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Original Research Article

A CLINICAL AND COMPARATIVE STUDY OF OTOMYCOSIS IN IMMUNOCOMPETENT AND IMMUNOCOMPROMISED INDIVIDUALS: A PROSPECTIVE COHORT STUDY

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ABSTRACT

Background: Otomycosis is a superficial fungal infection of the external auditory canal and represents a significant proportion of cases of otitis externa in tropical and subtropical regions. Immunocompromised individuals are believed to be at greater risk of developing fungal infections because of impaired host defense mechanisms. This study aimed to compare the incidence, clinical profile, mycological spectrum, and treatment outcomes of otomycosis among immunocompetent and immunocompromised patients. **Materials and Methods:** A prospective cohort study was conducted in the Department of Otorhinolaryngology, Osmania Medical College and GOVT ENT Hospital, Telangana, India, between Feb 2024 and Feb 2026. Among 2,907 patients presenting with ear complaints, age- and sex-matched cohorts comprising 150 immunocompetent and 150 immunocompromised individuals were selected. Diagnosis of otomycosis was confirmed by direct microscopy using 10% potassium hydroxide preparation and fungal culture on Sabouraud dextrose agar. Clinical characteristics, fungal isolates, and treatment outcomes were analyzed and compared. **Results:** Otomycosis was diagnosed in 101 of 300 study participants. The incidence was significantly higher among immunocompromised patients than immunocompetent patients (41.3% vs. 26.0%, p=0.007). Males were more commonly affected in both groups. The highest incidence among immunocompetent patients occurred in the 21–30-year age group, whereas among immunocompromised patients it was observed in the 51–60-year age group. Itching was the most common presenting symptom, followed by ear discharge. Aspergillus niger was the predominant isolate among immunocompetent patients (51.2%), whereas Candida species predominated among immunocompromised patients (45.1%). All immunocompetent patients responded to topical clotrimazole therapy, while 35.4% of immunocompromised patients required fluconazole after inadequate response to clotrimazole. **Conclusion:** Otomycosis occurs significantly more frequently in immunocompromised individuals. Aspergillus niger remains the dominant pathogen in immunocompetent hosts, whereas Candida species predominate among immunocompromised patients. Early diagnosis, microbiological confirmation, and appropriate antifungal therapy result in excellent clinical outcomes.

INTRODUCTION

Otomycosis is a fungal infection involving the external auditory canal and occasionally the tympanic membrane and middle ear. It is commonly encountered in otolaryngology practice, particularly in tropical and subtropical climates where heat and humidity favor fungal growth.[1] The condition accounts for approximately 10% of all cases of otitis externa and continues to be an important cause of morbidity because of its recurrent nature and prolonged treatment requirements.

The external auditory canal normally possesses several protective mechanisms, including cerumen, acidic pH, epithelial migration, and local immune defenses. Disruption of these protective barriers by

excessive moisture, trauma from instrumentation, prolonged use of topical antibiotics, or dermatological disorders facilitates fungal colonization and infection.[2] Common causative organisms include Aspergillus species and Candida species, although other fungi such as Penicillium and Alternaria have also been reported.

Several predisposing factors have been associated with otomycosis. Frequent swimming, habitual ear cleaning, use of hearing aids, prolonged antibiotic therapy, and environmental exposure to fungal spores are recognized risk factors.[3] Additionally, systemic conditions such as diabetes mellitus, human immunodeficiency virus (HIV) infection, malignancies, corticosteroid therapy, and radiotherapy contribute to impaired immune responses and increase susceptibility to fungal infections.

Immunocompromised individuals represent a particularly vulnerable population. Reduced cellular immunity allows fungal organisms to proliferate more readily, often resulting in persistent infection, bilateral disease, delayed healing, and recurrent episodes.[4] In such patients, otomycosis may be more aggressive and require prolonged therapy. Despite its clinical importance, comparative studies evaluating otomycosis in immunocompetent and immunocompromised individuals remain limited.

The clinical manifestations of otomycosis are often nonspecific and include itching, otalgia, ear discharge, aural fullness, tinnitus, and hearing impairment. Because these symptoms overlap with those of bacterial otitis externa, laboratory confirmation through direct microscopy and fungal culture is essential for accurate diagnosis and appropriate management.

The present study was undertaken to compare the incidence, clinical presentation, mycological profile, and treatment outcomes of otomycosis between immunocompetent and immunocompromised patients attending a tertiary care hospital.

MATERIALS AND METHODS

Study Design and Setting

This prospective cohort study was conducted in the Department of Otorhinolaryngology, Osmania Medical College and GOVT ENT Hospital, Telangana, India, over a 2year period from Feb 2024 to Feb 2026.

