

STATUS OF THE OPPOSITE EAR AND THE ROLE OF OCCUPATION IN CAUSING OTOMYCOSIS

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Abstract

Objective: In the tropical and subtropical areas otomycosis is a very common fungal infection of the ear worldwide. Aim of our study is to identify the role of occupation in causing otomycosis and to see the status of opposite ear of the patients.

Materials and Methods: Here the patients who met the inclusion criteria for this cross-sectional study are included and examined after taking written informed consent. After obtaining a thorough medical history, ear swabs from affected ear and opposite ear collected for culture, sensitivity, and potassium hydroxide were provided. Patients with positive culture results were studied between September 2019 and March 2021.

Results:

- Among 103 cases observed for 18 months in the Department of ENT, Rajarajeswari Medical College, and Hospital, Bengaluru, India, we found that males (56.31%) were more affected than females (43.68%).
- The most common predisposing factor was the usage of earbuds (26.21%) followed by water in the ear (23.3%) and oil in the ear (16.50%).
- Unilateral infection was most common (96%), and the left ear was most affected (64.07%).
- 36 (34.95%) were farmers, 31 (30.097%) were homemakers, 16 (15.53%) were labourers, 12 (11.65%) were students, 8 (7.76%).
- 93 patients (90.29%) had normal opposite ear followed by 9 (8.73%) safe type CSOM opposite ear and one unsafe ear.

Conclusion:

- The most common predisposing factor of otomycosis is the usage of earbuds in the ear followed by water entry in the ear.
- Farmers are the first to get otomycosis followed by homemakers
- Status of the opposite ear is normal in most of the cases.

Keywords: Aspergillus niger, candida, ear infection, fungal species, itching, otomycosis, pain, seasonal variation.

Introduction

- Common risk factors causing otomycosis include long-term topical antibiotics, hearing aid use, frequent contact with polluted water, ear canal trauma, and immunosuppression.[1]
- Otomycosis is a fungal infection that affects the external auditory canal.[2] Otomycosis is more prevalent in hot, humid, and dusty areas of the tropics and subtropics. Aspergillus and Candida are the most pervasive species involved in otomycosis.[3] The main symptom of otomycosis is severe pruritis.[1]
- Infection of the left ear was seen in 51 cases (39.5%), while the right ear was involved in 54 cases (42%). Bilateral infection was diagnosed in 36 patients (18.5%). The most isolated source of infection was A. niger, followed by A. flavus.

- In this study effect of occupation causing otomycosis and status of the opposite ear is studied in the patients of Bengaluru, Karnataka State for the early diagnosis of the disease.

MATERIALS AND METHODS

It is a hospital-based cross-sectional study included 103 patients with symptoms of otomycosis. The study was conducted at a Medical College and Hospital in Bengaluru for 18 months, from September 2019 to March 2021. Male and female patients above 10 years of age presenting with the symptoms and signs of otomycosis, such as ear pain, itching, tinnitus, sense of blocked ear, and impaired hearing, were included in the study. Patients with acute suppurative otitis media or chronic suppurative otitis media (CSOM), patients with benign or malignant tumors in the ear, or any surgical procedures in the ear were excluded from the study. We obtained ethical clearance from the Institutional Ethical Committee. The demographic profile, risk factors, presenting complaints, and clinical findings of patients with a clinical diagnosis were evaluated and analyzed using a predesigned proforma. We received informed consent from the patients. Age, gender, address, and clinical information, including chief complaints, duration of symptoms, and causative factors of the patients, were recorded.

