

# Otomycosis in Western Iran: Clinical and Mycological Aspects

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Received 2016 August 19; Revised 2017 January 05; Accepted 2017 February 05.

## Abstract

**Background:** Otomycosis is a globally distributed superficial infection of the auricle and external auditory canal. Its incidence differs in various geographical regions due to the different climatic conditions.

**Objectives:** The aim of this study was to determine the incidence of otomycosis in Khorramabad, Lorestan province, western Iran, using mycological besides clinical criteria.

**Methods:** In this cross-sectional descriptive study, a total of 79 patients clinically suspected to otomycosis were recruited from April 2014 to April 2015. Specimens were collected using sterile swabs. All the specimens were subjected to direct examination using 10% KOH, and culture in Sabouraud dextrose agar containing chloramphenicol, malt-extract agar, and Czapek Dox agar. CHROMagar candida and carbohydrate assimilation profile in API 32 C were used for the identification of yeasts.

**Results:** Among 79 patients, 15 (19%) were confirmed for otomycosis. The most common agent was *Candida albicans* (5, 33.33%), followed by *Aspergillus flavus* (4, 26.64%), *Penicillium* spp. (3, 19.98%), *A. niger* (2, 13.32%), and *Alternaria* spp. (1, 6.66%). Females were the dominant involved group (11, 73.33%) and itching was the most frequent clinical complaint in 100% of cases with otomycosis.

**Conclusions:** Regarding the dissimilarity in fungal spectrum in our study and other investigations and unspecificity of clinical signs and symptoms for otomycosis, mycological examination could be a beneficial measure for accurate diagnosis and treatment of otomycosis.

**Keywords:** Otomycosis, Iran, *Aspergillus*, *Candida*

## 1. Background

Fungal involvement of the external ear, known as otomycosis, is a globally distributed superficial infection of the auricle and external auditory canal (1). Humid and warm climates, poor hygiene, application of hearing aids, bacterial otitis externa, dermatomycosis, long-term exposure to water, and trauma are some factors that facilitate the occurrence of otomycosis (2-4). Immunosuppression may lead to middle ear involvement and perforation of the tympanic membrane (5).

Patients with otomycosis usually complain of itching and even pain in the ear, otorrhea, tinnitus, impaired hearing, and aural fullness (3, 5). Although these symptoms are common, they are not pathognomonic for otomycosis (2, 6). Accordingly, clinical signs and symptoms should be approved by mycological methods including direct examination and culture.

Species from *Aspergillus* and *Candida* genera are recog-

nized as the most frequently isolated agents of otomycosis (7, 8). Other fungi like *Penicillium* spp., *Mucor* spp., *Fusarium* spp., and *Alternaria* spp. are sporadically reported, as well (3, 7, 9).

Efficient treatment of otomycosis usually requires multiple procedures including resolving the predisposing factors, mechanical removal and cleaning of debris, and appropriate antifungal therapy (10). The route of antifungal drug administration is usually topical. Systemic therapy is necessary in immunocompromised patients as well as in cases with severe and invasive forms such as fungal mastoiditis. Topical forms of miconazole, clotrimazole, bifonazole, tolnaftate, ciclopiroxolamine, and amphotericin-B as well as triazoles such as voriconazole, itraconazole, and posaconazole for oral administration are instances of available therapies for otomycosis. Furthermore, other compounds like fuchsin, solutions of gentian violet (crystal violet), and mercurochrome may be

used (7, 11). Nevertheless, recurrent otomycosis is not an unexpected situation. Therefore, treatment should be directly against the causal agent. Accordingly, the identification of causal fungi helps in the efficient treatment of otomycosis and provides a preventive measure for drug resistance in etiologic agents (7).

## 2. Objectives

To the best of our knowledge, there are no available data about the incidence of otomycosis and the causal agents in Lorestan province, western Iran. Therefore, in this study we aimed to evaluate the incidence of otomycosis in patients who referred to the Otorhinolaryngology clinics of Khorramabad, Lorestan, Iran. Furthermore, we tried to identify the etiologic agents and predisposing factors related to the positive cases.

## 3. Methods

### 3.1. Patients

During a one year period (from April 2014 to April 2015), a set of 79 patients suspected to otomycosis were enrolled in this study. All patients have at least one complaint indicative of otomycosis such as itching, otalgia, otorrhea, tinnitus, impaired hearing, and aural fullness.