Study Population

During the study period, 8,394 patients attended the ENT outpatient department. Among them, 2,907 presented with ear-related complaints. Of these, 647 were immunocompromised and 2,260 were immunocompetent.

To ensure comparability, age- and sex-matched cohorts comprising 150 immunocompetent and 150 immunocompromised patients were selected.

Inclusion Criteria

- Patients aged 1–60 years presenting with ear complaints.
- Immunocompromised individuals with:
  - Diabetes mellitus
  - HIV infection
  - Leukemia
  - Long-term systemic steroid therapy
  - Radiotherapy exposure

Exclusion Criteria

- Age below 1 year or above 60 years.
- Chronic suppurative otitis media.
- Negative fungal microscopy and culture.
- Failure to provide consent or complete follow-up.

Diagnostic Evaluation

Detailed clinical history and otological examination were performed. Specimens were obtained from the external auditory canal using sterile swabs.

Laboratory investigations included:

1. Direct microscopy using 10% potassium hydroxide (KOH) mount.
2. Fungal culture on Sabouraud dextrose agar.

Only patients positive on both microscopy and culture were included as confirmed cases of otomycosis.

Treatment Protocol

All confirmed cases underwent aural toileting through suction clearance and dry mopping. Patients received topical clotrimazole ear drops for three weeks. Cases not responding to clotrimazole were switched to topical fluconazole therapy.

Patients were advised to maintain ear dryness and were followed for four weeks.

Statistical Analysis

Data were analyzed using SPSS version 17.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Fisher's exact test and unpaired t-test were used for comparisons. A p-value <0.05 was considered statistically significant.

Table 1: Incidence of Otomycosis in Immunocompetent and Immunocompromised Individuals

Group	Otomycosis (n)	Other Diagnoses (n)	Total	Incidence (%)
Immunocompetent	39	111	150	26.0
Immunocompromised	62	88	150	41.3
Total	101	199	300	33.7

Among the 300 participants included in the study, 101 (33.7%) were diagnosed with otomycosis. The incidence of otomycosis was significantly higher among immunocompromised individuals (41.3%) compared to immunocompetent individuals (26.0%). Statistical analysis using Fisher's exact test showed a significant association between immunocompromised status and occurrence of

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otomycosis (p=0.007), indicating increased susceptibility to fungal infection among patients with impaired immunity.

Table 2: Age Distribution

Age Group (years)	Immunocompetent (n)	Immunocompromised (n)
1–10	2	4
11–20	6	8
21–30	10	7
31–40	9	11
41–50	8	14
51–60	4	18

Among immunocompetent individuals, the highest number of otomycosis cases was observed in the 21–30-year age group (25.6%), followed by the 31–40-year age group (23.1%). In contrast, among immunocompromised individuals, the highest incidence occurred in the 51–60-year age group (29.0%), followed by the 41–50-year age group (22.6%). The findings suggest that otomycosis affects younger adults more commonly in immunocompetent populations, whereas advancing age appears to increase susceptibility among immunocompromised patients. In most age groups, the number of cases was higher among immunocompromised individuals than among immunocompetent individuals.

Table 3: Gender Distribution

Gender	Immunocompetent (n=39)	Percentage	Immunocompromised (n=62)	Percentage
Male	23	58.9%	38	61.3%
Female	16	41.1%	24	38.7%
Total	39	100%	62	100%

A male predominance was observed in both study groups. Males constituted 58.9% of otomycosis cases among immunocompetent individuals and 61.3% among immunocompromised individuals. Female patients accounted for 41.1% and 38.7% of cases respectively. These findings indicate that males are more frequently affected by otomycosis irrespective of immune status, possibly due to greater environmental exposure and occupational activities.

Table 4: Laterality

Laterality	Immunocompetent (n=39)	Percentage	Immunocompromised (n=62)	Percentage
Right Ear	20	51.2%	31	50.0%
Left Ear	15	38.4%	20	32.3%
Bilateral	4	10.2%	11	17.7%
Total	39	100%	62	100%

Unilateral disease predominated in both groups. Right ear involvement was the most common presentation, accounting for approximately half of all cases in both cohorts. Bilateral disease was more frequently observed among immunocompromised patients (17.7%) compared to immunocompetent patients (10.2%). These findings suggest a greater tendency for extensive or multifocal fungal involvement among patients with compromised immunity.