Sample collection and processing

Ear debris was collected under aseptic precautions in clinically diagnosed cases of otomycosis by using two thin cotton wool sterile swabs to manage the otomycotic junk from the deeper part of the canal. Swabs were sent immediately in a clean container to the microbiology department with a requisition for fungal culture. Direct microscopy used 10% potassium hydroxide (KOH) on the specimen. The KOH preparation was kept at room temperature until the material was cleared. The slide was warmed at times to speed up the clearing process. All inoculated media were incubated both at 25°C and 37°C and were observed daily for a week and twice weekly for another week, increasing the chance of recovery of fungal pathogens. Identification was made based on colony morphology and lactophenol cotton blue mount microscopy. *Aspergillus* isolates were characterized by varying lengths of conidiophores and the extent of coverage of vesicles by phialides and conidia. For characterization of *Candida* isolates, a germ tube test was done by observing the production of germ tubes on isolates in serum after 2–4 h of incubation at 37°C, and colonies were inoculated on HiChrome agar for identification of species. Patients were followed at the interval of 1 week for 4 weeks, and after aural toileting, we assessed their response to the treatment of cotrimoxazole 1% ear drops. Patients were followed up for 4 weeks for recurrent or residual otomycosis. Patients not willing to participate in the study, any other surgical procedure in the ear, and with a history of CSOM were excluded.

Statistical analysis

In this study descriptive statistics were used to summarize the data by utilizing the distribution of demographic data, given as frequency and percentages. Continuous data were expressed using the mean and standard deviation. Fisher's exact and Chi-square tests were employed in inferential statistics to determine whether the attributes were related. A *P*-value of <0.05 was deemed significant for any statistical analyses performed at a 5% significance level. Tables and diagrams were used whenever necessary to illustrate. According to the ENT OPD and Microbiology lab records, the population number (*N*) was determined by averaging the otomycosis cases over the previous 3 years. In 2016, 95 patients were seen, 105 in 2017, and 90 in 2018. *N* is equal to 96.6, or about 100. Using the Yamane equation, where $N = 100$, the sample size was determined for a known population with otomycosis.

Yamane equation: $n = N/1 + Ne^2$ (n = sample size, N = population size, and e = margin of error [for 95% confidence level margin of error = 0.05]).
 Sample size $n = 80$ approximated to 100.

