

CLINICAL STUDY OF OTOMYCOSIS

RUNNING TITLE: CLINICAL STUDY OF OTOMYCOSIS

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ABSTRACT:

Aim: To analyse the clinical profile of otomycosis.

Materials and method: The data of this prospective study was collected from patients attending ENT Outpatient Department at tertiary health care centre over a period of two years from JUNE 2021 to October 2022. The study population included patients attending the ENT OPD who gave history of discharge, pain, pruritis and reduced hearing. Over a period of two years, 50 patients were studied. All swabs taken were subjected to microscopic examination by 10% KOH and those positive for fungal elements were inoculated over saboraauds dextrose agar. No transport media was used as swabs were immediately inoculated over Saboraauds dextrose agar media for 48-72 hours at 37 degree C. The growth of the fungus was studied using gross morphology. Fungus was removed from patients ears once a week for three to four weeks via aural toileting, which included dry mopping, suction clearance, aural syringing, and forceps. The eardrops clotrimazole (4 drops 8 times a day for 4 weeks) were used regardless of the results of the culture.

Results: Otomycosis is more common in the monsoon season. Males are twice as likely to be impacted as females. The most common risk factor is swimming. *Aspergillus niger*, *Aspergillus fumigatus*, and *Candida albicans* are all susceptible to being killed by using Clotrimazole ear drops.

Conclusion: The widespread dissemination of spores of fungal species including *Aspergillus Niger*, *Aspergillus fumigatus*, and *Candida albicans* explains why they are so frequently recovered from Otomycosis. Otomycosis recurs frequently, and systemic disease is a major contributor.

Keywords: Otomycosis, *Aspergillus niger*, *Candida albicans*

Introduction: The term otomycosis is used to describe fungal infection of ear that is external auditory canal, eardrum.⁽¹⁾ A wide range of fungi, yeasts, bacteria & other microorganisms that are prevalent in the outside environment constantly pose a threat to the ear. Debris buildup, especially in moist tropical environments, facilitates ear colonisation and infection. The most frequent predisposing factors for otomycosis were swimming in public pools, bath and diabetes mellitus.⁽²⁾

Otomycosis is widespread throughout the world and, according to different recorded series, accounts for 5–20 percent of all instances of infective otitis externa, *Aspergillus* being most common fungi showed azole resistance. During the rainy season, it is one of the most prevalent appearances in “India”. It mainly happens in moist environments.⁽³⁾ Otomycosis is frequently seen in outpatient clinics in tropical countries and is frequently misdiagnosed as other illnesses. The illness goes unnoticed and untreated until it causes excruciating pain, and it frequently returns.

Otomycosis, or ear fungus, causes non-specific symptoms like pruritis, ear pain, aural fullness, discharge, and possibly hearing loss.⁽⁴⁾ Otomycosis can also be linked to open mastoid cavity infections and persistent middle ear diseases, which can be treated by cleaning and topical mycotic agents.⁽⁵⁾

Otomycosis predisposing factors include dermatitis, unsanitary habits, immunocompromised people, pre-existing ear disease, regular instrument use, etc. The contact with sea-water and the anti-microbial treatment are the main factors which favour infection.⁽⁶⁾ The infection may be either subacute or acute and is characterised by inflammation, pruritis, scaling and discomfort, miconazole singly or in combination to acidic drops was effective⁽⁷⁾. It is noteworthy that *Aspergillus niger*, in particular, is the species that causes otomycosis the most frequently.⁽⁸⁾

Infections of the external auditory canal range from moderate to severe, but are often confined to that area, *Aspergillus* has long been illustrated in the life cycle of ascomycete.⁽⁹⁾ Secondary bacterial infection complicates the situation significantly in extreme circumstances. The mycotic contamination of the external auditory meatus is common not just in the tropics, but also in the subtropics. Using topical antibiotics, which create a sterile environment in which the fungus may grow, has led to a rise in the occurrence of this disease in regions with more temperate weather. Tympanic perforations and serous otitis media are not uncommon with otomycosis and tend to resolve with treatment, vioform with salicylic acid was mostly successful.⁽¹⁰⁾ A secondary bacterial infection that develops after the main infection seems to be resistant to therapy. Focusing on a specific subset of microorganisms at the moment, anti-fungal treatment is quite effective.

