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Primary otomycosis: Assessment of risk factors and identification of fungal agents – A tertiary care hospital experience

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ABSTRACT

Background: Primary otomycosis is one of the common conditions seen in general clinical practices. Although non-fatal, inappropriate management of this condition may lead to serious complications. **Aims and Objectives:** A cross-sectional study was conducted in our tertiary care hospital to determine the fungal agents in primary otomycosis and its associated risk factors. **Materials and Methods:** A total of 62 consecutive patients of more than 18 years of age with clinical diagnosis of otomycosis were included in this study. Samples were collected and processed and the fungal isolate was identified. The predisposing factors, fungal isolate, and demographical profile of the patients were analyzed. **Results:** About 61.29% were males and 38.71% were females. Majority of the patients were in the age group of 18–30 years (62.90%). The most common associated risk factor was habitual self-cleaning (50%), followed by oil instillation (30.65%). Itching (75.81%) was the most common symptom followed by ear discharge (45.16%). About 79.03% of our fungal isolates were *Aspergillus* species, *Aspergillus niger* being the most common (58.06 %). About 12.90% of our isolates were *Candida* species. About 63.27% of *Aspergillus* isolates was associated with habitual self-cleaning and 62.50% of *Candida* isolates was isolated with the instillation of oil. About 66.67% of *Penicillium* species and 100% of *Rhizopus* species are associated with inappropriate use of topical antibiotics. **Conclusion:** Health education of the community along with knowledge of common fungal agents causing otomycosis and its associated risk factor will help in reducing the incidence of otomycosis, which along with proper management will prevent further complications.

Key words: Primary otomycosis; Risk factors; Fungal pathogens

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INTRODUCTION

Otomycosis is a superficial fungal infection of the external auditory canal (EAC), accounting for about 9–27% of all clinical cases of otitis externa in India[1,2] and up to 30% in patient's presenting with ear discharge.[3] The prevalence rate of otomycosis worldwide varies between 9% and 30%, the highest being in humid, hot, and dusty areas of tropical countries,[4] as fungal spores are ubiquitous and thrive well in these situations and are carried away very easily by wind, predisposing to higher prevalence rates. Otomycosis is broadly classified as primary and secondary otomycosis, based on whether the otomycosis is a primary disease or superimposed on previous bacterial infection/anatomical deformity of EAC/immunocompromised state, respectively.[5]

Various predisposing factors contribute to the increased incidence of otomycosis. Hot humid environment, instrumentation of ear, and habitual cleaning of ear with hard objects such as safety pins, sticks, and rolled paper ends were identified as the common predisposing factors. Local practices such as instillation of hot oil into the EAC and recurrent or indiscriminate use of local antibiotic drops also

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predispose to fungal infection.[6] Swimming in contaminated water, farmers and people who have fungal infections elsewhere in the body are also at a higher risk of developing otomycosis as they are frequently exposed to fungal spores.[5]

Otomycosis is a common infectious disease in developing countries, presenting with features of foul-smelling ear discharge, ear pain, itching, conductive deafness/blocked sensation in the ear, and tinnitus. Local examination may reveal the presence of greenish or blackish debris material in the EAC with an inflamed EAC wall. High clinical suspicion, laboratory identification of causative fungal pathogen, and appropriate treatment will help in efficient patient care. However, misdiagnosis of otomycosis along with inappropriate therapy may cause the progression of the disease with serious complications such as serous otitis media, temporal bone osteitis, and mastoiditis.[7] However, bilateral ear involvement and complications are much more common among immunocompromised patients than immunocompetant individuals.[8]

Although it is a non-fatal condition, it is quite a challenge to the treating clinician due to its chronic course, late presentation, inappropriate and long-term therapy, high recurrence rate, and probable emergence of resistance to commonly used antifungal agents. This study was conducted in a tertiary care hospital to identify the common fungal agents implicated in primary otomycosis in our locality and to determine their associated risk factors.