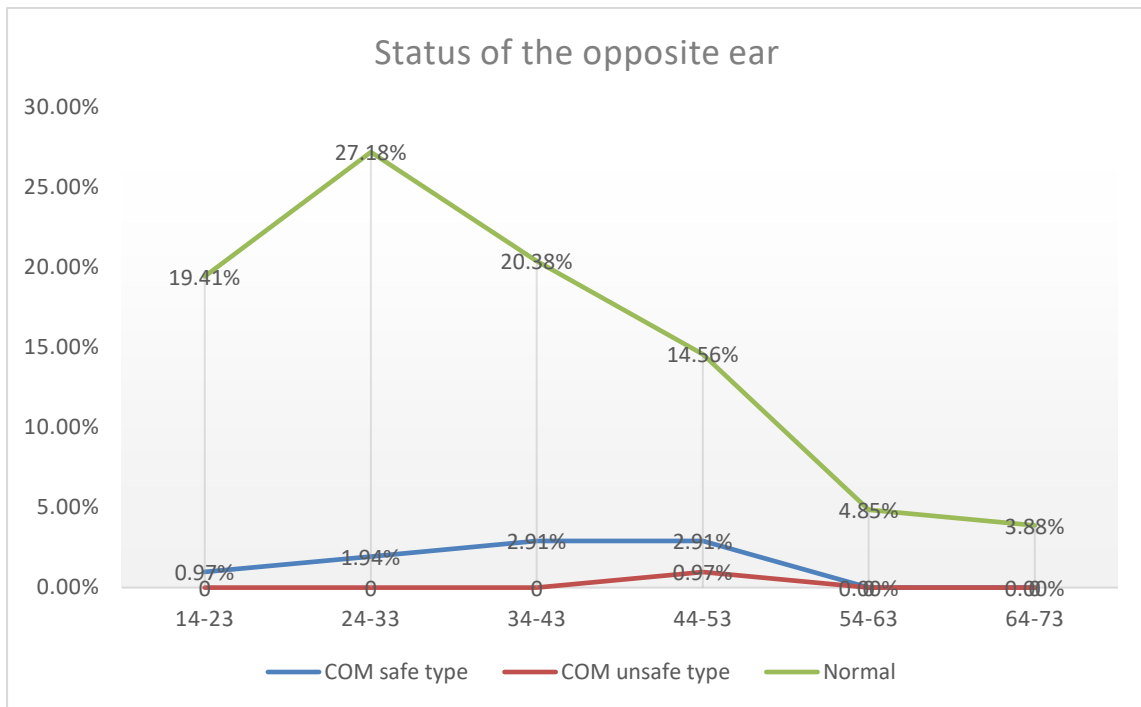
RESULTS

- Out of 103 patients included in the study, 58 (56.31%) were found to be male, and 45 (43.68%) of them were found to be female. Among 103 otomycosis patients, 21 belonged to the age group of 14–23 years, 30 belonged to 24–33 years, 24 patients to the age group of 34–43 years, and 19 patients were to the age group of 44–53 years. Only nine patients belong to the age group of 54 years and above.
- The symptom that first occurred in the patients was itching (70, 67.96%) followed by pain (21, 20.38%), sense of blocked ears (5, 4.85%), ear discharge, tinnitus, and hearing impairment seen in two patients each (1.94%, 1.94%, and 1.94%, respectively), only one patient had no complaints (0.97%).
- The important causative factor for otomycosis in many patients was reported as the use of earbuds (27, 26.21%) followed by water in the ear (24, 23.30%), other factors (18, 17.47%), oil in the ear (17, 16.50%), ear drops (14, 13.59%) and in three (2.91%) patients, there was no any predisposing factors reported.

STATUS OF THE OPPOSITE EAR ACCORDING TO AGE DISTRIBUTION

Age group(Year)	COM safe type	COM unsafe type	Normal	Total
14-23	1(0.97%)	0	20(19.41%)	21
24-33	2(1.94%)	0	28(27.18%)	30
34-43	3(2.91%)	0	21(20.38%)	24
44-53	3(2.91%)	1(0.97%)	15(14.56%)	19
54-63	0	0	5(4.85%)	5
64-73	0	0	4(3.88%)	4
Total	9(8.73%)	1(0.97%)	93(90.29%)	103

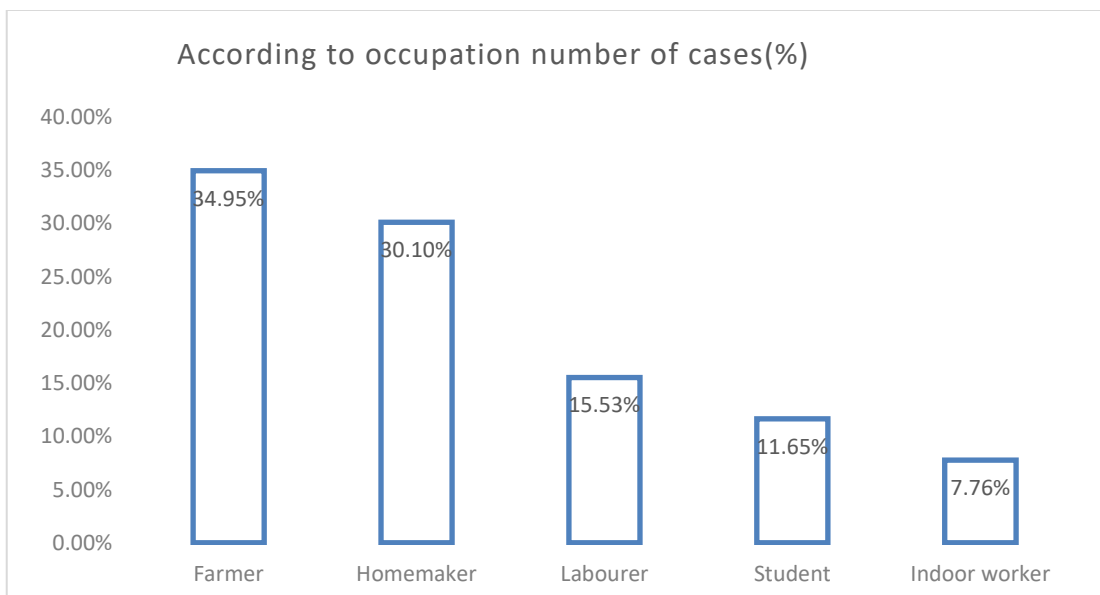
- In our study we found that 93 patients (90.29%) had normal opposite ear followed by 9(8.73%) safe type CSOM opposite ear and one unsafe ear.



