

Otomycosis: According to the Seasons Fungal Species Distribution in a Tertiary Care Hospital

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Conflict of interest: Nil

Abstract:**Aims:**

1. To study seasonal variation of otomycosis cases
2. To study fungal species distribution of otomycosis

Methodology: This is a tertiary Hospital based study which is carried out in the patients attending outpatient Department of ENT, Rajarajeswari Medical college and Hospital, Bengaluru. This study is conducted during the period between September 2019 and March 2021. 103 patients of otomycosis are considered in this study. Clinical diagnosis of otomycosis is done and then two ear swabs are taken and sent to the microbiology lab. Swabs were first subjected to 10% KOH slide preparation and then cultured over sabourauds dextrose agar (SDA) media for 48 to 72 hours at 37°C and 250°C.

Sampling Method: Purposive sampling.

Results:

- Otomycosis is more common during post monsoon (Oct-Dec) 60(58.25%), followed by Winter 32(31.06%) and South-west monsoon 11(10.67%)
- *Aspergillus niger* 62(60.18%) is the most common fungus isolated followed by *Aspergillus flavus* 14(13.58%) in our study.

Conclusion: This study showed that otomycosis is more common during post monsoon period and *Aspergillus niger* is the most common fungal species isolated.

Keywords: Otomycosis; seasons; aspergillus; fungus.

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Introduction

Otomycosis is a fungal infection affecting external auditory canal. [1] Otomycosis is most common in hot, humid, and dusty areas of the tropics and subtropics. *Aspergillus* and *Candida* are the most common species involved in otomycosis. [2] The main symptom of otomycosis is severe itching in the ear. [3] Common risk factors are long-term topical antibiotics ear drops, hearing aid use, frequent polluted water entry in ear, ear canal trauma, and immunosuppression. [3] In this study seasonal variation and fungal species distribution of otomycosis is studied in patients of Bengaluru, Karnataka state is studied.

Materials and Methods

This hospital-based cross-sectional study done on 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 of otomycosis like itching, pain, ringing

sensation, blocked ear, and hard of hearing, are included in the study. Patients with otitis media, 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

Otomycosis plug was collected under aseptic precautions in clinically diagnosed cases of otomycosis. Two thin cotton wool sterile swabs used and otomycotic plug from the deeper part of the canal is collected. Swabs were sent to the microbiology lab with a requisition for fungal

culture. Direct microscopy used 10% potassium hydroxide (KOH) on the specimen.

Identification of fungus was made based on colony morphology and lactophenol cotton blue mount microscopy. 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

Here descriptive statistics are used to summarize the data by utilizing the distribution of demographic data, given as frequency and percentages. Continuous data are 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. 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,

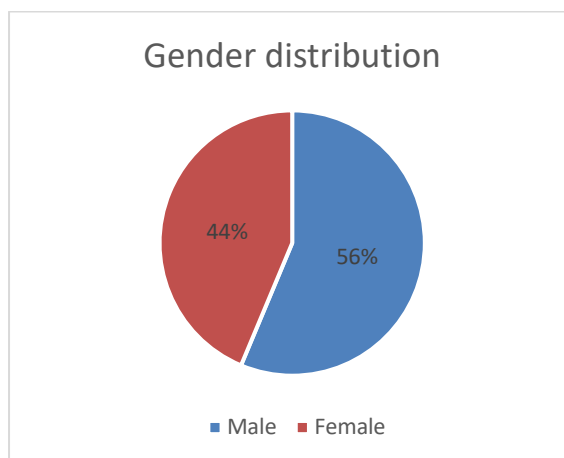
N = population size, and *e* = margin of error [for 95% confidence level margin of error = 0.05]).

Sample size *n* = 80 approximated to 100.