Aims and objectives

To identify the common fungal agents causing primary otomycosis and to determine their associated risk factors .

MATERIALS AND METHODS

This cross-sectional study was conducted in a tertiary care hospital over a period of 6 months after getting approval from the Institutional Ethical Committee (IEC no:4/2019/IEC/GMC dated July 15, 2019). During the 6-month study period, patients who were attending the ENT OP, presenting clinically with signs and symptoms suggestive of otomycosis and who are 18 years and above were included in the study population in a consecutive manner, after getting written informed consent. Those patients who are <18 years and those who have pre-existing otitis media, history of prior ear surgery, local instillation of antifungal/antibiotic drops, fungal disease elsewhere in the body, and with history of debilitating and immunocompromised conditions such as diabetes mellitus, on steroid therapy, malignancy, and tuberculosis were excluded from the study.

Demographic and relevant clinical details were collected from the study group using a structured questionnaire. The patients were explained about the procedure of sample collection from the EAC for mycological examination. Ear discharge/debris samples from the EAC were collected using two sterile cotton-tipped swabs or curette under strict aseptic precautions and were transported to the mycology laboratory as early as possible for further analysis.

Using the first swab/some of the debris material, potassium hydroxide (KOH) mount was prepared using 10% KOH, as per standard laboratory procedures and examined under ×10 and ×40 objectives of microscope for the presence of any fungal elements. The second swab/rest of the debris material was inoculated onto two Sabouraud's Dextrose agar (SDA) slopes with chloramphenicol and was incubated at 37°C. The cultures were examined at alternate days up to 3 weeks for the presence of any growth.

The fungal isolates that were grown on SDA agar were then identified based on their colony morphology and morphological structures such as hyphal characteristics, presence of asexual spores, their shape, size, and arrangement by Lactophenol cotton blue (LPCB) mount. For colonies resembling *Candida*, Gram stain was used for identification and further speciation was done by germ tube test and chrome agar.

RESULTS

During the 6-month study period, a total of 62 patients presented clinically with signs and symptoms suggestive of otomycosis and are included in the study population.

Among the study population, 38 were males (61.29%) and 24 were females (38.71%). Majority of the study population were in the age group of 18–30 years in both males and females (63.16% and 62.50%, respectively) (Table 1).

Among the 62 study population, habitual self-cleaning was found to be the most common predisposing factor (31, 50%) followed by instillation of oil into the ears (19, 30.65%). Other predisposing factors in the study population were inappropriate use of topical antibiotics, contributing to 17.74% (11) and swimming (1, 1.61%) (Chart 1).

Most common method of habitual ear cleaning in our study population was earbuds (22, 70.97%) followed by pins and metals (6, 19.35%) (Chart 2).

The most common clinical symptom among our study population was itching (75.81%) followed by ear discharge (45.16%). Other presentations are blocked sensation in the ear (37.10%), ear pain (22.58%), and tinnitus (6.45%). Most of the study population presented with more than one symptom (Chart 3).

Table 1: Age and sex distribution of the study population

S. No.	Age group	Males (n=38)		Females (n=24)		Total (n=62)	
		No.	%	No.	%	No	%
1.	18–30 years	24	63.16	15	62.50	39	62.90
2.	31–40 years	10	26.32	6	25	16	25.81
3.	41–50 years	3	7.89	3	12.50	6	9.68
4.	51–60 years	1	2.63	-	-	1	1.61
	Total	38	100	24	100	62	100