Number of cases according to occupation

Out of 103 patients 36 (34.95%) were farmers, 31 (30.097%) were homemakers, 16 (15.53%) were labourers, 12 (11.65%) were students, 8 (7.76%) were indoor workers.

Occupation	Number of cases (%)
Farmer	36(34.95%)
Homemaker	31(30.097)
Labourer	16(15.53%)
Student	12(11.65%)
Indoor worker	8(7.76%)
Total	103(100%)



DISCUSSION

The first to describe ear fungus infections were Kaur *et al.* and Wadhvani *et al.*[4,5] A superficial mycotic infection of the outer ear canal is called otomycosis. Inflammation, pruritus, scaling, and extreme discomfort are the characteristics of the disease, which can be either subacute or acute. Mycosis results in irritation, suppuration, masses of debris containing hyphae, superficial epithelial exfoliation, and inflammation.[21]

Otomycosis is usually neglected or unnoticed until there is severe pain and itching in the ear.[5]In this study we observed that males were more commonly affected with otomycosis than females. Out of 103patients,58 (56.31%) males and 45 (43.68%) females

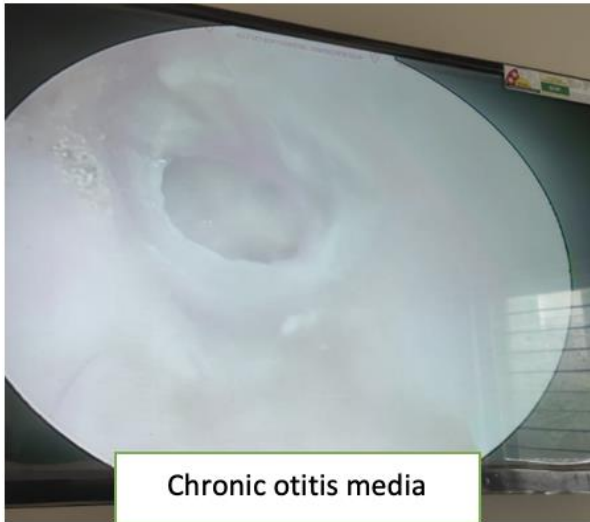
T Mugliston and G.O'Doughue (1989) from London showed in their study that there is little difference in the incidence of genders. [8] Paulose, Al Khalifa Shenoy, Sharma (1989)[9] and Baveja Dhingra PL, Natarajan R (1993)36, 64% showed that the incidence was found more in males. A study conducted by **H.S Satish et al**(2013) showed that otomycosis was more common among males (53%) than females[9] **Sampath Chandra Prasad** (2014) showed that 63 (63%) of the patients with otomycosis (study group) were males and 37 (37%) were females[22]. **AbdolhassanKazemi**(2015) showed that 59% were male and 41% were female[10].In our study 34.95% were farmers followed by30.097% homemakers. Because of males working in cold, hot, and humid environment in the fields, which leads to exposure of dust and fungal spores in the ear causing otomycosis. Because of sweeping and cleaning floor of the houses and working places homemakers are exposed to fungal spores present in the dust which acts as predisposing factor causing otomycosis, Yehia et al (1990)[11].11.65% were students, because of involvement in sports they are exposed to the similar environment causing otomycosis. 15.53% were labourers like in factories andbuilding sites, 7.76% were indoor workers like office workers, handloom workers.