Results

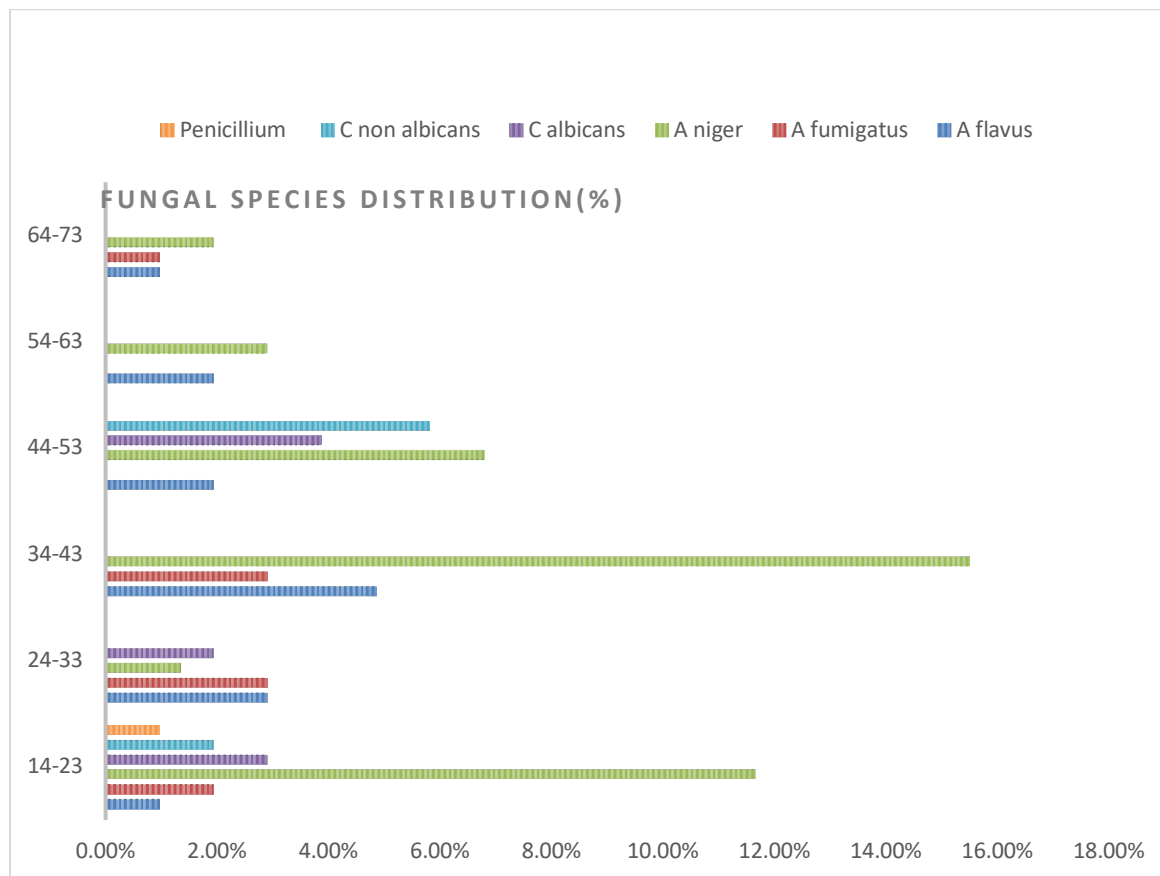
- This study is done on 103 patients, in that 58 (56.31%) are male, and 45 (43.68%) of them are female. Among 103 patients, 21 belonged to the age group of 14–23 years, 30 belonged to 24–33 years, 24 patients to the age group of 34–43 years, and 19 patients were to the age group of 44–53 years. Only 9 patients belong to the age group of 54 years and above, as shown in Table 1.
- A total of 103 otomycosis samples were processed for fungal culture. It was noticed that 62 were *Aspergillus niger* (60.19%), as shown in Figure 1a, 14 were *Aspergillus flavus* (13.59%), nine were *Aspergillus fumigatus* (8.73), nine were *Candida albicans* (8.73%), eight were *Candida non-albicans* (7.76%), and one was *Penicillium* species (0.97%), as shown in Table 4 and Figure 1a and b.
- This study found that otomycosis was very common in postmonsoon (October–December), 58.25% in that *A. niger* was the most common fungal isolate (37.86%) [Table 6].
- Microbiological culture of clinical specimen gave different organisms and varied in other age groups. It also showed that age has a significant association with other microorganisms yielded (*P* = 0.01) [Table 5].

Gender	Number	Percentage (%)
Male	58	56.31%
Female	45	43.68 %
	103	100 %



Age group in years	Aspergillus flavus	Aspergillus fumigatus	Aspergillus niger	Candida albicans	Candida non-albicans	Penicillium species	Total
14-23	1(0.97%)	2(1.94%)	12(11.65%)	3(2.9%)	2(1.94%)	1(0.97%)	21(20.38%)
24-33	3(2.9%)	3(2.9%)	22(21.35%)	2(1.94%)	0	0	30(29.12%)
34-43	5(4.85%)	3(2.9%)	16(15.5%)	0	0	0	24(23.3%)
44-53	2(1.94%)	0	7(6.79%)	4(3.88%)	6(5.82%)	0	19(18.44%)
54-63	2(1.94%)	0	3(2.9%)	0	0	0	5(4.85%)
64-73	1(0.97%)	1(0.97%)	2(1.94%)	0	0	0	4(3.88%)
Total	14(13.59%)	9(8.73%)	62(60.19%)	9(8.73%)	8(7.7%)	1(0.97%)	103(100%)

