
Epidemiology of Otomycosis at the Military Hospital Avicenne of Marrakech (Morocco)

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Abstract: Otomycosis is a fungal infection mainly affecting the outer ear, but can spread to the inner ear and become severe. The disease can cause a serious damage for its recurrence and resistance to treatment. The purpose of this work is to determine the prevalence of otomycosis in first place, then in second place to specify the contributing factors and to describe the spectrum of fungi involved. We conducted a prospective study over a period of 6 months between March 2018 and August 2018 in laboratory of parasitology and mycology at the Military Hospital Avicenna of Marrakech. For each patient we performed an aural sampling with sterile swabs. A direct examination and culture on Sabouraud-Chloramphenicol media with and without cycloheximide were carried out. The identification of fungi was based on the macroscopic, microscopic and phenotypic characteristics of colonies. Our study included 67 patients, of which 28 were positive, giving an overall prevalence of 41% with female predominance. The average age of our patients was 40 years old. Many factors enhanced the otomycosis, the daily cleaning of the external ear canal was the most recurrent factor (46%), followed by frequent bathing (35%). The most common species were *Aspergillus niger* (46%), *Aspergillus flavus* (35%), and *Candida albicans* (17%). This study demonstrates the importance of otomycosis in the etiologies of otitis in our population. The management of these infections must include a mycological study in order to establish an antifungal therapy adapted to the pathogen.

Keywords: Otomycosis, Favoring Factors, Otorrhea, *Aspergillus sp*, *Candida sp*

1. Introduction

Otomycosis is an acute, subacute or chronic fungal infection of the external ear canal [1]. The disease is a difficult and frustrating entity for both patients and otolaryngologists. From the outset mistakenly taken for a bacterial infection and most often treated following the same procedures. The mycological diagnosis of otomycosis generally occurs after many failures probabilistic therapeutic protocols which considerably increases the time of diagnosis [2]. The correct diagnosis of otomycosis is based on the presence of clinical and otoscopic signs confirmed by a mycological study, providing adequate drug management and a judicious antifungal choice depending on the causative

agent [3]. In Morocco, studies that have focused on otomycosis remain rare. Thus the present work is ambitious in order to approach the clinical and mycological study of otomycosis in the city of Marrakech.

2. Patients and Methods

Our prospective study was conducted during six months between March 2018 and August 2018 in the Parasitology and Mycology Department in collaboration with the Department of Otolaryngology at the Avicenne Military Hospital in Marrakech.

2.1. Patients

This study included 67 patients received in otorhinolaryngology consultation, in whom the diagnosis of external fungal otitis was suspected on clinical and otoscopic examination.

Patients on antifungal therapy during the 15 days prior to their consultation were excluded from our study.

Epidemiological data on age, sex and some personal habits (cotton swab cleaning, unfavorable hygiene, repeated baths and the frequent use of antibiotic and corticoid-based ear drops) were collected on a questionnaire, reason for consultation and the presence of functional signs (earache, otorrhea, pruritus, hearing loss).

2.2. Methods

For each patient, an ear sample is microscopically taken during otoscopic examination using two sterile dry cotton swabs, one for direct microscopic examination, and the other for culture.

The direct examination was performed under an optical microscope in a drop of sterile 0.9% saline with systematic culture on Sabouraud-chloramphenicol and Sabouraud-chloramphenicol-cycloheximide media. The tubes are incubated in the oven at 30°C and observed daily for two weeks. The identification of yeast colonies was based first on the blastosis test and then the study of the assimilation of sugars by fungi (Auxanogram) using API 20 C AUX galleries. Filamentous fungi were identified on the basis of macroscopic and microscopic criteria.