**Ethical approval:** The study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by the human research committee of Lorestan University of Medical Sciences (Ethics approval code: LUMS.REC.1394.44).

**Informed consent:** An informed consent was obtained from each patient took part in the study.

### 3.2. Specimen Collection

Specimens were obtained by sterile swabs from external auditory canal of all patients. All the specimens were transferred to a medical mycology laboratory for mycological investigations.

### 3.3. Mycological Testes

Direct microscopy using 10% KOH was performed on all the specimens seeking for fungal elements such as septate and aseptate hyphae, yeast and conidia cells, and conidia formation structures. Furthermore, all the specimens were cultured on Sabouraud dextrose agar (Merck, Germany) containing chloramphenicol, malt-extract agar (Merck, Germany), and Czapek Dox agar (Himedia, India) and incubated at 30°C for 2 weeks. The cultures were controlled daily, and all colonies were identified using morphological characteristics in slide cultures, colony colors

on CHROMagar candida (CHROMagar, France), and carbohydrate assimilation profile in API 32 C (bioMerieux, France).

### 3.4. Statistical Analyses

The correlations between predisposing factors and otomycosis were statistically studied using chi-square, t-test or non-parametric tests according to the distribution of data in SPSS 18. P value < 0.05 was considered statistically significant.

## 4. Results

Among 79 patients enrolled in this study, 31 (39.2%) were male and 48 (60.8%) were female. According to the results of the mycological tests, otomycosis was confirmed in 15 out of 79 patients (19%). Fungal elements were seen in direct examination of all 15 cases and these findings were confirmed by positive cultures. The positive cases consisted of 4 (26.66%) males and 11 (73.33%) females. Itching was the most frequent clinical finding in 83.5% (66 of 79) of the study population and 100% (15 of 15) of the positive cases. The frequency of different clinical findings in the study population and positive cases of otomycosis are presented in [Table 1](#).

The leading isolated fungal genus was *Aspergillus*, accounting for 6 out of 15 cases (39.96%). However, *Candida albicans* was the most frequent fungal species isolated from 5 out of 15 (33.33%) cases of otomycosis. Also, an uncommon case of otomycosis due to *Alternaria* spp. was diagnosed. [Table 2](#) shows the frequency of different fungal species recovered from patients with otomycosis.

In this study, no statistically significant correlation was observed between otomycosis and factors like habitant, gender, swimming, application of hearing aids, trauma, and history of otitis externa. However, considering the mean age of positive ( $45.86 \pm 14.33$  years) and negative ( $36.36 \pm 16.2$  years) patients, a significant correlation between older age and otomycosis was confirmed (P value = 0.04).

## 5. Discussion

Otomycosis or fungal otitis externa is a fungal infection of the external ear, which can involve the middle ear in the cases of tympanic membrane perforation. It has a global distribution with higher frequency in tropical and sub-tropical regions (8, 12-14).

In our study the incidence of otomycosis among 79 suspected patients was 19% (15 out of 79). Bineshian et al. (8) reported a lower incidence (11.4%) of otomycosis among

**Table 1.** The Frequency of Different Clinical Findings Indicative of Otomycosis Among 15 Proven Cases of Otomycosis and all 79 Studied Patients

Clinical Finding	Positive Cases of Otomycosis (N=15)		Study Population (N=79)	
	Frequency	Percentage	Frequency	Percentage
Ear itching	15	100	66	83.5
Aural fullness	8	53.2	47	59.5
Hearing impairment	8	53.2	46	58.2
Otalgia	7	46.6	47	59.5
Tinnitus	6	39.9	26	32.9
Otorrhea	5	33.3	46	58.2
Ear inflammation	4	26.6	18	22.8
Cotton-like debris	4	26.6	4	5.1
Waxy Debris in ear	3	19.9	10	12.7

**Table 2.** The Frequency of Different Fungal Species Isolated from 15 Patients with Otomycosis

Fungal Species	Frequency	Percentage
<i>Aspergillus flavus</i>	4	26.64
<i>Aspergillus niger</i>	2	13.32
<i>Candida albicans</i>	5	33.33
<i>Penicillium spp.</i>	3	19.98
<i>Alternaria spp.</i>	1	6.66
<b>Total</b>	<b>15</b>	<b>100</b>

the suspected patients group in Semnan, Iran. However, higher incidences have been reported by other authors including 32.25% in Khouzestan Province, south-west of Iran (2), 43% in the north of Iran (1), 57% in Tehran (15), 69% in central Iran (4), and 92% in the north-west of Iran (11), among the study population with suspicion of otomycosis.

