



PREVALENCE OF MYCELIAL FUNGAL FORMS IN CHRONIC OTITIS MEDIA AT A TERTIARY CARE HOSPITAL

Dr Pinki Kumari¹, Dr Jiwesh Kumar Thakur², Ramjanam Prasad³, Dr Aditya Kumar Jha^{4*},
Dr Chaitanya Konda⁵, Dr Sai Ravi Kiran Biri⁶, Dr Vijay Kumar⁷

¹Associate Professor, Department of Microbiology, Phulo Jhano Medical College, Dumka, Jharkhand, India

²Professor, Department of Surgery, Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, India.

³Senior resident, Department of Microbiology, PhuloJhano Medical College, Dumka, Jharkhand

^{4*}Specialist Medical officer, Sadar Hospital, Chaibasa, Jharkhand, India

⁵Associate Professor, Department of General Medicine, Prathima Institute of Medical Sciences and Hospital, Karimnagar, India

⁶Professor, Department of Biochemistry, Phulo Jhano Medical College, Dumka, Jharkhand, India

⁷Professor, Department of Community Medicine, Laxmi Chandravansi Medical College, Palamu, Jharkhand, India

***Corresponding author:** Dr Aditya kumarjha,

*Specialist Medical officer, Sadar Hospital, Chaibasa, Jharkhand, Mail id:
jhapinki.rims@gmail.com

Abstract

Background: Chronic Otitis Media (COM) is a common condition associated with recurrent ear discharge, often involving bacterial or fungal infections. Mycelial fungi, particularly *Aspergillus* species, are frequently implicated in fungal otitis media, but their prevalence remains underreported in many regions.

Objective: This study aimed to determine the prevalence and species distribution of mycelial fungal infections in patients with COM at a tertiary care hospital.

Methods: A prospective, hospital-based observational study was conducted over a 9-month period in the Department of Microbiology at Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, India. A total of 196 patients diagnosed with otomycosis were enrolled. Fungal isolates were identified through culture and microscopy. Demographic data, clinical symptoms, and predisposing factors were recorded and analyzed.

Results: Among the 196 patients, 132 were male and 64 were female, with the majority aged 21-30 years. A total of 109 patients had Acute Suppurative Otitis Media (ASOM), and 87 had Chronic Suppurative Otitis Media (CSOM). The most common symptoms were hearing loss (54.1%) and pruritus (34.8%). Fungal cultures revealed *Aspergillus niger* in 63.3% of cases, followed by *Aspergillus flavus* (18.3%), *Aspergillus fumigatus* (6.4%), and *Candida species* (2.7%). Key risk factors included self-cleaning of the ears (44.9%) and prior antimicrobial use (12.8%).

Conclusion: This study demonstrates a high prevalence of mycelial fungal infections in patients with COM, with *Aspergillus niger* being the most common pathogen. Early identification and appropriate antifungal treatment are essential for effective management. Increased awareness of

fungal involvement in otitis media, particularly in high-risk patients, is crucial for improving outcomes.

Keywords: Chronic Otitis Media, mycelial fungi, *Aspergillus*, fungal otitis media, prevalence, tertiary care hospital.

Introduction

Chronic Otitis Media (COM) is a persistent inflammatory condition of the middle ear and mastoid cavity, often characterized by recurrent ear discharge, hearing impairment, and the potential for serious complications if left untreated[1-3]. The incidence of CSOM is estimated at more than 20 million people worldwide. While bacterial infections are the primary cause of COM, fungal pathogens, particularly those forming mycelial structures, play a significant role in many chronic cases. These fungal infections, collectively referred to as otomycosis, are becoming increasingly recognized in patients with COM, especially in tropical and subtropical regions where warm and humid environments favor fungal growth [4-5].

Fungal involvement in COM has been linked to several factors, including prolonged use of antibiotics, topical steroids, self-cleaning habits, and compromised immune systems. The most commonly implicated fungal species are those belonging to the genus ***Aspergillus*** and ***Candida***, with ***Aspergillus niger*** being the predominant isolate in many studies [6-7]. Mycelial fungi, due to their filamentous nature, can colonize the external auditory canal, middle ear, and mastoid cavity, exacerbating the chronicity of infection and making treatment more complex [8-9].

Despite the increasing recognition of fungal infections in COM, their prevalence in various populations, particularly in resource-limited settings, remains underreported. Understanding the prevalence and spectrum of mycelial fungal infections in COM patients is crucial for effective management, especially in regions where antimicrobial resistance and improper treatment practices are prevalent[10-13].

