

Management of Mycotic Otitis Externa: A Clinicomycological Study

ANIKET R BUCHE¹, SACHIN H GARUD², AL ATHUL KRISHNA³

ABSTRACT

Introduction: Fungi are eukaryotic heterotrophic organisms. In otolaryngology, mycotic otitis externa is one of the most common infection affecting external ear canal. The predisposing causes for otomycosis are mostly preventable or adequately controlled by medical treatment. It is important to evaluate the predisposing factors elaborately and economical mode of treating the disease adequately.

Aim: To evaluate the predisposing factors, clinical features and management of mycotic otitis externa.

Materials and Methods: The present longitudinal study was conducted in the Department of Otorhinolaryngology, Shri Vasant Rao Naik Government Medical College, Yavatmal, Maharashtra, India, from December 2019 to December 2021. A sample size of 150 patients was taken for study. The predisposing factors, clinical features with which the patients presented were studied clinically. Otolaryngoscopic examination was done and type of fungal colony identified. The ear swab from affected ear or ears are taken and sent for fungal culture. Thorough aural toileting done and maximum debris was

removed. The fungal reports were collected and the patients response to treatment was evaluated at the end of four weeks. All the data collected was entered into a master chart in Microsoft Excel 2019 and Statistical Package for the Social Sciences (SPSS) software version 23.0 was used for analysis of study. The p-value obtained is less than 0.05 and the study was hence proved significant.

Results: Most (59.9%) of the patient's age were from 16 to 45 years age group and there were 82 (54.67%) males and 68 (45.33%) females. The most common predisposing factor was unsterile methods of ear cleaning (86.6%) followed by administration of unsterile ear drops (72%). *Aspergillus niger* was the most common fungal isolate (62%) and clinically most (96.6%) of the cases responded to clotrimazole.

Conclusion: Mycotic otitis externa being the most common fungal infection of external ear canal, which can be treated adequately and effectively. The region wise fungal population diversity identification will help in effective treatment. Aural toileting along with topical antifungal agents is found to be effective in majority of the cases.

Keywords: Antifungal therapy, *Aspergillus niger*, Clotrimazole therapy, Diabetes mellitus, Otomycosis

INTRODUCTION

Fungi are a large group of heterotrophic organisms. They are seen as saprophytes in the soil and dead plant material. They are eukaryotic organisms. They are important in the degradation and recycling of organic matter. They are industrially important species needed for the production of food, fermented products, antibiotics and an array of enzymes [1].

The fungal infection incidence is like an iceberg, the unreported cases are larger than the reported cases. With improved diagnostic facilities, fungal infections are reported more leading to better life longevity of immunosuppressed patients. Among the 50000 species reported 150 species has been studied to cause infections in humans. Humans are accidental hosts, mostly by means of spore inhalation or by means of spore implantation via direct trauma. The virulence factors responsible for fungal infestation in human has not yet been completely identified. The important factors that influence the virulence of fungus is its ability of the fungus to grow at 37°C and the ability to produce variety of enzymes and toxins [2,3].

It is been noted that otomycosis accounts for 5-20% of all cases of infective otitis externa [4]. Humid atmosphere is one of the most favourable factors for the growth of fungi. Otomycosis is similar to the desquamative form of diffuse infective otitis externa. Infections are mostly limited to external auditory canal and the severity ranges from mild to severe infection. In severe cases, it is usually accompanied by secondary bacterial infection. The irrational use of topical antibiotics has led to flourishing of fungal infection [5].

The other major predisposing cause for flourishing of fungal infection is intractable otorrhea, infection of radical mastoidectomy

and fenestration cavities, and increased use of topical antibiotics. Many fungi like candida species are seen as commensals in ear and it is questionable, whether or not these organisms are the cause of otomycosis. Treatment of fungal infection yields dramatic response [6]. Keeping all these in mind, the present study was undertaken to find out common fungi that cause otomycosis, the predisposing factors and response to treatment method.

