Demographic profile and fungal characteristics in patients of otomycosis in North Indian population: A Prospective study

Nidhi Pandey¹, Sushil Kumar Aggarwal², Kirti Jaiswal³, Ragini Tilak⁴

ABSTRACT

Fungal infections such as otomycosis have been reported decades back. Distribution of this particular disease has been reported worldwide from the areas having a hot and humid environment especially tropical and subtropical zone. This study included 244 patients of suspected otomycosis from January 2017 to June 2018, in which the presence of fungal agents was determined by mycological examination. The mycological investigation revealed A. niger and Candida as predominant species. Incidence in the male population was higher than females. Otorrhea and pruritis were the common symptoms presented by patients. Several risk factors associated with otomycosis including moisture, broad-spectrum antibiotics and chemotherapeutic agents use, topical ear drops and frequent bathing or swimming was reported. Amphotericin B was found to be more sensitive followed by voriconazole during antifungal susceptibility testing. The objective of this study was to determine the prevalence of otomycosis with emphasis on involved etiologic agents and their antifungal sensitivity pattern.

Key words: A. niger, Candida, Fluconazole, MIC, Moisture, Steroid

Introduction

Otomycosis has been described as a mycotic infection of the external auditory canal with infrequent complications involving the middle ear.¹,² Distribution of this particular disease has been reported worldwide from the areas having a hot and humid environment especially tropical and subtropical zone.¹, ³ In India also, it is a common medical problem with individuals belonging to lower socioeconomic status and keeping poor hygiene.¹, 4,5 The fungus is usually secondary contaminant in cases of otitis externa and hence can be found mixed with bacterial infections also.⁶ The degree of infection may vary from acute/subacute to chronic, usually presenting with symptoms like ear itching, otalgia, aural fullness, hearing impairment and tinnitus. There are several risk factors associated with otomycosis including moisture, broad-spectrum antibiotics and chemotherapeutic agents use, topical ear drops, minor inflammation, physical injury, living in hot and humid zones and frequent bathing or swimming.⁶ The most common causative agents belong to the genus Aspergillus and Candida but some authors have collected more than 50 causative fungi species in their studies including species from the genera Penicillium, Fusarium, Mucoraceae, Scopulariopsis, Alternaria, Malassezia and as well various dermatophytes.⁶, ⁷

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An erroneous diagnosis of otomycosis and lack of caution in the administration of ototopical antibiotics may change the normally acidic environment of the external ear canal and the clinical process of otomycosis. Although otomycosis is a disease spread throughout the world, there are only a handful of studies regarding its prevalence, associated risk factors, and etiologic pathogens.

In this study, we aim to characterize the clinical presentation, predisposing factors, fungal agents involved and their antifungal susceptibility pattern.

Materials and Methods

A total 244 samples were included in the study for mycological analysis that was collected from 236 clinically suspected patients of otomycosis from the Out-Patient Department (OPD) of Otorhinolaryngology (ENT), Institute of Medical Sciences (IMS), BHU, Varanasi from January 2017 to June 2018. Immuno compromised individuals; patients suffering from malignant disease and having prior ear surgery or ruptured tympanic membrane were excluded from the study group. Both male and female patients presenting with symptoms like otorrhea, hearing loss, aural fullness, pruritis, and tinnitus were included. The samples were collected from patients that were clinically diagnosed to have otomycosis after taking relevant information and clinical details such as chief complaints, name, age, gender, suspected risk factors, occupation, history of infection and address, samples were collected by sterile cotton swabs. Further, the samples were brought to the mycology laboratory in the Department of Microbiology, IMS, BHU, Varanasi for mycological investigation.

The samples were processed for direct examination, isolation, and identification of the fungus on agar media. For direct microscopic examination, a small portion of the specimen was mounted in 10% KOH and observed microscopically for the presence of fungal structures such as hyphae (septate or aseptate) and budding cells. The specimen was inoculated on Sabouraud’s chloramphenicol agar (Himedia Laboratory Pvt. Ltd., Bombay, India) and incubated at 28°C for four weeks. After the observation of growth pattern, further identification of molds as well as yeasts was done on the basis of morphological characteristics. Lactophenol cotton blue wet mount was prepared for molds identification whereas CHROM agar along with germ tube test was executed for identification of Candida isolates.