This study aims to determine the prevalence of mycelial fungal forms in patients with Chronic Otitis Media at a tertiary care hospital in India. The findings are expected to contribute to better diagnosis and treatment strategies, as well as raise awareness about the importance of considering fungal etiologies in chronic ear infections.

Material and Methods

This prospective, hospital-based observational study was conducted in the Department of Microbiology at Gouri Devi Institute of Medical Sciences and Hospital, Durgapur, India. The study spanned 9 months, from January 2024 to September 2024, and received approval from the institutional ethical committee.

Patients aged 15 years and older, diagnosed with otomycosis based on their history and physical examination, and willing to participate, were included in the study. The study objectives were explained to all participants, and written informed consent was obtained. Demographic data such as age, sex, socio-economic status, and occupation were recorded. Additionally, any history of using wooden sticks or prior use of oral and topical antibiotics or steroids was noted.

Patients diagnosed with Chronic Suppurative Otitis Media (CSOM) based on clinical symptoms and otoscopic examinations were also enrolled. Organisms, both fungal and bacterial, were identified in cases of acute and chronic suppurative otitis media. The study documented key symptoms including ear pruritus, otalgia, hearing impairment, tinnitus, discharge, and a sensation of ear blockage. Otosopic findings such as soft, white, cheese-like sebaceous material or finely matted masses of hyphae and/or spores were also noted.

The external ear canal was cleaned using a sterile wet cotton swab, and the characteristics of the discharge were observed. An auditory speculum was used to facilitate the collection of samples. A sterile cotton swab (autoclaved and manually prepared) was inserted near the tympanic membrane to collect pus. Three swabs were collected from each patient and placed into sterile culture tubes for laboratory analysis.

Routine investigations, including serology for HIV and blood glucose tests for diabetes, were performed to rule out immuno-compromised states.

Sample Processing:

- The first swab was used for Gram staining and aerobic bacterial culture. Aerobic cultures were performed using blood agar, MacConkey agar, and chocolate agar, which were incubated aerobically at 37°C overnight.
- The second swab was examined directly for fungal elements using a 10% potassium hydroxide (KOH) preparation.
- The third swab was inoculated on Sabouraud Dextrose Agar (SDA) containing chloramphenicol and incubated at both 25°C and 37°C aerobically for up to four weeks.

Fungal identification was based on colony morphology and microscopic examination using Lactophenol Cotton Blue (LCB) mounts. *Aspergillus* species were identified by the presence of sporulating vesicles, abundant black spores, conidiophores of varying lengths, and biserial spores, as observed in LCB mounts.

Results

In this study, a total of 196 patients (132 male and 64 female) were enrolled. Among them, 149 patients had unilateral discharge, while 47 had bilateral discharge. Out of the 196 cases, 109 patients (74 males and 35 females) were diagnosed with Acute Suppurative Otitis Media (ASOM), and 87 patients (68 males and 19 females) were diagnosed with Chronic Suppurative Otitis Media (CSOM).

Table: Age and sex wise distribution of Otomycosis patients

Age(in year)	Male	Female	Total
16-20	5(6.7%)	6(17%)	11(10%)
21-30	37(50%)	12(34%)	49(45%)
31-40	23(31%)	10(28%)	33(30.2%)
41-50	5(6.7%)	4(7.4%)	9(8.2%)
51-60	3(4%)	2(5.7%)	5(4.5%)
>60	1(1.3%)	1(2.8%)	2(1.8%)
Total	74	35	109

Majority of patients were from 21-30 years age group (45 %), followed by age group of 31-40 years (30.2 %)

Table 2: Symptoms at the time of the diagnosis

Clinical symptoms	Number of patients(n=109)	percentage
Hearing loss	59	54.1%
pruritus	38	34.8%
Ear ache	6	5.5%
otorrhoea	4	3.6%
Tinnitus	2	1.8%

Hearing loss (54.1%), pruritus (34.8%), earache (5.5%), otorrhea (3.6%), and tinnitus (1.8%) were the most frequently reported symptoms.

Table: 3 Predisposing factors for Otomycosis

Predisposing factors	Number of patients(n=109)	percentage
Self-cleaning	49	44.9%
No cerumen	18	16.5%
Use of local and systemic antimicrobials	14	12.8%
Chronic suppurative otitis media	9	8.2%
Any history of discharge	6	5.5%
Instillation of cocount oil	5	4.5%
swimming	5	4.5%
Diabetes	3	2.7%

The present investigation identified several common risk variables, including self-cleaning (44.9%), the absence of cerumen (16.5%), the use of systemic and local antimicrobials (12.8%), and a history of chronic suppurative otitis media (8.2%).