Priti Agarwal et al (2017) Occupation of majority of the males in the study population was farming (58%) and construction work (30%). Most (62%) of the females were housewives[12]. **Suharshi Gupta at al**(2015) In this study 37.1% of cases were housewives hailing from town and villages. They constituted a major group because of the cold damp working atmosphere of village kaccha houses acting as a contributory factor. This group frequently cleans and sweeps the floor of the houses[13]. **KeyvanKiakojuri et al** (2019) majority of the individuals with otomycosis were (43.5%) housewives followed by those with freelancing jobs and students (23%, 15.5%)[14]

Status of the opposite ear:

- This study showed that, the status of the opposite ear was normal in 93(90.29%) patients followed by 9(8.73%) safe CSOM and 1 (0.97%) CSOM unsafe type.
- In our study, out of 103 patients positive for fungal growth, Aspergillus was the most common isolate (85[82.52%]), followed by Candida (17 [16.50%]),and Penicillium (1 [0.97%]). Out of 85Aspergillus isolates, 62 (60.19%) were *A. niger*, 14 (13.59%), *A. flavus*, and 9 (8.73%) *A. fumigatus*. Out of 17 Candida species, 9 (8.73%) [Figure 1b] were *C. albicans*, and 8 (7.76%) were *C. non-albicans*. Only one Penicillium species was seen. In a study by Suraneni *et al.*,[15] *A. niger* was the most typical organism isolated (52%), followed by *A. flavus* (12%) and *A. fumigatus* (06%). Candida species was the next most common organism following *A. niger* was isolated in only 16% of cases. Penicillium species were separated in two patients (4%), similar to the current study.[10] Mistry *et*

al., [16] also in their study, showed that *A. niger* 40 (52.63%) was the predominant species isolated. *A. flavus* 28 (36.84%) was the second most common species isolated, followed by *Candida* species (5 [6.57%]), *Penicillium* species (2 [2.63%]), and *Rhizopus* species (1[1.33%]). [16]



Chronic otitis media



Chronic otitis media



Otomycosis(Candida)

Oto-endoscopic examination of opposite ear



Unsafe COM

13) Role of cerumen in preventing otomycosis:

- There was no cerumen in the external auditory canal in any of the patients in this study. This is in accordance with the study conducted by KO Paulose and Al Khalifa, P. Shenoy, RK Sharma[17](1989)and Youseff and Abdula MH [24]. Ear wax has inhibitory action on fungi because of its contents like numerous amino acids, saturated and unsaturated fatty acids (Santuria 1957)[5]. But still its controversial that the wax may support growth of aspergillus species despite containing the contents mentioned above (Akobjanoff 1954)[18].

14)Response to clotrimazole:

In this study we followed our patients at the interval of 1 week for 4 weeks and after aural toileting the response of them to the treatment of clo-trimazole 1% ear drops was assessed.

In our study 93% of the patients had very good response to clo-trimazole 1% with reduction of signs and symptoms. This is in accordance with study by Paulose ko, Al Khalifa, P. Shenoy, R K Sharma[19].

Here we followed up our patients for a period of 4 weeks for recurrent or residual otomycosis. Our many patients became asymptomatic within 2-3 weeks.

In our study seven patients who had uncontrolled diabetes (6.79%) developed recurrent or residual otomycosis even after antifungal ear drops or ointment followed by aural toileting. This study correlates with an experimental evaluation conducted by Adoga and Iduh,[20] which concluded that clotrimazole 1% was very effective in almost all cases of otomycosis.

CONCLUSION

- In our study we found that 90.29% had normal opposite ear followed by 8.73% safe type CSOM opposite ear and one unsafe ear so status of the opposite ear is normal in majority of the patients.
- 34.95% were farmers, 30.097% were homemakers, 15.53% were labourers, 11.65% were students, 7.76% were indoor workers.
- Most fungal isolates (60.12%) were *A. niger* and Males are more likely to be affected than Females, unilateral left-sided otomycosis is a highly prevalent in occurrence.
- Clotrimazole 1% ear drops provided an excellent results in 93% of the patients.

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