Antifungal susceptibility testing of the isolates was executed according to CLSI guidelines documented by M44-A2 for Candida and by M51P for filamentous fungi. Disc diffusion assay was conducted in Mueller Hinton agar supplemented with 2% glucose and 0.5μg/ml methylene blue for Candida and Mueller Hinton agar without glucose for filamentous fungus. Culture suspension of the standard was prepared and swabbed on the media surface. Discs were placed on the inoculated plates and incubated at 28°C and 37°C. The zone of inhibition was observed and categorized into the susceptible, dose-dependent and resistant.

Results

Mycological investigations of total of 244 samples from 236 otomycosis suspected patients were done. Among the different age groups, the highest incidence of otomycosis was observed in between 21-40 years age group (43.82%), followed by 0-20 years (29.78%) and 60-80 years
(16.69%). The occurrence of fungal infection was higher in the male group that was 57% of the total study population.

Although usually unilateral ear involvement was noticed, some patients (n=5) showed bilateral otitis infection. Majority of the patients attending the OPD gave a history of discharge and earache. Out of these two hundred thirty-six patients, 159 had the otorrhea as most common presenting symptoms in combination with other tinnitus and pruritis. Other common symptoms and their prevalence have been listed (Table 1).

\[
\begin{array}{|c|c|c|}
\hline
\text{Symptoms} & \text{No.} & \% \\
\hline
\text{Otorrhea} & 166 & 88.77 \\
\text{Pruritis} & 138 & 73.79 \\
\text{Earache} & 104 & 55.61 \\
\text{Less hearing} & 83 & 44.38 \\
\text{Tinnitus} & 65 & 34.75 \\
\hline
\end{array}
\]

*Symptoms present solely or in combination during diagnosis

![Graph showing prevalence of otomycosis in different age groups](image)

On the basis of culture examination, 187 samples were positive for fungi. Among these 187 positive fungal isolates, the most prevalent genus was Aspergillus (n=131) followed by genus Candida (n=37). Among the genus Aspergillus, the most predominant species was A. niger (n=81) followed by A. flavus (n=34) (Table 3).
Table-3: Spectrum of the isolated fungi causing otomycosis (n=187)

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of Isolates</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspergillus niger</td>
<td>81</td>
<td>43.31</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>34</td>
<td>18.19</td>
</tr>
<tr>
<td>Aspergillus fumigates</td>
<td>8</td>
<td>4.28</td>
</tr>
<tr>
<td>Aspergillus nidulans</td>
<td>3</td>
<td>1.60</td>
</tr>
<tr>
<td>Aspergillus terreus</td>
<td>5</td>
<td>2.68</td>
</tr>
<tr>
<td>Candidasp</td>
<td>37</td>
<td>19.79</td>
</tr>
<tr>
<td>Scenedosporium</td>
<td>1</td>
<td>0.53</td>
</tr>
<tr>
<td>Rhizopuspp</td>
<td>3</td>
<td>1.60</td>
</tr>
<tr>
<td>Scopulariopissp</td>
<td>1</td>
<td>0.53</td>
</tr>
<tr>
<td>Unidentified Yeasts</td>
<td>9</td>
<td>4.81</td>
</tr>
<tr>
<td>Unidentified Filamentous</td>
<td>5</td>
<td>2.68</td>
</tr>
</tbody>
</table>

The highest percentage of sensitivity was observed against amphotericin B (98.39%) followed by voriconazole (97.32%) (Table 4).

