antifungal, Ear picking, Cerumen, Diabetes mellitus

INTRODUCTION

The ear is continuously exposed to a variety of fungi, bacteria, yeasts, and other microorganisms that are present in the external environment. Otomycosis is a fungal infection that affects the external auditory canal.¹ It is more prevalent in hot and humid climates of tropical and subtropical countries.² Otomycosis is reported all over the world and it accounts for 5 to 20 percent of all cases of Infective otitis externa during rainy seasons. The predisposing factors such as swimming, self-inflicted trauma, ear picking, use of oil, bacterial infections,

antibiotic drops abuse, hearing aid or prosthesis, pre-existing ear disease, diabetes mellitus, neoplasia, immune disorder, chemotherapy, and or radiotherapy make the host more susceptible to this infection.

The patients usually present with non-specific symptoms like itching, aural fullness, tinnitus, discomfort, pain, hearing impairment, and occasionally discharge from the ear. Many fungi are present as commensals in the ear. Though a wide spectrum of fungi is involved in the infection, the most common cause of infection are the *Aspergillus species* and the *Candida species*.³ Increased

use of topical antibiotics produces a medium sterilized of other organisms, in which the fungus may flourish. The management of the infection is dependent on the knowledge of microbiology involving potential pathogens and familiarity with clinical presentation.

METHODS

A prospective observational study was done in the ENT department at the Southern Railway Headquarters Hospital, Perambur, Chennai, for a period of one and a half years (September 2020- January 2022).

Ethical committee approval was obtained. Otomycosis was considered the primary outcome of interest. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. Data was also represented using appropriate diagrams like bar diagrams, pie diagrams, and box plots. Mean and standard deviation were computed for continuous variables. The percentage was calculated for categorical variables. The Chi-square test was used and a p value was calculated. Pearson correlation analysis was done and the r-value was computed. Statistical package for the social sciences (SPSS) version 20 and EZR software were used and a p value <0.05 was considered significant.

Inclusion criteria

The patients presenting with clinical features and evidence of mycotic ear infection of both sexes with ages above 15 years were selected; presenting complaints like itching, fullness of the ear, pain, tinnitus, and hard of hearing were included; clinical evidence showing fungal hyphae or spores or curd-like discharge; potassium hydroxide mounts positive for fungal elements; and demonstration of the culture of materials on Sabouraud's dextrose agar were included.

Exclusion criteria

Patients without otoscopic evidence of otomycosis, patients of age less than 15 years of both sexes, and patients who were not willing to participate in the study were excluded.

Methodology

The patients coming to the ENT department satisfying the above-mentioned inclusion criteria were selected. Detailed clinical history was obtained from the patient regarding the predisposing factors, and symptoms like itching, discharge, pain, hard of hearing, tinnitus, and other underlying diseases. The otoscopic examination showing clinical evidence of otomycotic debris in the external auditory canal of the patients was used for the clinical diagnosis of otomycosis. Two aural swabs were taken up on sterile ear swab sticks for wet mount preparation in 10% potassium hydroxide (KOH) solution and for culture in Sabouraud's dextrose agar medium. The discharge and

debris in the external auditory canal were cleaned thoroughly. After aural toileting, patients were prescribed topical antifungal agents. Patients were informed to report after 1 week, 2 weeks, and 3 weeks for follow-up. The response to treatment was noted in terms of a decrease in symptoms and signs.

RESULTS

A total of 100 subjects were included in the final analysis.

Characteristics of patient

The majority of the cases (20%) were seen in the 51 to 60 years age group followed by 21 to 30 and 31 to 40 years age group as shown in Table 1. In our study, the majority of the patients (52%) were males and 48% were females as in Figure 1. It was observed that the majority of the patients (41%) were housewives and 26% were technicians as depicted in Figure 2. The most common risk factor was ear picking followed by oil instillation and diabetes mellitus. 88% of the patients had a history of ear picking as shown in Table 2. In our study, it was also found that 26% of the patients were hypothyroid, 21% of patients had hypertension.

Table 1: Descriptive analysis of age distribution in the study population (n=100).

Age distribution	Number	Percentage
15 to 20	4	4.00
21 to 30	19	19.00
31 to 40	19	19.00
41 to 50	13	13.00
51 to 60	20	20.00
61 to 70	18	18.00
71 to 80	7	7.00

Table 2: Descriptive analysis of risk factors in the study population.