Some patients have shown an increased risk for Otomycosis after being exposed to neomycin and polymycin B. In light of the foregoing, the current investigation set out to identify the most prevalent fungi responsible for otomycosis, as well as their related risk factors and bacterial infections. Barotrauma from air flights, typically during descent, is a common cause of OME in adults, particularly when travelling with a URTI.⁽¹¹⁾ This can lead to ear discharge, further contributing to otomycosis due to moist conditions. In patients with chronic otitis media, among age groups between 20 to 40 yrs, *Aspergillus niger*, *fumigatus*, *flavus*, *candida* were most common species. *Aspergillus Niger* was most common in otitis externa patients.^(12,13)

With the above information, the present study was conducted keeping the following aim and objectives in mind:

AIM: To do clinical study of otomycosis.

OBJECTIVES:

- 1.)To study the commonest modes of presentation and various types of fungi causing otomycosis.
- 2.)To study the various predisposing factors for otomycosis.
- 3.)To study the response of various anti fungal drops in treatment of otomycosis.

Materials and Method: The data of this prospective study was collected from patients attending ENT Outpatient Department at tertiary health care centre over a period of two years from JUNE 2021 to October 2022. Before beginning the research approval from ethics committee was taken. Written & informed consent was taken from all the patients. The patients were informed regarding the purpose, procedures, risks, benefits, of the study in the language of their understanding. The study population included patients attending the ENT OPD who gave history of discharge, pain, pruritis and reduced hearing. Over a period of two years, 50 patients were studied. The patients coming to the opd were allocated till the desired sample size was achieved by using the randomisation table obtained from the WINPEPI Software.

All age group subjects irrespective of gender and only culture positive were included for the study. The patients presenting with history of previous procedures, suspected malignancy patients and those with infiltrating tumours were excluded from the study.

Sample Collection: All swabs taken were subjected to microscopic examination by 10% KOH and those positive for fungal elements were inoculated over saboraauds dextrose agar. No transport media was used as swabs were immediately inoculated over Saboraauds dextrose agar media for 48-72 hours at 37 degree C. Pruritis, otalgia, hearing loss & the appearance of fungal debris in the external ear all contributed to a clinical diagnosis of fungal infection. After using antiseptic eg. pinna to swab the pinna & surrounding area of the ear, debris in the external auditory canal was composed using moist germ-free swabs or disinfected forceps for subjects presenting with Otomycosis under stringent aseptic protections. The specimen was quickly shipped to the lab, where it was processed the same day it was obtained.

Mounting in 10% Potassium Hydroxide: The specimen was examined using direct microscopy after being mounted in 10% Potassium hydroxide.

Procedure:

- A) A fresh glass slide was used to evaluate the sample.
- B) The substance was combined with a single drop of 10% KOH.
- C) The preparation was covered with a cover slip that was free of air bubbles.
- D) The “KOH solution” was stored at room high temperature till it was time to clear the substance. In order to hasten the cleansing process, the slide was occasionally heated.
- E) For this reason, we used bright field microscopy to analyze the sample.

There was a search for fungi (hyphal elements, Conidiophore spores). Cultured fungi were examined in the material. The fungus culture was started the same day the material was injected onto Sabouraud's dextrose agar and Czapek's agar. Since these chemicals inhibit a

wide variety of saprophytes, they were left out of the Sabouraud's dextrose medium. However, 80 milligrams of Gentamicin were added to one liter of the medium to reduce the risk of bacterial growth. Since Czapek's medium containing Gentamicin is the gold standard for the classification of Aspergilli, it was also created. All infected medium were incubated at 25 and 37 degrees Celsius and monitored everyday for a week, then double weekly for a further

period. Recovering fungal pathogens was more likely when several culture media were used at incubation temperatures of 25 and 37 degrees Celsius.

The growth of the fungus was studied using gross morphology, which revealed the following:

1) Fungus Growth Rate: A) Fast-Growing Fungi Reached Maturity in 2-5 Days; B) Moderate-Growing Fungi Reached Maturity in 6-10 Days; C) Slow-Growing Fungi Reached Maturity in 2 to 3 Weeks.

Colouration of the colony's exterior, known as pigmentation, was determined by the spores which didn't show up until abundant spore production had occurred. It was investigated if the colony's surface was blue-green, black, yellow-green, white or blue-gray. Golden, red-brown, white, yellow, olive-green & purplish-red colouring were considered undesirable.

“Lactophenol cotton blue mount (wet mount): On a spotless glass slide, we put some cotton blue dye made from lacto phenol. A tiny bit of the fungal growth was still on it, and it had to be plucked off with a needle. When I put on the cover slip, there weren't any voids where air could get in. Next, its microscopic morphological traits were examined using a light microscope, first with a low power objective and subsequently with a high power objective.

A microscope was used to search for typical microscopic features of Aspergillus species.