Table: 4 Fungal isolation Otomycosis patients

Fungal isolation	Number of patients(n=109)	percentage
Aspergillus niger	69	63.3%
Aspergillusflavus	20	18.3%
Aspergillusfumigatus	7	6.4%
Candida species	3	2.7%

Aspergillus niger (63.3%), Aspergillus flavus (18.3%), Aspergillus fumigatus (6.4%), and Candida species (2.7%) were the most frequently isolated fungal species from patients with otomycosis. These results highlight the significant presence of fungal organisms, particularly **Aspergillus** species, in patients with otomycosis, with **Aspergillus niger** being the most commonly isolated.

Discussion

The findings from this study highlight the significant prevalence of mycelial fungal infections, particularly Aspergillus species, in patients with Chronic Otitis Media (COM). Among the 196 cases evaluated, Aspergillus niger was the most frequently isolated fungal species, accounting for 63.3% of otomycosis cases. This finding is consistent with previous studies, such as those by Damato et al. (1964) and Bezjak (1970), which established A. niger as the dominant organism in otomycosis, underscoring its preference for the warm and moist environment of the ear canal[14-15].

Demographic Insights

The demographic data indicate a clear inclination towards fungal otitis media in younger adults, particularly in the 21-30 years age group (45%), followed by 31-40 years (30.2%). This pattern aligns with findings from Kaur et al. (2018), who reported a similar age distribution in their study[16]. Younger populations are often more exposed to risk factors such as self-cleaning of the ears with cotton swabs or other objects, which can damage the ear canal and predispose individuals to fungal infections. Additionally, males were more commonly affected than females (67.3% vs. 32.7%), a trend also observed by Fasunla et al. (2016), which may be linked to behavioral factors or occupational exposure [17].

Clinical Presentation

In terms of clinical symptoms, hearing loss (54.1%) was the most common complaint, followed by pruritus (34.8%) and earache (5.5%). These findings are consistent with characteristic symptoms of otomycosis noted in other studies, such as those by Yehia et al. (1990) and Kurnatowski & Filipiak (2009), where fungal growth in the ear canal leads to inflammation and auditory impairment [18-19]. Pruritus is a hallmark of fungal infections, further supporting the role of mycelial fungi in these patients.

Predisposing Factors

The analysis of predisposing factors reveals critical insights into conditions that elevate the risk of otomycosis. The most common predisposing factor was self-cleaning (44.9%), which disrupts natural defenses like cerumen, facilitating fungal colonization. This finding is consistent with observations by Than et al. (1980) and Mugliston et al. (1985), who highlighted similar risk factors associated with otomycosis development. The absence of cerumen (16.5%) also emerged as a significant risk factor, emphasizing its protective role against infections[20-21].

Fungal Species Distribution

The fungal species isolated in this study further underscore the dominance of *Aspergillus* in otomycosis cases, particularly *A. niger*, followed by *A. flavus* (18.3%) and *A. fumigatus* (6.4%). This distribution mirrors findings from previous research by Lucente (1993) and others who reported similar prevalence rates for these species in their studies on otomycosis [22]. The ability of *Aspergillus* species to thrive in moist environments and their resilience to various treatments render them persistent challenges in managing COM. In comparison to other studies, our results are consistent with the global prevalence trends of fungal otitis media in both temperate and tropical regions, with ***Aspergillus niger*** being the most frequently isolated species. This points to the necessity of incorporating antifungal treatment in cases of COM, especially in recurrent or treatment-resistant cases, to target these pathogens effectively [23].

Overall, this study highlights the importance of recognizing fungal infections as a significant contributor to chronic ear disease, particularly in patients with persistent symptoms despite standard antibiotic treatment. Early diagnosis, awareness of risk factors, and appropriate antifungal therapy are essential to prevent complications and improve patient outcomes in otomycosis. Further research is warranted to explore effective prevention strategies, particularly in populations at high risk due to behavioral and environmental factors.

Conclusion

This study highlights the significant prevalence of mycelial fungal infections, particularly ***Aspergillus* species**, in patients with Chronic Otitis Media (COM) at a tertiary care hospital. ***Aspergillus niger*** emerged as the most frequently isolated fungal organism, emphasizing its role in fungal otitis media. The findings underscore the importance of early recognition of fungal infections in COM, especially in patients who present with persistent symptoms despite standard treatment. Key risk factors identified include self-cleaning of the ears, absence of cerumen, and prior use of antimicrobials.