MATERIALS AND METHODS

The present study was a longitudinal study conducted in the Department of Otorhinolaryngology, Shri Vasant Rao Naik Government Medical College Yavatmal, Maharashtra, India, from December 2019 to December 2021. Ethical clearance was obtained from the Institutional Ethical Committee before commencing the study (VNGMC/Ethicscommittee/15/2020 dated 23/01/2020). Convenience sampling was done. A total of 150 cases of clinically diagnosed mycotic otitis externa patients were selected as the study population. The study population comprised of patients coming to the Ear, Nose and Throat (ENT) Outpatient Department (OPD) with clinical features and otoscopic findings suggestive of otomycosis.

Inclusion criteria: Patients having clinical features and otoscopic findings suggestive of mycotic otitis externa and all patients with a history of chronic otitis media, tympanic membrane perforations, prior ear surgery, or aural procedures presenting with features of otomycosis were included in the study.

Exclusion criteria: Previously treated cases of otomycosis, Human Immunodeficiency Virus (HIV) positive and Hepatitis B surface Antigen (HbsAg) positive patients were excluded from the study.

Study Procedure

Sterile swabs were taken from the affected ear of patients clinically diagnosed to have otomycosis and was sent for fungal culture. A 10% Potassium Hydroxide (KOH) mount direct microscopy was done on the specimen. Fungal culture was also done. Results were analysed for most common fungal species identification. The parameters used for that were recorded in were age, gender, unilateral or bilateral ear involvement, predisposing factors, symptomatology, fungal species distribution, response to topical clotrimazole therapy.

Aural toileting and application of clotrimazole: Aural toileting was done weekly for 3-4 weeks by means of dry mopping and suction clearance. Irrespective of culture results 1% w/v clotrimazole ear drops were used at four drops every eight hourly for four weeks. Patient not getting complete resolution after four weeks of therapy were considered non responders. Patients presenting with severe earache due to canal wall oedema were treated with anti-inflammatory drugs orally (aceclofenac and paracetamol with serratiopeptidase combinations). Response to the clotrimazole ear drops was observed on every follow-up. Follow-up was done for a period of four weeks.

STATISTICAL ANALYSIS

The data collected were entered into a master chart in Microsoft Excel 2019 software. For the purpose of tabulation, Microsoft word was used. Data was analysed with the help of SPSS version 23.0.

RESULTS

The most commonly affected were adolescent and middle aged individuals. That includes patients age ranging from 16-45 years, constituting about 59.9% cases [Table/Fig-1]. In gender wise distribution, male patients were found to be more affected. One sided ear involvement was commoner than both ear involvement constituting about 95.3% of total. Most of the patients had multiple predisposing factors and clinical features. *Aspergillus niger* was the most common fungal species identified constituting about 62%. A 96.7% of the total patients responded to topical clotrimazole therapy. Males (n=82, 54.67%) were more affected than females (n=68, 45.33%) in a ratio of 1.2:1. [Table/Fig-2].

Age distribution (in years)	Male, n	Female, n	Total, n	Percentage (%)
0-15	6	4	10	6.6
16-30	23	29	52	34.6
31-45	17	21	38	25.3
46-60	22	7	29	19.3
Above 60	14	7	21	14
Total (N)	82	68	150	100

[Table/Fig-1]: Age-wise distribution of otomycosis (N=150).

Sex	Number of cases (n)	Percentage (%)
Male	82	54.67
Female	68	45.33
Total (N)	150	100

[Table/Fig-2]: Gender-wise distribution of otomycosis (N=150).

Most of the cases were having one-sided ear involvement either right or left (143). Both ear involvement while presentation were seen in seven cases out of 150 only [Table/Fig-3]. The most common predisposing factor was unsterile methods of ear cleaning (86.6%) followed by administration of unsterile ear drops (72%). Many of the patients had both habits [Table/Fig-4].

Ear involvement	Number of cases (n)	Percentage (%)
Right	68	45.33
Left	75	50
Single ear involved	143	95.3
Both ears involved	7	4.67
Total (N)	150	100

[Table/Fig-3]: Distribution of cases according to unilateral or bilateral ear involvement (N=150).