The following characteristics were identified as being shared by all Aspergilli.

- 1) Septate and hyaline hyphae are present
- 2) A radial chain of phialides that gives rise to spherical conidia.

Damp mount was put by mocking the “PENICILLIUM” development when the SDA displayed hues of green-blue with a velvety to powdery texture. The following microscopic characteristics confirmed penicillium.

- 1) Hyaline hyphae with septa
- 2) Use a conidiophore-like brush

In the case of “CANDIDA”, Grams stain dye was used if gram-positive emerging cells were observed and the growth was creamy white with a curdy odor. It turned out to be Candida.

Clotrimazole Application and Aural Toileting: Fungus was removed from patients ears once a week for three to four weeks via aural toileting, which included dry mopping, suction clearance, aural syringing, and forceps. The eardrops clotrimazole (4 drops 8 times a day for 4 weeks) were used regardless of the results of the culture. Where fungal infection persisted, patients were seen every week for monitoring. This procedure was repeated. Initially, patients who presented with significant ear pain due to canal wall oedema were preserved with Icthammol glycerine packing daily for 4 days in addition to oral anti-inflammatory medicines. When the swelling subsided, syringing was used to extract the fungus mass in some cases.

Statistical analysis: The obtained data was entered into an Excel spreadsheet and tallied by a statistician. The statistical analysis was performed by calculating the means & standard

deviations of the measurements for each group. The chi-square test was used to compare the two groups, with a significance level of $p < 0.05$.

Results: Maximum subjects belonged to the age group of 21-40 years. Males (62%) were comparatively more as compared to females (38%). Lower class, upper lower class, lower middle class and upper middle class was revealed in 30%, 20%, 28% and 22% of the subjects respectively as shown in table 1.

Table 1: Age, gender and socio economic status distribution of otomycosis

| Age Group (in years) | N | % |
|------------------------------|----|-----|
| 11-20 | 6 | 12 |
| 21-30 | 15 | 30 |
| 31-40 | 15 | 30 |
| 41-50 | 8 | 16 |
| 51-60 | 5 | 10 |
| 61-70 | 1 | 2 |
| SEX | | |
| Male | 31 | 62 |
| Female | 19 | 38 |
| Socio Economic Status | | |
| Lower Class | 15 | 30 |
| Upper Lower Class | 10 | 20 |
| Lower Middle Class | 14 | 28 |
| Upper Middle Class | 11 | 22 |
| Total | 50 | 100 |

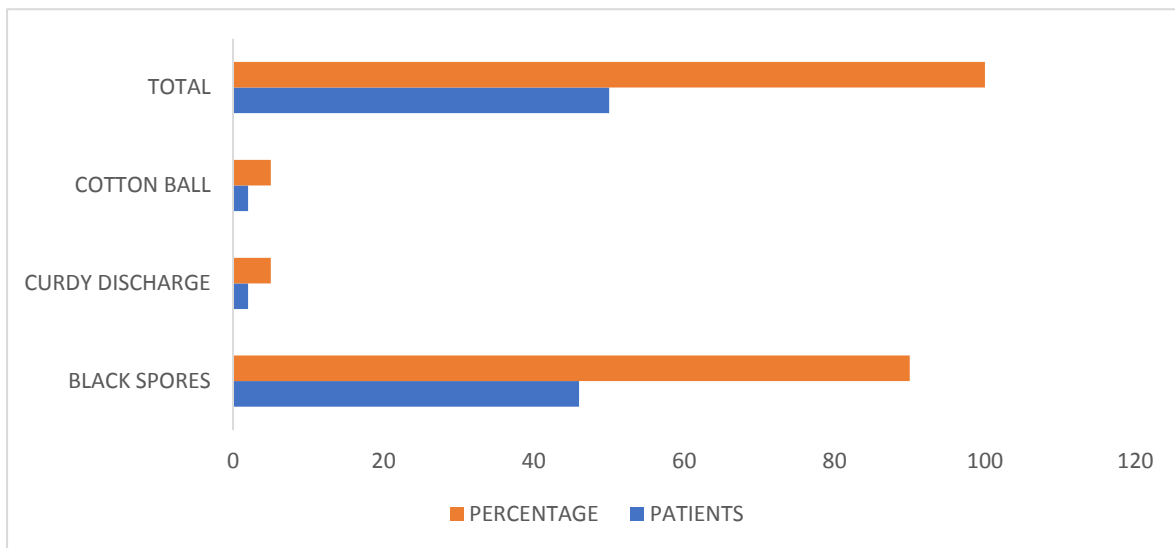
Right and left ear were equally affected in this study (44%). Bilateral involvement was found among 12% of the subjects. Pruritis (100%) was the most common symptom followed by discharge (68%) followed by pain (64%) and aural fullness (32%). Amongst the predisposing factors contributing to otomycosis, maximum patients acquired post swimming (44%), followed by self cleaning (32%), followed by otitis externa (24%) as shown in table 2.