Discussion

Otomycosis is the infection of otitis externa that occur frequently in a tropical and subtropical region with a hot and humid climate. Prevalence, etiologic agents and diagnostic studies in patients with suspected mycosis have been conducted in many different countries, including the USA, Spain, Bahrain, Brazil, Turkey, Russia, Nigeria, Nepal, Gabon, and Iraq. (6) The results of these studies suggest that otomycosis has a global prevalence. In addition, findings from these studies demonstrate that the saprophytic fungus Aspergillus, especially A. niger and Candida species are the most commonly identified fungal pathogens in otomycosis. (4) This is consistent with the limited mycology data available in this series. Infection with Candida can be more difficult to detect clinically because of its lack of a characteristic appearance like Aspergillus and can present as otorrhea not responding to aural antimicrobials. Otomycosis attributed to Candida is often identified by culture data. Several studies reported that the incidence was higher in the hot and humid zone.

This study is similar with the study conducted by Aneja et al in the context that the most prevalent microorganism was Aspergillus niger (43.31%). (10) This finding is also similar with the results obtained from a study done by Fasunla et al. (3) However, a study conducted by Barati et al in year 2011 found that A. flavus was the predominant etiologic mold in cases of otomycosis in central Iran. (5) Paulose et al reported that A. niger and A. fumigatus have been the most common fungal pathogens in ear canal infections. (11) Also several other results obtained from different studies conducted worldwide reported A. niger as the most common mycological pathogen. (12,13,14,15,16) Our results are slightly different from the findings of Kaur et al, who reported A. fumigatus as the most common cause of otomycosis. (17) The color of discharge from the ear and also the laboratory
identification may help towards the probable identification of the disease agent. Usually the black discharge may be due to Aspergillus genus, especially A. niger, and creamy or white discharge may be due to Candida genus. The high frequency of the black and white color in the present study is because of the incorporation of fungal elements in direct examination and also culture. Of course, culture, an appropriate media can be important for the identification of fungal agents in otomycosis. The highest incidence of fungal infection was accounted in between 21-40 yrs (43.31%) similar to findings by Ologe & Nwabuisi et al. Comparing the male-female ratio in some studies suggests that the incidence of otomycosis is higher in male rather than female patients. On the other side, a study conducted by Aneja et al reported a higher incidence in females. Our study is consistent with the previous reports made by Tang Ho et al, where the male ratio is higher (90%) in comparison to females.

Multiple in vitro studies to demonstrate the antifungal susceptibility for a proper treatment have been done but there is no consensus on the most effective drug. Among the all tested antifungal agents, susceptibility towards amphotericin B (98.39%) was more followed by voriconazole (97.32%). Decreased susceptibility of isolates towards Fluconazole was also observed. Our results are slightly different to study made by Ayse et al as they showed 100% sensitivity towards voriconazole and amphotericin B while we have obtained 97.32% and 98.39% sensitivity respectively. Ketoconazole and Fluconazole are azole antifungal agents that have a broad spectrum of activity. This family of chemical components is effective in treating the most common etiological agents of otomycosis. Topical Fluconazole has been reported effective in 90% of cases in several series. Amphotericin B is a member of the polynene family. It has been replaced by safer agents in most cases but is still used, despite its side effects, for life-threatening fungal infections. Nong in 1999 reported that Aspergillus and Candida albicans were sensitive to the use of amphotericin B as demonstrated in antifungal susceptibility tests. In the present study, we only executed antifungal susceptibility testing by disc diffusion. Broth micro-dilution is the ideal method to determine the susceptibility pattern. This broth micro-dilution method can be executed for strains, showing resistant on disc diffusion.

Conclusion

Early microbiological diagnosis in the cases of otomycosis is needed for prompt and effective treatment to avoid its serious complications. Knowledge of the causative fungi and its sensitivity pattern may contribute to effective management of cases of otomycosis. In our study, we described the demographic profile and fungal characteristics in patients of otomycosis of North Indian population. We also studied the antifungal susceptibility of various antifungal agents in our patients. Our study is the first study of its kind to study the various characteristics of otomycosis in North Indian population.

Prior Publication : Nil
Financial Support : Nil
Conflict of Interest : Nil
References