3. Results

Out of the patients enrolled in otorhinolaryngology consultation during the six months only 67 patients were clinically suspected of having otomycosis from whom we collected our samples. Fungal isolates were identified in 28 specimens based on direct examination and a positive culture, with a prevalence of 41%. In this group of patients with otomycosis, a female predominance was noticed (female: 16(57%), male: 12(43%)) with a sex ratio (F/H) of 1.33. A peak of incidence was noted in the age ranges between 4 and 72 years with an average age of 40 years. The involvement of the left ear was seen in (64%) of the patients and that of the right ear was noted in (36%) of the cases. No bilateral involvement was found. Otorrhea was the most common symptom in 42% of otomycotic patients, followed by pruritus (28%). Other symptoms were otalgia (21%), hypoacusia (10%), and blocked ear sensations (7%) (Table 1). Frequent cleaning of the ear with cotton bud (46%) has been shown to be the predominant predisposing factor for otomycosis. The second most common predisposing factor was frequent bathing (35%) (Table 2). Pre-diagnosis use of antibiotic-based aural therapy was reported in 61% of patients with otomycosis. The results of the direct examination were consistent with those of the culture (Table 3) in the 28 positive samples. The culture allowed the isolation of 29

strains including 72% of molds (21 strains) and 28% of yeasts (8 strains). The most frequently encountered fungal agents are *Aspergillus niger* (35%), *Aspergillus flavus* (25%), and *Candida albicans* (17%). The association of two fungal species was noted in one patient (Table 4).

Table 1. The different reasons for consultation.

Reported symptoms	Number (%)
Otorrhea	12(42%)
Pruritus	8(28%)
Earache	6(21%)
Hearing Loss	3(10%)
Clogged ear sensation	2(7%)

Table 2. Reported favoring factors for otomycosis.

Favoring factors	Number (%)
Frequent cleaning with cotton buds	13(46%)
Bathing	10(35%)
Eczema of the external auditory canal	3(10%)
Diabetes	3(10%)
Nasopharyngitis	2(7%)
corticosteroid	2(7%)

Table 3. Results of the direct examination and culture.

	Positive culture	Negative culture	Total
Positive direct examination	28	0	28
Negative direct examination	0	39	39
Total	28	39	67

Table 4. Etiological agents of otomycosis.

Fungal species	Number (%)
<i>Aspergillus niger</i>	10(35%)
<i>Aspergillus flavus</i>	7(25%)
<i>Candida albicans</i>	5(17%)
<i>Candida famata</i>	2(7%)
<i>Aspergillus terreus</i>	2(7%)
<i>Aspergillus fumigatus</i>	1(3%)
<i>Aspergillus candidus</i> + <i>candida albicans</i>	1(3%)

4. Discussion

The otomycoses are cosmopolitan affections, their prevalence varies according to the regions. Tropical and subtropical regions, given climatic and environmental factors, are more exposed [4]. According to the literature, the diagnosis is most often made in adults over 35 years of age. The otomycoses can meet in healthy subjects and without notable antecedents, but most often there are many involved factors such as recent treatment with antibiotics, changes in skin pH or antibacterial properties of cerumen, recent otologic surgery or trauma to the external ear canal. In general, all conditions inducing local immunodeficiency, such as local corticosteroids treatment for eczema in the external ear canal, increase the risk of developing otomycosis [5]. In recent years, there has been a dramatic increase in the incidence of mycotic infections and in the diversity of pathogenic fungi. Our study revealed a prevalence of 41%, a rate similar to that reported by a study conducted in Rabat,