Risk factors	Number	Percentage
Ear picking	88	88.00
Oil	43	43.00
Diabetes	37	37.00
Hypertension	21	21.00
Antibiotic abuse	11	11.00
Long-standing CSOM	8	8.00
Hypothyroid	26	26.00
Bronchial asthma	6	6.00
Swimming	1	1.00
Headphone	16	16.00
Hearing aid	2	2.00

Characteristics of infection

About 62% of cases had symptoms for less than 1-week duration. 34% of cases had symptoms for about 1 to 2

weeks. The minimum duration was 1 day and the maximum duration was 30 days as given in Table 3. As described in Table 4, it was observed that the most common complaint is otalgia (81%), followed by pruritus (79%) and aural fullness (49%). Most of the patients had left-sided (52%) ear infections as shown in Table 5. Out of 100 patients, only 28 patients had tragal tenderness, and the rest of the 72 patients had no tenderness. In our study about 89% of cases had inflammation, 26% of cases had discharge and 4% had wax. According to Figure 3, the most common appearance of fungal debris in the external auditory canal was a mycotic plug (32%) followed by a wet mycelial mat (25%). In 84% of cases, the tympanic membrane was intact and in 16% of cases, perforation was noted.

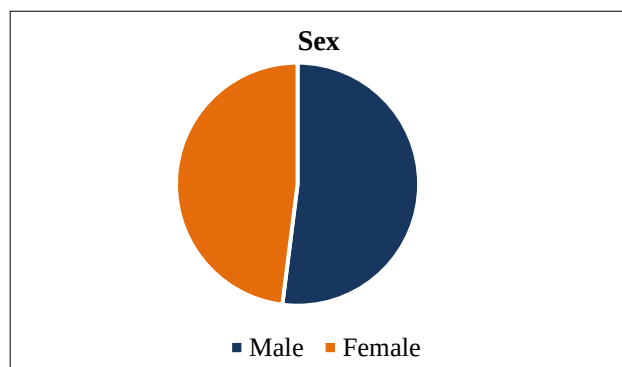


Figure 1: Pie chart of sex distribution in the study population.

Table 3: Descriptive analysis of the duration of symptoms in the study population.

Duration of symptoms	Number	Percentage
Less than 1 week	62	62.00
1 to 2 weeks	34	34.00
More than 2 weeks	4	4.00

Table 4: Descriptive analysis of presenting symptoms in the study population.

Symptoms	Number	Percentage
Otalgia	81	81.00
Pruritus	79	79.00
Aural fullness	49	49.00
Discharge	26	26.00
HOH	24	24.00
Tinnitus	23	23.00
Others	0	0.00

Table 5: Descriptive analysis of laterality of symptoms in the study population.

Ear	Number	Percentage
Right	43	43.00
Left	52	52.00
Bilateral	5	5.00

Management and follow-up

Examination under a microscope with 10% KOH for fungal elements showed positive for 82% of patients and negative for 18%. To identify the fungal organism, either the otomycotic debris or the aural swab was directly inoculated over Sabouraud's dextrose agar medium and incubated at 37°C. According to our study, the most common organism was *Aspergillus niger* (49%), followed by *Candida* species as shown in Figure 4.

All the patients were treated with antifungal ear drops after aural toileting. The decrease in signs and symptoms and the decrease in ear discharge were considered a good response. EAC with no otomycotic debris, or inflammatory changes, and free from all signs of otitis externa are considered to be cured. The treatment response is shown in Table 6. At the end of the first week, 72 patients had a good response, 7 had no response and 21 patients were cured of the infection. At the end of the second week, 46 patients had a good response and 54 patients were cured of the infection. At the end of three weeks, 92% of patients got cured.

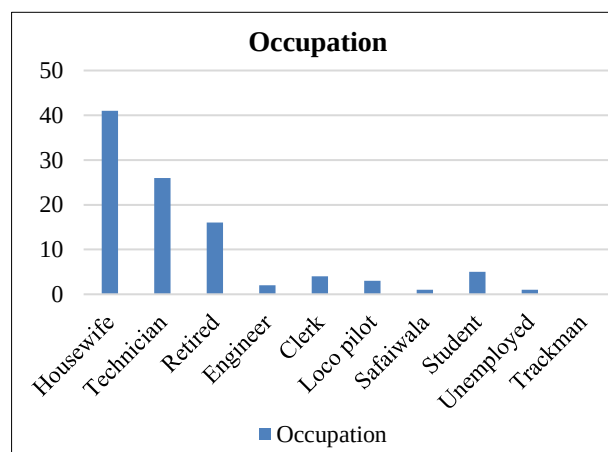


Figure 2: Bar chart of occupation of the study population.