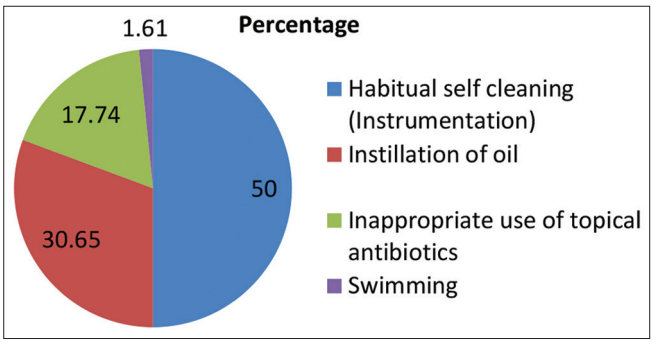

Chart 1: Distribution of associated risk factors (n=62)

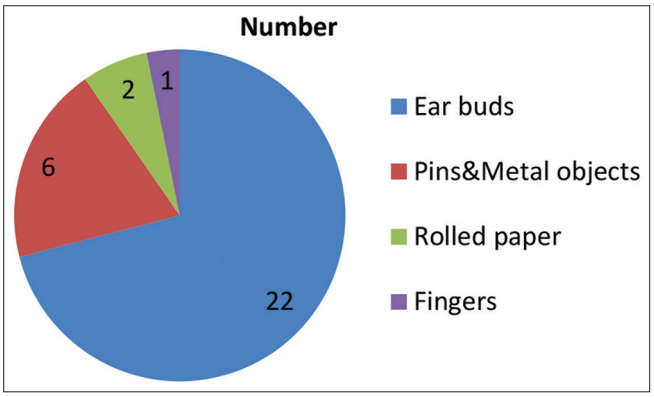

Chart 2: Various methods of habitual self-cleaning (n=31)

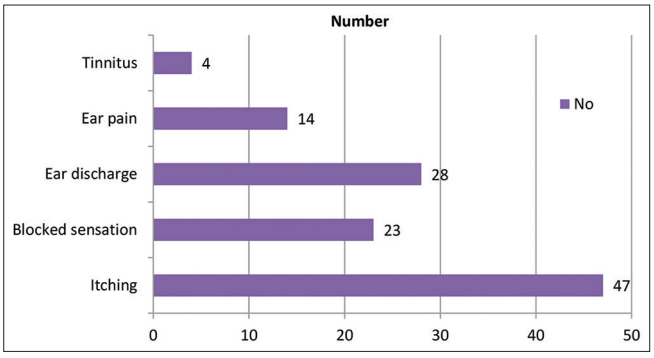

Chart 3: Distribution of clinical symptoms among the study population (n=62)

The most common fungal isolate was *Aspergillus* species (79.03%) followed by *Candida* species (12.90%). Among the *Aspergillus* isolates, *Aspergillus niger* (58.06%) was found to be commonest isolate followed by *Aspergillus fumigatus* (14.52%). Among the *Candida* species isolated, *Candida kruseii* (8.06%) was the most common isolate followed by *Candida albicans* (4.84%) (Table 2). All the 62 samples collected from the patients, who are clinically diagnosed as primary otomycosis, showed the presence of fungal hyphae in 10% of KOH mount and all of them were culture positive.

About 63.27% of *Aspergillus* isolates was associated with habitual self-cleaning and 62.50% of *Candida* isolates was isolated with the instillation of oil. About 66.67% of *Penicillium* species and 100% of *Rhizopus* species are associated with inappropriate use of antibiotics (Table 3).

DISCUSSION

Primary otomycosis is one of the most common recurrent illnesses, seen in Indian subcontinent. Although it is not a life-threatening condition, proper diagnosis and treatment will prevent further disease progression. This study was conducted in a tertiary care hospital to identify the fungal pathogens causing primary otomycosis and to determine its associated risk factors. Over 62 patients, attending the ENT outpatient department, over 6-month period with clinical history suggestive of primary otomycosis, were included in the study.

In our present study, 61.29% of the patients were males and 38.71 % were females. Similar observations were found in studies conducted by Prasad et al.,[5] Agarwal and Devi[4]; Anwar et al.,[7] who showed 63%, 57%, and 59% of their study group as males, respectively. This increased incidence in males may be due to more outdoor activities and occupational related exposure to fungal spores. However, studies conducted by Adoga and Iduh;[9] Barati et al.,[10] showed a female preponderance of cases (69% and 50%, respectively). This discrepancy in gender among different studies may also be due to variations in associating risk factors and climatic conditions.