Table 5: Clinical Presentation

Symptom	Immunocompetent	Immunocompromised
Itching	15 (38.4%)	17 (27.4%)
Ear discharge	10 (25.6%)	13 (20.9%)
Pain	5 (12.8%)	14 (22.5%)
Ear fullness	5 (12.8%)	9 (14.5%)
Hearing loss	2 (5.1%)	5 (8.0%)
Tinnitus	2 (5.1%)	4 (4.8%)

Itching was the most common presenting complaint, reported by 31.7% of all patients, followed by ear discharge (22.8%) and ear pain (18.8%). Itching and ear discharge were relatively more common among immunocompetent individuals, whereas pain, ear fullness, hearing impairment, and tinnitus were observed more frequently among immunocompromised patients. These findings suggest that immunocompromised patients tend to present with more severe or advanced symptoms.

Table 6: Mycological Profile

Organism	Immunocompetent	Immunocompromised
Aspergillus niger	20 (51.2%)	15 (24.1%)
Aspergillus flavus	6 (15.3%)	7 (11.2%)

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Aspergillus fumigates	3 (7.6%)	6 (9.6%)
Candida species	5 (12.8%)	28 (45.1%)
Penicillium	3 (7.6%)	3 (4.8%)
Alternaria	2 (5.1%)	3 (4.8%)

A distinct difference in fungal spectrum was observed between the two groups. Among immunocompetent individuals, Aspergillus niger was the predominant isolate, accounting for 51.2% of cases, followed by Aspergillus flavus and Candida species. In contrast, Candida species constituted the largest proportion of isolates among immunocompromised individuals (45.1%), followed by Aspergillus niger (24.1%). This shift in fungal profile highlights the influence of host immune status on the causative organisms of otomycosis.

Table 7: Treatment Outcome of Otomycosis

Outcome Parameter	Immunocompetent (n=39)	Immunocompromised (n=62)
Responded to Clotrimazole	39 (100%)	40 (64.5%)
Required Fluconazole Therapy	0	22 (35.5%)
Mean Duration for Symptom Resolution (days)	10 ± 3.5	16 ± 4.2
Complete Clinical Cure	39 (100%)	62 (100%)
Adverse Drug Reactions	0	0
Recurrence During Follow-up	0	0
p-value	—	<0.0001

All immunocompetent patients demonstrated complete clinical response to topical clotrimazole therapy, with symptom resolution occurring within a mean duration of 10 ± 3.5 days. Among immunocompromised patients, only 64.5% responded adequately to clotrimazole, while 35.5% required a switch to topical fluconazole due to delayed or inadequate response. The average duration required for symptom resolution was significantly longer in immunocompromised patients (16 ± 4.2 days) compared to immunocompetent patients (10 ± 3.5 days), and this difference was statistically significant ($p<0.0001$). Nevertheless, all patients achieved complete clinical cure by the end of follow-up, and no adverse reactions to antifungal therapy were reported.

DISCUSSION

In the present study, otomycosis was diagnosed in 101 of 300 study participants, yielding an overall incidence of 33.7%. The incidence among immunocompetent individuals was 26.0%, whereas a significantly higher incidence of 41.3% was observed among immunocompromised patients ($p=0.007$). These findings clearly indicate that immunocompromised individuals are at increased risk of developing fungal infections of the external auditory canal.

The increased incidence among immunocompromised patients can be attributed to impaired cellular immunity, reduced local defense mechanisms, and altered host-pathogen interactions. Diabetes mellitus, HIV infection, hematological malignancies, prolonged steroid therapy, and radiotherapy suppress immune responses and facilitate fungal proliferation. Similar observations were reported by Viswanatha et al,[4] who demonstrated a significantly greater frequency of otomycosis among immunocompromised individuals. Ho et al. and Yassin et al. also emphasized that immunosuppression is an important predisposing factor for otomycosis.[5,6] The incidence observed in the present study is comparable to reports from tropical countries where fungal infections account for a substantial proportion of otitis externa cases.

Analysis of age distribution revealed distinct patterns between the two groups. Among immunocompetent individuals, the highest incidence was observed in the 21–30-year age group (25.6%), followed by the 31–40-year age group. In contrast, immunocompromised patients demonstrated peak incidence in the 51–60-year age group (29.0%), followed by the 41–50-year age group.

Conversely, the increased incidence among older immunocompromised patients is likely related to age-associated decline in immune function, the presence of multiple comorbidities, and prolonged exposure to immunosuppressive conditions. Similar findings were reported by Fasunla et al,[7] Paulose et al,[8] and Viswanatha et al,[4] who observed that otomycosis predominantly affected middle-aged adults in the general population but was more common among elderly patients with underlying immunosuppression.

Several studies including those by Paulose et al,[8] Ho et al,[5] and Yassin et al,[6] have similarly reported male predominance in otomycosis. This trend may be attributed to occupational exposure, particularly among individuals involved in farming, construction work, and other outdoor activities where contact with dust and fungal spores is common. In many rural settings, men are more frequently exposed to environmental conditions conducive to fungal contamination.