Table 2: Distribution according to symptoms and predisposing factors

| Symptoms | N | % |
|----------------|----|-----|
| Pain | 32 | 64 |
| Pruritis | 50 | 100 |
| Discharge | 34 | 68 |
| Aural Fullness | 16 | 32 |

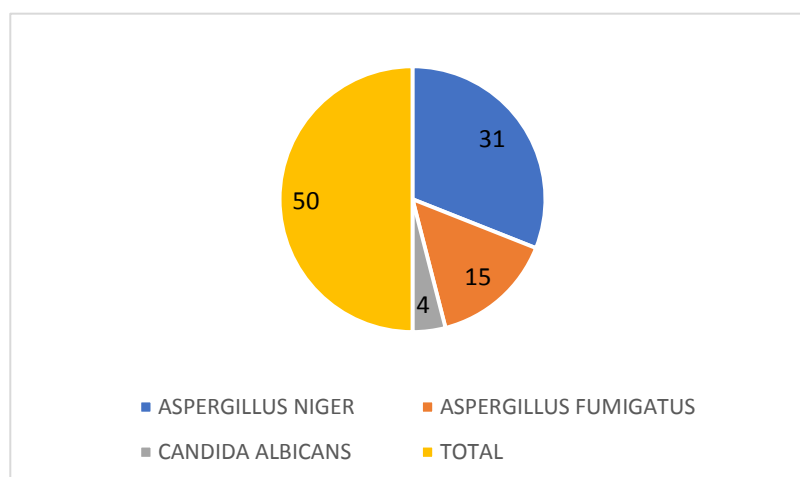
| Predisposing Factors | | |
|----------------------|----|-----|
| Swimming | 22 | 44 |
| Self Cleaning | 16 | 32 |
| Otitis Externa | 12 | 24 |
| Total | 50 | 100 |

Maximum patients developed black spores (92%), followed by cotton ball appearance (4%) and curdy discharge (4%) as shown in graph 1.



Graph 1: Distribution with respect to otoscopic findings

The maximum incidence was of *Aspergillus niger* (62%), followed by *Aspergillus fumigatus* (30%), followed by *Candida albicans* (8%) as mentioned in graph 2.



Graph 2: Distribution with respect to fungal species

All the treatment modalities viz. Fluconazole, Cotrimazole, Fluconazole+ Polymyxin B and Cotrimazole+Polymyxin B provided relief to almost all the patients except one in each

category. No significant difference was found among the treatment modalities w.r.t. outcome (table 3).

Table 3: Distribution with respect to treatment

| Treatment | Patients | Relieved | Not Relieved |
|--------------------------|----------|----------|--------------|
| FLUCONAZOLE | 15 | 14 | 1 |
| COTRIMAZOLE | 21 | 20 | 1 |
| FLUCONAZOLE+ POLYMYXIN B | 8 | 7 | 1 |
| COTRIMAZOLE+POLYMYXIN B | 6 | 5 | 1 |
| Chi Square | 0.51 | | |
| p value | 0.87 | | |

DISCUSSION: Otomycosis affects the outer ear and is a frequent ear infection. In India, increased heat and humidity, a dusty atmosphere, and the huge amount of the populace consisting of outdoor workers & those of low socioeconomic position all contribute to the high frequency.

Garcia Martos research in 1993 revealed that the ages 31–40 and 50–64 were more at risk for developing otomycosis⁽⁶⁾. In a study conducted by J Chander in 1996, 110 patients were investigated, majority were between 21-30 years, male - female ratio was equal.⁽²⁾ In a study conducted by Keyvan Kiakojuri in 2007, majority age group was 40-49 years.⁽¹⁴⁾ In the present study, maximum patients belonged to the age group of 21-40 years.

Mocatela Ruiz et al. found no significant differences in patient age and sex in their study.⁽¹⁰⁾ In a study conducted by Keyvan Kiakojuri in 2007, women were more affected than men.⁽¹⁴⁾ In this study, males (62%) were comparatively more as compared to females(38%) and the ratio was 1.7:1.