Majority of patients in the present study were in the age group of 18–30 years (62.90%) followed by 31–40 years (25.81%). Similar observations were found in the studies conducted by Agarwal and Devi;[4] Ali et al.,[11] who showed higher incidences in the age group of 15–35 years (66%)

and the age group of 21–30 years (27%), respectively. This may be due to the fact that younger age group (18–30 years) people are more involved in outdoor activities and hence exposed to sweat, dust, and polluted air are more prone to develop primary otomycosis.

In our study, instrumentation/habitual cleaning of ear (50%), instillation of oils (30.65%), and inappropriate usage of topical antibiotics (17.74%) were the common associated risk factors with primary otomycosis. Similar rates for associated risk factors were found in the study conducted by Agarwal and Devi[4] where 64% of their study population showed instrumentation of ear as the associated risk factor. In contrast to our study, Prasad et al.,[5] showed a lesser association for instrumentation of ear [32%]. Instrumentation/habitual cleaning of ear is found to be strongly associated with the incidence of otomycosis as it removes cerumen, which has a protective role in the EAC. Among instrumentation, usage of earbuds (70.97%) and pins and metals (19.35%) have been found to be associated with a higher incidence of primary otomycosis due to the presence of fungal spores in unsterile cotton ear buds and damage to EAC mucosa caused by metal objects, respectively.

Other factors such as instillation of oils and inappropriate usage of topical antibiotics were found to be associated with 30.65% and 17.74% of cases in our study, which correlates well with the observations of the study conducted by Prasad et al.,[5] (42% and 20%, respectively). This may be due to the fact that oil being sporostatic, preserves the viability of fungal conidia deposited in the EAC for a longer duration, predisposing to otomycosis.[12] Inappropriate usage of antibiotic eardrops without proper medical consultation acts as an important predisposing factor as they will alter the local microbial flora, thereby enhancing the chance of otomycosis.

The most common clinical symptom among our study population was itching (75.81%) followed by ear discharge (45.16%). Similar results were also observed in the study by Prasad et al.,[5] where 73% of their study population presented with itching followed by blocked sensation in ear (38%), ear discharge (38%), ear pain (35%), and tinnitus (8%). Other common presentations in our present study were blocked sensation in the ear (37.10%), ear pain (22.58%), and tinnitus (6.45%). These findings correlate well with the findings of Prasad et al.[5]

In our present study, the predominant isolate identified was *Aspergillus* species (79.03%) followed by Candida species (12.90%). Various studies conducted all over the world, also showed *Aspergillus* species as the most common agent causing otomycosis with results ranging from 70% to 92%.[4,10,13] This may be due to the fact that *Aspergillus*, being a saprophytic is a rapid grower and produces abundant of easily aerosolized conidia making it a common air contaminant.[4] This increases the exposure rate and thus the high incidence of *Aspergillus* otomycosis.

Among the various species of *Aspergillus*, *A. niger* was the predominant isolate (58.06%) in our study followed by *A. fumigatus* (14.52%) and *Aspergillus flavus* (6.45%). *A. niger* is both a saprophyte and an oligotroph and hence it can grow even in a nutritionally deprived environment. As the EAC has an abundance of proteins and carbohydrates with favorable temperature and humidity, it explains the higher incidence of *A. niger* otomycosis. Studies done by Aneja et al.,[8] Ali et al.,[11] also had shown *A. niger* as the predominant isolate (51%).