However, some investigators such as Kaur et al,[9] and Fasunla et al,[7] reported higher prevalence among females, suggesting that gender alone may not be a direct determinant of susceptibility. Instead, lifestyle, occupational exposure, and hygienic

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practices are likely more important contributors than biological sex.

Otomycosis was predominantly unilateral in both study groups. Right ear involvement was observed in approximately half of all cases, followed by left ear involvement. Bilateral disease was uncommon overall but occurred more frequently among immunocompromised individuals (17.7%) compared with immunocompetent individuals (10.2%).

The predominance of unilateral disease has been consistently reported in the literature. Paulose et al,[8] Yehia et al,[10] and Ozcan et al,[11] observed similar patterns and suggested that unilateral disease may result from localized trauma or inoculation of fungal spores into one ear canal. The slightly higher prevalence of right-sided involvement has often been attributed to right-hand dominance, leading to more frequent manipulation and trauma of the right external auditory canal.

The increased frequency of bilateral disease among immunocompromised patients is particularly noteworthy. Reduced immune surveillance may permit simultaneous colonization of both ear canals, resulting in more extensive disease. Similar findings were reported by Viswanatha et al,[5] who demonstrated a markedly higher incidence of bilateral otomycosis among immunocompromised individuals.

The clinical manifestations observed in the present study were largely consistent with the classical presentation of otomycosis. Itching was the most common symptom, reported in 31.7% of all patients, followed by ear discharge, pain, fullness in the ear, hearing impairment, and tinnitus.

The predominance of itching as the principal symptom is consistent with studies conducted by Paulose et al,[8] Yehia et al,[10] Pradhan et al,[12] and Satish et al.[13] However, some investigators such as Fasunla et al,[7] reported ear fullness as the most common presenting complaint. Variations in symptomatology may reflect differences in disease severity, causative organisms, environmental factors, and healthcare-seeking behavior.

Among immunocompetent individuals, Aspergillus niger was the predominant isolate, accounting for 51.2% of cases. Aspergillus flavus and Candida species were the next most frequently isolated organisms. These findings are in agreement with reports from Paulose et al,[8] Yehia et al,[10] and Satish et al,[13] all of whom identified Aspergillus niger as the leading causative organism of otomycosis.

The predominance of Aspergillus species can be explained by their ubiquitous presence in soil, dust, and decomposing organic matter. The acidic pH of the external auditory canal and the presence of cerumen provide an ideal environment for Aspergillus growth. Aspergillus niger is particularly well adapted to survive under these conditions and frequently forms dense fungal mats within the ear canal.

Similar findings were reported by Viswanatha et al,[4] who observed Candida predominance among immunocompromised individuals. The shift from Aspergillus dominance in immunocompetent patients to Candida predominance in immunocompromised patients highlights the important role of host immune status in determining the etiological agent of infection.

Among immunocompetent individuals, clotrimazole achieved a 100% clinical response rate, with complete symptom resolution occurring within 10 ± 3.5 days. These findings confirm the excellent efficacy of clotrimazole against common fungal pathogens causing otomycosis.

In contrast, only 64.5% of immunocompromised patients responded adequately to clotrimazole alone. The remaining 35.5% required treatment escalation with topical fluconazole. The mean duration required for symptom resolution in immunocompromised patients was significantly longer (16 ± 4.2 days) than that observed among immunocompetent patients ($p<0.0001$).

The findings are consistent with studies by Stern et al,[14] Yadav et al,[15] Bassiouny et al,[16] which established clotrimazole as a highly effective first-line treatment for otomycosis. Fluconazole proved to be a useful alternative in patients who exhibited delayed or incomplete response to clotrimazole.

Limitations

The study was conducted at a single tertiary care center, which may limit generalizability of the findings. The sample size, although adequate for comparison, was relatively modest. Long-term recurrence rates were not evaluated beyond the study follow-up period. Future multicentric studies involving larger populations and longer follow-up durations would provide more comprehensive information regarding disease recurrence and long-term outcomes.

CONCLUSION

Otomycosis is a common fungal infection of the external auditory canal and occurs significantly more frequently in immunocompromised individuals than in immunocompetent individuals. The disease predominantly affects males and is usually unilateral. Itching remains the most common presenting symptom. Aspergillus niger is the leading pathogen among immunocompetent patients, whereas Candida species predominate among immunocompromised individuals. Topical clotrimazole is highly effective, although immunocompromised patients may require prolonged treatment or alternative antifungal therapy. Early diagnosis, microbiological confirmation, and appropriate antifungal management are essential for successful outcomes.

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