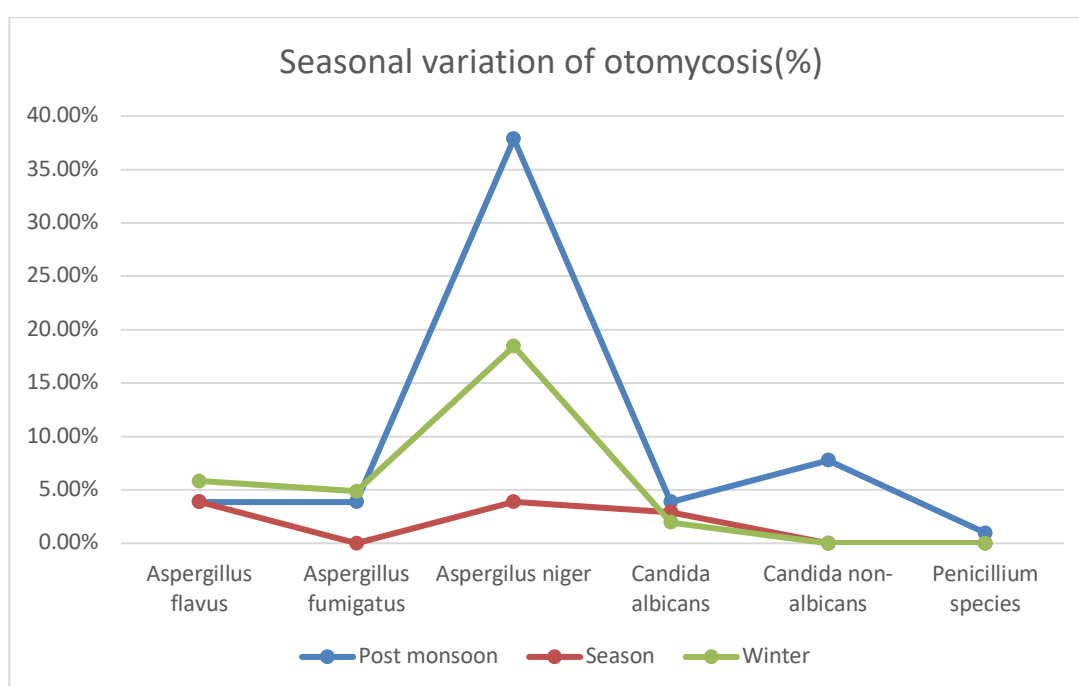
Fisher's Exact test Probability=0.010



Sr. No.	Month	Number of Patients
1	January	7
2	February	25
3	March	-
4	April	-
5	May	-
6	June	-
7	July	-
8	August	-
9	September	11
10	October	9
11	November	37
12	December	14
	Total	103

Season	Culture						Total (%)
	Aspergillus flavus	Aspergillus fumigatus	Aspergillus niger	Candida albicans	Candida non-albicans	Penicillium species	
Post monsoon (October–December)	4(3.88%)	4(3.88%)	39(37.86%)	4(3.88%)	8(7.76%)	1(0.97%)	60(58.25%)
South west monsoon (June–September)	4(3.88%)	0	4(3.88%)	3(2.91%)	0	0	11(10.67%)
Winter (January–February)	6(5.82%)	5(4.85%)	19(18.44%)	2(1.94%)	0	0	32(31.06%)
Total	14(13.58%)	9(8.73%)	62(60.18%)	9(8.73%)	8(7.76)	1(0.97%)	103(100%)

Chi-square=22.5 Probability=0.013 Degree of freedom=10



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.[2]

- Among 103, clinically diagnosed with otomycosis were selected as the study population. In India, otomycosis is very commonly seen. In the external auditory canal, fungi are considered normal microflora, which plays a vital role in otomycosis. Otomycosis is usually neglected or

unnoticed until there is severe pain and itching in the ear.[5]

- In this study, we observed that males, 58 (56.31%), were more commonly affected with otomycosis than females, 45 (43.68%). Similarly, a study by Sangavi *et al.*[6] showed that the ratio between male and female patients was 1.13:1, with male predominance.
- In this study, we observed that the incidence of otomycosis was most common in 24–33 years old (30 [29.12%]), followed by 34–43 years old (24 [23.30%]).
- The reason that middle-aged people were more affected in both the current study and the ones cited above could be attributed to the fact that young people are more susceptible to fungi due to their occupations, travel, and other factors.[7]