The research of Ravinder Kaur et al corroborates this finding that otomycosis often affects only one ear. It suggests that it is not an extremely contagious disease.⁽¹⁵⁾ In a study conducted by Borlingegowda Viswanath et al, 50 immunocompromised and 50 immunocompetent patients were selected, bilateral involvement was more in immunocompetent group⁽¹⁶⁾. Our research revealed that, despite the presence of risk factors, the majority of cases of otomycosis were unilateral, either right or left in equal proportion (44%). Bilateral involvement was found among (12%) of the subjects. This means that neither side of the ear was favored more than the other in our analysis.

Oliveria S in 1984 concluded itching, discomfort, and hearing loss to be the most common symptoms of otomycosis.⁽¹⁷⁾ According to research by Paulose and colleagues, ear itching (88%), ear block (87.5%), tinnitus (22%), ear discharge (30%).⁽¹⁸⁾ In this study, Pruritis was the most common symptom in (100%) cases, followed by discharge (68%) and pain (64%).

Senturia et al., details various causes of otitis externa. They include exposure to high temperatures and/or humidity, physical damage, and the removal of the protective cerumen coating by frequent bathing, swimming, or cleaning.⁽¹²⁾ Oliveri S et al⁽¹⁷⁾ concluded that wearing hearing devices or external support of any kind may also be a predisposing factor, bath in salt water, swimming were not that risky then to cause otomycosis. In a study conducted by Keyvan Kiakojuri, putting dirty fingers in ears, using cotton swabs and matchsticks were predisposing factors causing otomycosis.⁽¹⁴⁾ In this study, the most common predisposing factor was post swimming (44%) followed by self cleaning (32%) followed by otitis externa (24%).

Oliveri S et al of Italy in 1984 concluded that *Aspergillus Niger* was most prevalent followed by *fumigatus*, then *candida albicans*.⁽¹⁷⁾ HC Gugnani study on etiological agents of otomycosis in nigeria in 1989 concluded that *Aspergillus Niger* was most prevalent followed by *fumigatus* and *candida albicans*.⁽⁸⁾ In 1989 K Paulose concluded that the most common species was *Aspergillus Niger* and *Fumigatus*.⁽¹⁸⁾ In my study maximum patients developed black spores(92%), followed by cotton ball appearance (4%) followed by curdy discharge (4%) and with respect to distribution maximum incidence was of *Aspergillus Niger*(62%) followed by *Aspergillus fumigatus* (30%) and *Candida Albicans* (8%).

In otitis externa or contagion of the radical mastoidectomy & fenestration cavities, Otomycosis was suspected. They suggested it as an alternative to widespread application of topical antibiotics, which are known to promote fungal development.⁽¹⁹⁾ Patient reaction to treatment with 1% clotrimazole was evaluated weekly following aural toileting. Aside from one patient, clotrimazole ear drops were effective in treating all of the others symptoms. In around two to three weeks, the patients symptoms subsided and they were asymptomatic. Their progress was monitored for two weeks to look for signs of return. Their fungal invasion of the exterior canal was undetectable. In a study of 4 individuals with persistent otomycosis despite aural toilet and antifungal treatment, 1 was HIV positive and self-cleaning was a risk factor. Only three patients were not relieved or came with residual otomycosis after treatment with fluconazole and antibiotic combination drops, so the treatment was successful overall. One HIV-positive individual in our series developed otomycosis after being referred for ear cleaning; the causative fungus was *aspergillus*. *Aspergillus niger* was shown to be the most prevalent fungus in HIV and to be very invasive in Niger Martinez's study. Because it was not invasive, we were able to treat it successfully with 1.1 clo-trimazole.

Due to insufficient data on comparison between immunocompromised and immunocompetent patients, proper comparative study could not be prepared. Hence in my study all treatment modalities fluconazole, cotrimazole, fluconazole +Polymyxin B and Cotrimzole + Polymyxin B provided relief to almost all except one in each category.

CONCLUSION: The following points can be concluded from the present study:

- 1) Otomycosis is more common in the monsoon season.
- 2) Males are twice as likely to be impacted as females.
- 3) Occurrence of disease is more common in unilateral cases than bilateral cases.
- 4) The most common risk factor is swimming.

- 5) *Aspergillus niger*, *Aspergillus fumigatus*, and *Candida albicans* are all susceptible to being killed by using Clotrimazole ear drops.
- 6) The widespread dissemination of spores of fungal species including *Aspergillus Niger*, *Aspergillus fumigatus*, and *Candida albicans* explains why they are so frequently recovered from Otomycosis.
- 7) Otomycosis recurs frequently, and systemic disease is a major contributor.
- 8) One contributing factor to the recurrence of the problem is that the audio facilities are inadequate.

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