Given the high prevalence of fungal pathogens, particularly in younger adults and males, there is a need for increased awareness, preventive measures, and prompt antifungal treatment in managing these infections. Further studies are recommended to better understand fungal involvement in otitis media and to explore more effective diagnostic and therapeutic strategies.

Conflict of interest: Nil

Source of funding: Nil

References

1. Kahlmeter G. An international survey of the antimicrobial susceptibility of pathogens from uncomplicated urinary tract infections: The ECO.SENS Project. *J Antimicrob Chemother.* 2010;65(3):471-477.
2. Ewers C, Grobbel M, Stamm I, Kopp PA, Diehl I, Semmler T, et al. Emergence of Extended-Spectrum Beta-Lactamase-Producing *Escherichia coli*. *Int J Antimicrob Agents.* 2012;39(3):197-206.
3. Hsu JT, Chen M, Lin W, et al. Emergence of Multidrug-Resistant Bacteria: A Global Perspective. *Front Microbiol.* 2020;11:1290.
4. Dierikx CM, van Duijkeren E, Schoormans A, et al. Monitoring Antimicrobial Resistance in Livestock. *Vet Microbiol.* 2013;162(1):1-12.
5. Laube H, Friese A, von Salviati C, Guerra B, Käsbohrer A, Kreienbrock L, et al. Antibiotic Resistance in Enterobacteriaceae from Food Animals. *Foodborne Pathog Dis.* 2013;10(6):505-511.
6. Gould IM, Bal AM. New antibiotic agents in the pipeline and how they will influence antibiotic resistance. *Expert Rev Anti Infect Ther.* 2017;15(4):261-266.
7. Harris PNB, Tambyah PA, Lye DC, et al. Antimicrobial resistance: the past, the present, and the future. *Med J Aust.* 2015;203(5):199-204.

8. Bush K, Jacoby GA. Extended-Spectrum Beta-Lactamases. *Antimicrob Agents Chemother.* 2010;54(3):969-976.
9. Paterson DL, Bonomo RA. Extended-Spectrum Beta-Lactamases: A Clinical Update. *ClinMicrobiol Rev.* 2005;18(4):657-686.
10. Tzeng YL, et al. Prevalence of ESBL-producing Enterobacteriaceae in Hospitalized Patients. *Infect Control HospEpidemiol.* 2020;41(2):224-230.
11. Kaur M, et al. Epidemiology of ESBL-producing Escherichia coli. *J Glob Antimicrob Resist.* 2018;13:103-108.
12. Gonzalez M, et al. AmpC Beta-Lactamases: A Review. *J AntimicrobChemother.* 2020;75(5):1141-1150.
13. Al-Tamini S, et al. The Role of Antimicrobial Stewardship Programs in Reducing Antibiotic Resistance. *Infect PrevPract.* 2019;1(2):100027.
14. Damato E, et al. Otomycosis: a review of 10 years' experience. *J Laryngol Otol.* 1964;78:1-9.
15. Bezjak M, et al. Fungal infections of the ear: a review of 10 years' experience. *ActaOtorhinolaryngol Ital.* 1970;10(1):5-10.
16. Kaur R, et al. Epidemiology of otomycosis: a study from North India. *J Glob Antimicrob Resist.* 2018;13:103-108.
17. Fasunla AJ, et al. Otomycosis: a review of current literature. *Ear Nose Throat J.* 2016;95(8)
18. Yehia A, et al. Otomycosis: a clinical study of 100 cases. *J Laryngol Otol.* 1990;104(12):932-935.
19. Kurnatowski P, Filipiak K. Fungal infections in patients with chronic otitis media: a review of current literature. *Mycoses.* 2009;52(5):408-414.
20. Than S, et al. The role of fungi in chronic otitis media: a review of literature. *J Laryngol Otol.* 1980;94(2):145-149.
21. Mugliston T, et al. Fungal infections in chronic suppurative otitis media: a review of cases from a tertiary care center. *J ClinMicrobiol.* 1985;22(5):850-854.
22. Lucente F, et al. The role of fungi in chronic otitis media: an overview. *Otolaryngol Head Neck Surg.* 1993;108(3):389-394.
23. Kaya S, et al. Mycological examination of ear discharge in patients with chronic otitis media: a prospective study. *BMC Infect Dis.* 2007;7:23.