Predisposing factors	Number of cases (n)	Percentage (%)
Ear cleaning	130	86.6
Ear drop/oil administration	108	72
Recurrent ear discharge	46	30.6
Swimming	10	6.6
Immunocompromised disease (uncontrolled diabetes mellitus, on chronic steroidal therapy)	20	1.3

[Table/Fig-4]: Predisposing factor distribution (N=150). Multiple predisposing factors were seen in a single individual

Pruritis was the most common symptom 117 (78%) followed by ear pain 110 (73.3%) [Table/Fig-5]. *Aspergillus niger* was the most common fungal isolate (62%) [Table/Fig-6].

Symptoms	Number of cases (n)	Percentage (%)
Pruritis	117	78
Ear pain	110	73.3
Ear fullness	100	66.6
Ear discharge	46	30.6
Tinnitus	40	26.6
Hard of hearing	15	10

[Table/Fig-5]: Symptom-wise distribution of cases (N=150). *Single patient was found to have multiple symptoms

Species	Number of cases (n)	Percentage (%)
<i>Aspergillus niger</i>	93	62
<i>Aspergillus flavus</i>	36	24
<i>Aspergillus fumigatus</i>	15	10
<i>Candida albicans</i>	6	4

[Table/Fig-6]: Fungal isolates in mycotic otitis externa (N=150).

Clinically most (n=145, 96.6%) cases responded to clotrimazole. Only 5 (3.33%) cases did not respond to clotrimazole therapy [Table/Fig-7]. Of these, two had uncontrolled diabetes mellitus and three had habitual unsterile ear cleaning despite advices.

Response to clotrimazole	Number of cases (n)	Percentage (%)
Responders	145	96.67
Non responders	5	3.33
Total	150	100

[Table/Fig-7]: Sensitivity to clotrimazole ear drops (N=150).

DISCUSSION

A total of 150 cases of clinically diagnosed mycotic otitis externa patients were selected as the study population. In the study, extremes of age group were affected, with the youngest being two years and the eldest being 82 years; but the most commonly involved age group were of adolescent and middle age constituting 59.9% of total cases. The most common age groups involved as per studies are, 15-35 years (66.3%) as per Agarwal P et al., and average age of 23.5 was reported Bakshi SS and Das S which is similar to the findings of the current study [7,8].

In the present study, it was found that males were more the most affected than females with a ratio of 1.2:1. Which is similar to previous literature, 1.3:1 as per Agarwal P and Devi LS, and 2.3:1 as per Jeer M and Mallika N [7,9]. In one of the studies done by Viswanatha B et al., higher overall incidence was seen in male patients but there were more female patients in the immunocompromised group (36%) than the immunocompetent group (24%) [10].

In the present study, it was found the unilateral ear involvement is more than bilateral involvement. Of total 150, 143 cases had unilateral involvement constituting 95.3% of the total cases, of which 75 patients had left side involvement and 68 patients had right side involvement. In the study done by Agarwal P and Devi LS, majority of the patients (96.6%) presented with unilateral involvement of the ear [7]. In study by Viswanatha B et al., it has been reported that otomycosis is seen more frequently in immunosuppressed than immunocompetent [10]. It was found that among the predisposing factors unsterile methods of ear cleaning has been the most prominent factor, which is found in 86.6% of the 150 cases studies. It has also been found that, most of the patients had multiple habits or predisposing factors, like unsterile ear drops/oil administration was found in 72% cases, recurrent ear discharge in 40.6% cases. Topical antibiotic use can cause otomycosis, like ofloxacin [11].

Agarwal P and Devi LS, found more than 64% of cases had ear cleaning habit factor as a predisposing to otomycosis [7]. Study done by Viswanatha B et al., showed 62% having ear cleaning as predisposing factor and 60% having unsterile ear drop and/or oil administration [10]. Immunocompromised host also predisposes to otomycosis, in this study 20 patients had diabetes mellitus. The ones which were under control had good response to clotrimazole therapy [7,10].