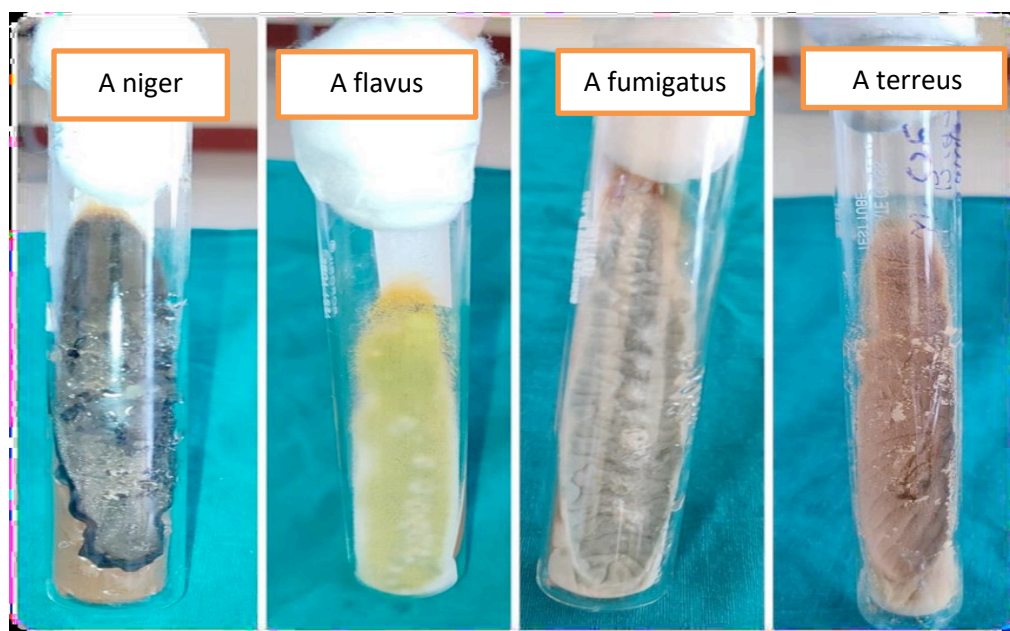
Distribution of Fungal Species

- Once the fungal debris was removed from the external auditory canal, it was subjected to 10% KOH slide preparation, and the presence of fungal elements was examined. Those positive for fungal details were cultured on Sabouraud Dextrose Agar for fungal growth.
- 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%]), as shown in Figure 1b, and *Penicillium* (1 [0.97%]). Out of 85 *Aspergillus* isolates, 62 (60.19%) were *A. niger* [Figure 1a], 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.*, [8] *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.*, [19] 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%]). [19] According to our study, *A. niger* was the most seen fungus in the age group of 24–33 years (21.35%) followed by 34–43 years (15.53%). *A. flavus* was most seen in the age group of 34–43 years (4.85%) followed by 24–33 years (2.91%). Our study ($P = 0.010$) shows a significant difference between age-wise and fungal species distribution.

Culture of Aspergillus



Seasonal Distribution of Fungi

Our study was conducted from September 2019 to March 2021. In our study, the incidence of otomycosis was more during postmonsoon (October–December) (60 [58.25%]) followed by Winter (January–February) (32 [31.06%]), and South-west monsoon (June–September) (11 [10.67%]). Our study ($P = 0.013$) shows a significant difference between seasons and fungal

species distribution. Postmonsoon constitutes the rainy season in Bangalore. This correlates with the study conducted by Than *et al.* [20] found that the incidence of otomycosis increases during rainy seasons. Agrawal *et al.* [21] also proved that the

development of otomycosis is also favored by high humidity during the monsoon months. In a study by Kulal *et al.*, [22] otomycosis was more prevalent in the rainy season, that is June (15%), followed by October (14%) and November (13%). Jahan *et al.* [12] conducted a study on 120 patients. A higher incidence of otomycosis was seen in the rainy season, with a maximum number of patients in the age group of 31–40 years. [12] In India, the average temperature ranges from 17°C to 38°C. There is much rain, roughly 4000 mm each year, with about 90% falling between June and September during the monsoon season. During the monsoon season, the relative humidity reaches a very high saturation level.

Fungi may grow very well in warm, damp environments. Hence, the incidence of otomycosis is higher in the rainy months than in summer.[23] the relative humidity reaches a very high saturation level. Fungi may grow very well in warm, damp environments. Hence, the incidence of otomycosis is higher in the rainy months than in summer.[23]

Treatment

Since the widespread use of topical medicines started more than 20 years ago, Oliveri *et al.*[24] and Mugliston and O'Donoghue[25] found in their study that there has not been a substantial increase in the incidence of otomycosis. This study has shown that self-inflicted trauma is a common risk factor that is also easily avoidable.[14] In the survey, 93% of the patients had an excellent response to clotrimazole, and 1% had a reduction of signs and symptoms. We followed up with our patients for 4 weeks for recurrent or residual otomycosis. Our many patients became asymptomatic within 2–3 weeks. In our study, seven patients with 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, [26] which concluded that clotrimazole 1% was very effective in almost all cases of otomycosis.

Conclusion

- In our study most fungal isolates (60.12%) were *Aspergillus niger*.
- *Aspergillus niger* was frequently observed in the postmonsoon season (October–December).
- Clotrimazole 1% ear drops provided an excellent response in 93% of the patients. After receiving treatment.

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