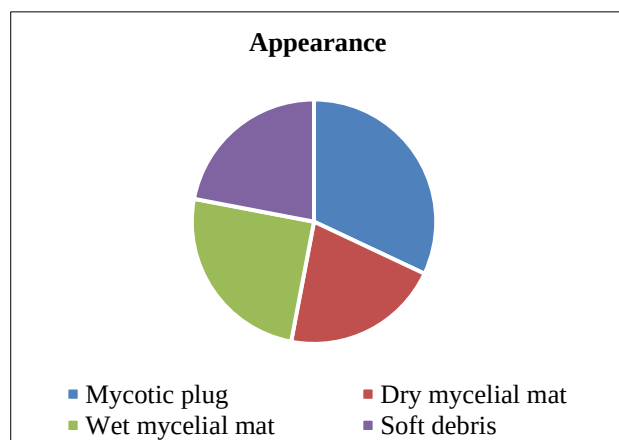
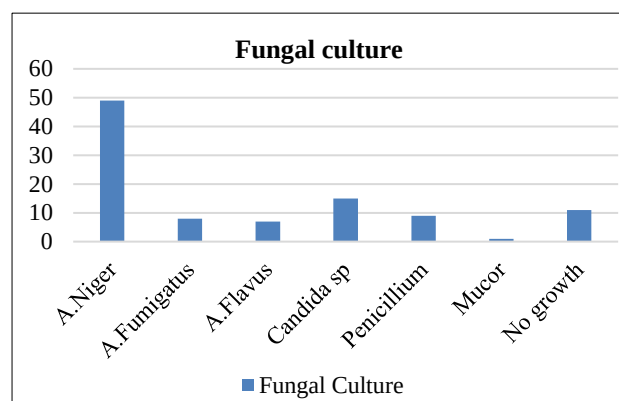


Figure 3: Pie chart of appearance of fungal debris in the study population.

Table 6: Descriptive analysis of treatment response in the study population.

Response	1 week	2 weeks	3 weeks
No response	7	0	0
Good	72	46	8
Cured	21	54	92

**Figure 4: Bar chart of fungal culture in the study population.**

DISCUSSION

The study was based on 100 patients who had clinical features and evidence of mycotic ear infection. The study has revealed that the majority of the cases (20%) were seen predominantly in the 51 to 60 years age group. It is followed by the age groups of 21 to 30 years and 31 to 40 years thereafter. The mean age of the cases is 46.92 years from the data gathered with a standard deviation of ± 16.85 . This shows that otomycosis is more common among the middle-aged. The most common age of presentation according to Murat Ozcan and colleagues was 31-60 years.⁴ In our study male patients were more prone to otomycosis than female patients, out of the 100 patients, 52% were male and 48% were female. Mugliston and O'Doughue from London, in their study, discovered little difference in the sex incidence.⁵ Meanwhile, Yehia et al had shown that otomycosis was common among females in Northern Iraq (65.44%).⁶ In another case study, Yassin revealed a higher incidence in males.⁷

In our study, the majority of the patients were housewives (41%), followed by technicians (26%). Housewives were frequently exposed to a warm, damp working atmosphere and dust containing fungal spores. The next group with the highest incidence was technicians. Their work environment includes machinery, foundries, and moving parts of machines that generate heat leading to an ideal hot, humid, and dusty condition that favors the disease. In the study by Yehia, the majority of the cases were also housewives.⁶

The majority of cases were reported between April and November which includes the summer and rainy seasons in Tamil Nadu. Fungi generally exist in abundance in the

soil or sand which contains decomposing vegetable matter, droppings of cattle, goats, and other domestic animals. These fungi are transmitted through airborne fungal spores. Hence the spread is more prevalent during the above-mentioned seasons. Excessive sweating during summer in tropical regions dilutes the ear wax and reduces its protective property. In addition to that, high humidity increases the pH of the external canal. The high alkalinity and various other factors in the canal provide favorable conditions for the growth of multiple bacteria and fungi. Our study shows an increased occurrence of otomycosis in the months when the climate is highly humid. The above observations were in agreement with the study by Muglistan et al and Sood et al.^{5,8}

According to our study, the most common risk factor was found to be ear picking followed by oil instillation and diabetes mellitus. 88% of the patients had a history of ear picking using earbuds, or hairpins to clean the external canals. History of use of oil was present in 39% of cases as a predisposing factor. Cerumen is considered the key factor contributing to the protection of the canal wall, the frequent removal of cerumen leads to recurrent otomycosis. In cases with diabetes mellitus, a high level of glucose in the tissues alter the pH and favors the growth of fungi in the external auditory canal. 37% of the patients involved in this study are diabetic. Many authors such as Pradhan et al and Liston et al attribute the recent increase in the occurrence of otomycosis to the increased use of antibiotic and steroid ear drops, systemic and local steroid usage.^{9,10} However, this was not the finding of Mugliston and O'Donoghue who noted that there was no significant increase in the incidence of otomycosis with the widespread use of a topical combination of antibiotic and steroid drops.⁵ In our study, though 26% of the patients were hypothyroid and 21% of patients had hypertension, no clinical significance was identified.