In the present study the most common clinical feature was pruritis accounting to 117 (78%) patients. It is also found that most of the patients had multiple complaints or clinical features. A 73.3% of patients had ear pain complaint and the next major complaint was ear fullness which was seen in 66.6% of patients. A 30.6% patient had ear discharge, 26.6% patients had tinnitus and 10% had hard of hearing. As per Aneja KR et al., the most common initial complaints at the time of diagnosis were pruritis (73%) followed by otalgia (66.5%), ear blockage (57%) [12]. In the study conducted by Viswanatha B et al., itching and ear discharge were seen more in immunocompetent patients than in immunocompromised patients, whereas pain was present in 48% of immunocompromised patients and in 40% of immunocompetent patients [10].

In the present study, the fungal species identified were *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus*, candida species. A total of 93 patients (62%) had *Aspergillus niger* infestation 36 patients (24%) had *Aspergillus flavus* infestation *Aspergillus fumigatus* was isolated in 15 patients (10%) and candida in six patients (4%). In study by Viswanatha B et al., *Aspergillus niger* was isolated in 56% cases, *Aspergillus fumigatus* in 18% cases, *Candida albicans* in 16% cases, and *Penicillium chrysogenum* in 10% cases [10]. In a study conducted by Abdelzaleem M et al., *Aspergillus niger* was found to be the major organism isolated [13].

In the study, conducted by Sangavi AB et al., the most common isolated species was *Aspergillus niger* and the least isolated species was *Aspergillus terreus* [14]. In the study, out of 150 cases of mycotic otitis externa 145 cases responded to clotrimazole therapy, only five patients had recurrence. In the study by Agarwal P and Devi LS clotrimazole therapy was

found to be effective against aspergillus and candida species [7]. Clotrimazole is also studied to have an antibactericidal effect in addition to an antifungal effect. Clotrimazole has been found to be very effective in most of the species causing otomycosis [15]. In the study, conducted by Kurnatowski P and Filipiak A it has been found that topical clotrimazole is found to be more effective than topical fluconazole [16].

Patients were followed-up at weekly intervals and their response to treatment with 1% clotrimazole was assessed after aural toileting. Only five cases hadn't responded to clotrimazole therapy. Of these, two had uncontrolled diabetes mellitus, three had habitual unsterile ear cleaning, despite advices. The present describes a simple and economical way of treating majority of cases of mycotic otitis externa.

Limitation(s)

The study should be conducted in larger populations for better evaluation and generalisation of results. Systemic and oral antifungal indication in otomycosis needs to be studied better in a larger diverse population of immunocompromised patients.

CONCLUSION(S)

Mycotic otitis externa being the most common fungal infection affecting the external ear, especially patients from low socio-economic strata and immunocompromised people, a simple step-wise protocol is needed for proper treatment. The present study describes a simple method for treatment of mycotic otitis externa cases. Adequate removal of fungal hyphae and eradication of spore germination through a four week therapy, is the key. It helps to keep in reserve expensive oral and systemic antifungal for the absolutely indicated.