It has been well established that the incidence of otomycosis differs in various geographical regions due to the different climatic conditions (16, 17). Thus, the disagreement between the incidence of otomycosis in our and other studies in Iran could be due to the different geographical regions, as well as the different inclusion and exclusion criteria for patients defined by each research group.

The female gender was more commonly affected by otomycosis (73.33%, 11 of 15 patients) in our study which is in accordance with the results of other reports (1, 12, 15). Whereas, higher involvement of males was reported by some authors (11, 18).

Itching or pruritus was the most frequent symptom noted in 100% of the patients, which confirms the findings of Bhan et al. (18), Abdelazeem et al. (17), Kazemi et al. (11),

Barati et al. (4), and Jia et al. (5).

*C. albicans* was the leading fungal species isolated from 33.33% of the patients, followed by *Aspergillus flavus* (26.64%) and *Penicillium spp.* (19.98%). *C. albicans* is a natural habitant of human body; infections due to this yeast in individuals with predisposing factors are not an unexpected issue (11). Pontes et al. (19) found *C. albicans* as the most common species isolated from 30% of the otomycosis cases in their study, which is in agreement with our results. These findings dispute several previous publications that reported *A. niger* as the most frequent agent of otomycosis (11, 12, 15, 17, 20, 21). In spite of this, if we classify the etiologic agents as yeast and saprophytic molds, the majority (66.66%, 10 of 15) of our cases were due to the latter, which is in accordance with the findings of other publications (1, 2, 9, 14). *Alternaria spp.* is a dematiaceous fungi with rare reported cases of otomycosis in Iran (3). In the present study, we reported another case of fungal otitis externa due to this fungus.

The accurate diagnosis of otomycosis should be based on clinical and mycological criteria; in some cases imaging studies should be performed, as well (7). However, in many cases, diagnosis is completely based on clinical signs and symptoms, which are mainly unspecific (22-24).

According to the literature, the causal agents of otomycosis are highly divergent and their antifungal susceptibility profiles are different (3, 7). Also, drug resistance of etiological fungi and recurrent cases of otomycosis following unspecific treatment are reported (5, 25, 26). Therefore, mycological examinations in suspected cases of otomycosis and antifungal susceptibility testing prior to drug administration could be beneficial for accurate diagnosis and treatment.

Also, the results of Szigeti et al. (25, 27) indicated the low accuracy of conventional morphological methods in

the identification of black *Aspergillus* species as the most frequent cause of otomycosis. Accordingly, the application of suitable identification methods is preferred to provide accurate epidemiological data, which requires further studies.

The present study provided the first report on otomycosis in Lorestan province, western Iran. However, due to the limited number of patients investigated, our results could not be generalized. Furthermore, the antifungal susceptibility pattern of isolates was not determined in our study, which is another disadvantage. Thus, additional studies incorporating larger study populations, antifungal susceptibility testing, and treatment follow-ups are necessary.

In conclusion, the incidence of otomycosis in this study was 19% and the most common causative agent was *C. albicans*. Similar conditions have not been found in other regions of Iran. This indicates the necessity for ENT specialists to be aware of the leading causal agent in each geographical region in order to prescribe antifungal drugs appropriately. Also, the high incidence of different clinical complaints from patients with and without proven otomycosis highlights the need for mycological examination in addition to clinical examinations in the diagnosis of otomycosis.

## Acknowledgments

The authors appreciate the patients for their contribution to this study.

## Footnotes

**Authors' Contribution:** Asghar Sepahvand and Siros Kazemi designed and managed the study. Sajad Cheraghshahar performed the experiments and collected data. Mehdi Birjandi analyzed the data. Mohammad Yarahmadi and Rasoul Mohammadi assisted in experiments. Shahram Mahmoudi wrote the manuscript.

**Financial Disclosure:** None declared.

**Conflict of Interests:** The authors declare that they have no conflict of interest.

**Funding/Support:** This study was financially supported by Lorestan University of Medical Sciences, Lorestan, Iran (grant number: 1986).

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