About 62% had symptoms for less than 7 days at the time of presentation and 34% of the cases reported between 7 to 14 days. The mean duration of symptoms in days is 6.15 with a $\pm$ SD of 4.97. The range varies from a minimum duration of 1 day and a maximum duration of 30 days. The patients in our study presented themselves with various symptoms. The most common complaint is otalgia (81%), followed by pruritus (79%) and aural fullness (49%). Paulose et al found that itching was the most common symptom (88%) closely followed by ear block (87.5%) with the other symptoms being discharge (30%) and tinnitus (22%).¹¹ Oliveri et al also stated that itching is the characteristic symptom of otomycosis along with pain and loss of hearing in the study.¹² The side of the ear infection was also evaluated in our case study. The majority (95%) of the study population had a unilateral infection. About 52% of the patients had a left-sided ear infection and 43% had a right-sided ear infection. The above results are correlating with the studies conducted by Paulose et al and Mugliston et al which showed unilateral predominance. In our study, out of 100 patients, only 28 patients had tragal tenderness and the rest of 72 patients had no tenderness.

All patients in the study population were subjected to the otoscopic examination of the external auditory canal. It was found that about 89% of the cases had inflammation of the ear canal and 26% of the cases had a discharge. In our study, only 4% of the cases had cerumen in the external canal. This shows that ear wax contains numerous amino acids, saturated and unsaturated fatty acids which have an inhibitory effect on fungi. After clearing the fungal debris, the tympanic membrane was examined. In 84% of the cases, the tympanic membrane was intact and in the remaining 16% of the cases, perforation was noted. This implies that otomycosis is a localized infection of the external auditory canal in the majority of cases. The fungal debris in the external auditory canal was visualized either by otoscope or oto-endoscope, the most common appearance was a mycotic plug (32%) closely followed by a wet mycelial mat (25%). These findings were similar to that of Youseff and Abdou.¹³ Sheikh et al found that the predominant mycological picture was greyish-white debris.¹⁴

Aural swabs were taken up with sterile ear swab sticks for wet mount preparation. The aural swabs or the debris were then examined under a microscope with 10% KOH. In our study, KOH mount was positive for 82% of patients and negative for 18%. To identify the fungal organism, either the otomycotic debris or the aural swab was directly inoculated over Sabouraud's dextrose agar medium and incubated at 37°C. In this study, 89 out of 100 cases showed positive fungal culture giving an isolation rate of 89%. According to our study, the most common organism was *Aspergillus niger* (49%), followed by *Candida species*. This is supported by Yehia et al who had 92.1% *Aspergillus* isolates in their study.⁶ Our study correlates with the findings of Than et al, who found *Aspergillus* as the commonest species isolated in their study.¹⁵ According to the study by Lucente, *Aspergillus niger* was the most common isolate among housewives and indoor workers as they spend more time indoors exposed to dusty environments.¹⁶ This is in favor of the statement by Horner, who revealed that indoor dust contains *Aspergillus* spores.¹⁷

In our study, the patients were followed up at weekly intervals and their response to aural toileting and treatment with 1% clotrimazole ear drops was assessed. The decrease in itching, pain, ear discharge, and other symptoms were considered as good responses. The EAC with no otomycotic debris, inflammatory changes, and signs of otitis externa were considered to be cured. All patients except 8 (8%) responded well to clotrimazole ear drops. The patients' symptoms decreased and they became asymptomatic within two to three weeks. At the end of the first week, 21 patients (21%) were cured, 72 patients (72%) had a good response and 7 (7%) had no response to treatment. At the end of the second week, 46 patients (46%) had a good response and 54 patients (54%) were cured of the infection. At the end of three weeks, 92% of patients got cured. Maher et al in their experimental evaluation of six antimycotic agents on otomycosis had

concluded that clotrimazole ear drops were effective in almost all cases which correlates with our study.¹⁸

CONCLUSION

Otomycosis is a common condition in tropical regions like India, where the weather is more suitable for the growth of fungi. In our study we found the disease to be more common among the 51 to 60 years age group. Males were affected more than females. The most common occupation in our study was housewife. The most common predisposing factor was ear picking and the symptom was otalgia followed by itching. The disease was predominantly unilateral. *Aspergillus niger* was found to be the most common organism. Clotrimazole was the effective drug for otomycosis and significant responses were seen at the end of the 3rd week of treatment.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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