REFERENCES

- [1] Köhler JR, Hube B, Puccia R. Fungi that infect humans. *Microbiol Spect*. 2017;5(3) Doi: 10.1128/microbiolspec.
- [2] Ismail MT, Al-Kafri A, Ismail M. Otomycosis in Damascus, Syria: Etiology and clinical features. *Curr Med Mycol*. 2017;3(3):27-30. Doi:10.29252/cmm.3.3.27.
- [3] Bayó M, Agut M, Calvo MA. Infectious external otitis: etiology in the Terrassa region, culture methods, and considerations on otomycosis. *Microbiologia*. 1994;10(3):279-84. Spanish. PMID: 7873104.
- [4] Kryukov AI, Kunelskaya NL, Kunelskaya VY, Ivoylov AY, Shadrin GB, Machulin AI. Fungal otitis externa in children: principles of diagnosis and rational therapy. *Vestn Otorinolaringol*. 2020;85(1):60-63. Russian. Doi: 10.17116/otorino20208501160. PMID: 32241991.
- [5] Tasić-Otašević S, Golubović M, Đenić S. Species distribution patterns and epidemiological characteristics of otomycosis in Southeastern Serbia. *J Mycol Med*. 2020;30(3):101011. Doi: 10.1016/j.mycmed.2020.101011.
- [6] Kazemi A, Majidinia M, Jaafari A, Mousavi SAA, Mahmoudabadi AZ, Alikhah H. Etiologic agents of otomycosis in the north-western Area of Iran. *Jundishapur Journal of Microbiology*. 2015;8(9):e21776. Doi: 10.5812/jjm.21776.
- [7] Agarwal P, Devi LS. Otomycosis in a rural community attending a tertiary care hospital: assessment of risk factors and identification of fungal and bacterial agents. *Journal of Clinical and Diagnostic Research*. 2017;11(6):14-18. Doi: 10.7860/JCDR/2017/25865.10068
- [8] Bakshi SS, Das S. Otomycosis. *Medicina Clinica*. 2020;27:472. Doi: 10.1016/j.medcli.2019.08.003.
- [9] Jeer M, Mallika N. Clinicomycological study of otomycosis.. *Int J Curr Microbiol App Sci*. 2019;8(4):1334-7. Doi: 10.20546/ijcmas.2019.804.155
- [10] Viswanatha B, Sumatha D, Vijayashree MS. Otomycosis in immunocompetent and immunocompromised patients: comparative study and literature review. *Ear Nose Throat J*. 2012;91(3):114-21. Doi: 10.1177/014556131209100308.
- [11] Jackman A, Ward R, April M, Bent J. Topical antibiotic induced otomycosis. *Int J Pediatr Otorhinolaryngol*. 2005;69(6):857-60. Doi: 10.1016/j.ijporl.2005.01.022.
- [12] Aneja KR, Sharma C, Joshi R. Fungal infection of the ear: a common problem in the north eastern part of Haryana. *International Journal of Pediatric Otorhinolaryngology*. 2010;74(6):604-07. Doi: 10.1016/j.ijporl.2010.03.001.
- [13] Abdelazeem M, Gamea A, Mubarak H, Elzawayy N. Epidemiology, causative agents, and risk factors affecting human otomycosis infections. *Turk J Med Sci*. 2015;45(4):820-26. Doi: 10.3906/sag-1407-17.
- [14] Sangavi AB, Peerapur B, Gummadri N. Clinicomycological study of otomycosis in Raichur, Karnataka: a hospital based study. *Int J Otorhinolaryngol Head Neck Surg*. 2018;4(1):233-36.

[15] Stern JC, Lucente FE, Shah MK. In vitro effectiveness of 13 agents in otomycosis and review of the literature. *Laryngoscope*. 1988;98(11):1173-77. Doi: 10.1288/00005537-198811000-00005.

[16] Kurnatowski P, Filipiak A. Otomycosis: prevalence, clinical symptoms, therapeutic procedure. *Mycoses*. 2001;44(11-12):472-79. Doi: 10.1046/j.1439-0507.2001.00689.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Ear, Nose and Throat, Shri Vasant Rao Naik Government Medical College, Yavatmal, Maharashtra, India.
2. Assistant Professor, Department of Ear, Nose and Throat, Shri Vasant Rao Naik Government Medical College, Yavatmal, Maharashtra, India.
3. Senior Resident, Department of Ear, Nose and Throat, Shri Vasant Rao Naik Government Medical College, Yavatmal, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. AL Athul Krishna,
Room No. 108, PG Hostel, Shri Vasant Rao Naik Government Medical College,
Yavatmal-445001, Maharashtra, India.
E-mail: drathulkrishna1993@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Dec 04, 2022
- Manual Googling: Feb 28, 2022
- iThenticate Software: Apr 07, 2023 (12%)

ETYMOLOGY: Author Origin**EMENDATIONS:** 6**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Nov 19, 2022**Date of Peer Review: **Jan 12, 2023**Date of Acceptance: **Apr 10, 2023**Date of Publishing: **Jun 01, 2023**