In our study, the second most common isolate identified was *Candida* species (12.90%), *C. kruseii* being 8.06%, and *C. albicans* 4.84%. Studies conducted by Agarwal and Devi,[4]

Table 2: Distribution of isolated fungal pathogens (n=62)

S. No.	Fungal isolate	No	%
1.	*Aspergillus niger*	36	58.06
2.	*Aspergillus fumigatus*	9	14.52
3.	*Aspergillus flavus*	4	6.45
4.	*Candida kruseii*	5	8.06
5.	*Candida albicans*	3	4.84
6.	*Penicillium* spp.	3	4.84
7.	*Rhizopus* spp.	2	3.23
	Total	62	100

Table 3: Association of fungal isolates with the risk factors (n=62)

S. No.	Risk factors	*Aspergillus* spp. (n=49)		*Candida* spp. (n=8)		*Penicillium* spp. (n=3)		*Rhizopus* spp. (n=2)		Total (n=62)	
		No.	%	No.	%	No.	%	No.	%	No	%
1.	Habitual self-cleaning (n=31)	31	63.27	-	-	-		-	-	31	100
2.	Instillation of oil (n=19)	13	26.53	5	62.50	1	33.33	-	-	19	100
3.	Inappropriate use of antibiotics (n=11)	5	10.20	2	25	2	66.67	2	100	11	100
4.	Swimming (n=1)	-	-	1	12.50	-	-	-	-	1	100
	Total	49	100	8	100	3	100	2	100	62	100

Ali et al.,[11] also showed similar results (10% and 14.7%, respectively). Furthermore, 4.84% and 3.23 % of our isolates were *Penicillium* species and *Rhizopus* species. The study conducted by Prasad et al.,[5] showed that 8% of their isolates were *Penicillium* species and 1% was *Rhizopus* species. These results correlate well with our study. Furthermore, many studies conducted in various parts of the world showed isolates such as *Mucor* and *Rhizopus* in cases of otomycosis are mostly associated with immunocompromised states.[5] As our study includes only cases of primary otomycosis, it explains the few *Rhizopus* isolates in our study.

About 63.27% of *Aspergillus* species isolated in our current study were found to be associated with habitual self-cleaning, especially with earbuds. This may be due to the fact that *Aspergillus* being a common saprophyte may contaminate the cotton buds, leading to otomycosis in individuals using earbuds for habitual self-cleaning.[4] Furthermore, it may cause changes in cerumen production or relative humidity that favor fungal growth and hence otomycosis.[7] Nearly 62.50% of *Candida* isolates in our study was associated with instillation of oil into the ear canal. Oil will provide the required moisture and warmth that will allow the *Candida* species to colonize and invade the EAC mucosa.

Penicillium (66.67%) and *Rhizopus* (100%) species were found to be associated with the instillation/inappropriate usage of antibiotic drops in our study. Usage of antibiotics alters the normal bacterial flora in the external ear canal thereby, favoring the overgrowth of fungi such as *Penicillium and Rhizopus*.[7] Limited data were available regarding the actual association of risk factors with specific fungal isolates in primary otomycosis in India.

Limitations of the study

The limitations of the study include shorter duration of study period and smaller sample size . Also there is a chance of recall bias from the study population , on the associated risk factors. A multicentric study with a larger sample size will provide us more insight in primary otomycosis.

CONCLUSION

Primary otomycosis has been a common cause of concern for clinicians due to its association with various risk factors, high recurrence rate, and poor compliance among patients for prolonged treatment. Our study has thrown light and knowledge regarding the common fungal agents causing primary otomycosis with its associated risk factors in our area. High clinical suspicion and prompt diagnosis of otomycosis in immunocompetent individuals is of utmost importance. As different species of fungi have varying anti-fungal susceptibilities, proper identification of pathogenic fungi will help in choosing the correct anti-fungal agent. This may also improve the patient compliance toward treatment and reduce their economic burden. Health education of the community regarding the serious consequences of self-cleaning measures and other home remedies, along with prompt diagnosis and management, will lead to better patient care and prevention of its long-term fatal complication.

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