Morocco, which included 70 patients [6]. However, in India, Ivory Coast and Nigeria, very high rates of 78.3%, 80% and 95.5% respectively were reported. In these tropical and subtropical countries, high humidity, warm weather and dust in the environment promote the spread and growth of molds [7, 8, 9]. In our study we noted a female predominance with a sex ratio (F/H) of 1.33. In Turkey, it has been observed that there is a sex ratio largely in favor of women (8/2), this has been explained by the authors by the wearing of head covers [10]. The same thing was observed in Rabat (Morocco) where women accounted for three-quarters of cases reported as fungal infections [6]. Other studies have shown that the prevalence of otomycosis is higher in boys than in girls, so boys would be more active outdoors and therefore more exposed to air borne spores [11-13]. In our series, 13 positive patients used to routinely clean the ears daily with cotton swabs, present a prevalence of 46%. This parameter was found in Nigeria with a rate of 82.54% of the total number of patients with otomycosis [14]. In southern India and Ivory Coast, the prevalence of self-cleaning history was significantly higher in the otomycosis group compared with the control group [15, 16]. Indeed, the obsessive manipulation of the outer ear by cotton swabs or hard objects such as wooden sticks to clean the ear or relieve itching causes a lack of ear wax which can lead to drying of the stratum corneum, which may contribute to the development of inflammation of the ear canal. As well as microtrauma on the skin of the external auditory canal and the deposition of fungal conidia in the wound leading to a fungal infection [17, 18, 19]. Bathing is an obvious risk factor for otitis externa, it reduces the acidity of the skin of the external auditory canal and alters the protective ceruminous film. Several studies have found that swimming is a predisposing factor for otomycosis [14, 20, 21, 22]. Indeed, in Turkey [20], 27% of patients with otomycosis bathed frequently in the pool or the sea and 23% had frequented the thermal baths which is consistent with our findings, 35% of otomycosis cases were related to frequent swimming, especially in the thermal baths. The use of local antibiotherapy imbalances the flora of the external auditory canal in favor of micromycetes as well as the use of local steroids (with or without antibiotics) [23]. In another study, the authors found that the risk of contracting otomycosis was 9-fold higher in patients who misused such ear treatments [15]. In another work, the authors also showed that the prevalence of the use of ear drops was significantly higher in the group of otomycosis compared to the control group (20% versus 9%) [16]. In our study, 61% of patients with otomycosis previously used local antibiotic therapy. It should be noted that the use of an antibiotic-based ear treatment was associated in 90% with the occurrence of otomycosis [6]. The manifestations of this pathology remain most often paucisymptomatic and had an insidious evolution [2, 4]. In this regard, atrial pruritus, which is often mild (28%), otorrhoea (42%) and earache (21%) were the main reasons for consultation in our study. The clinical symptomatology is quite similar according to the different authors but at variable frequencies [16, 24-26]. The most

commonly found agent in Europe is *Candida albicans*, followed by *Aspergillus niger* and *Aspergillus flavus*. *Aspergillus fumigatus*, which poses the most therapeutic problems, is more rare [27]. In the subtropical countries as well as in Morocco, the ratio is reversed with a predominance of *Aspergillus*. According to a prospective study in the Department of Otolaryngology and Maxillofacial Surgery at Rabat Specialty Hospital, a dominance of filamentous fungi compared to yeasts was found. In the filamentous fungi, two species were incriminated, *A. niger* and *A. flavus*. Yeast-like fungi are exclusively represented by the genus *Candida* [6]. In Mexico, the authors also noted the predominance of molds (63.9%) with *A. flavus* (26%) on yeasts dominated by *C. albicans* (26.8%) [28]. In Brazil, yeasts predominated with *C. albicans* (30%), *C. parapsilosis* (5%), *C. tropicalis* (5%) compared with filamentous fungi represented by *A. niger* (20%), *A. flavus* (10%) and *A. fumigatus* (5%) [25]. In a Nigerian study, it was noted that the main agents of the predominant otomycoses are the fungi of the genus *Aspergillus* (63.2%) with *A. fumigatus* (39.5%) and on the fungi of the genus *Candida* (35.5%) with *C. albicans* (18.4%) [8]. While the predominant etiologic agents in another study were *C. albicans* (28.3%) and *A. fumigatus* (5.7%) [29]. In Asia, filamentous fungi are the predominant agents of otomycosis. Thus, Kaur et al, found respectively, *A. fumigatus* (41.1%), *A. niger* (36.9%) and *C. albicans* (8.2%) [4]. In Iran, *A. niger* is the most involved fungus in otomycosis (62.9%) [30]. In Spain [31], the predominantly isolated agents are filamentous fungi with *A. flavus* (42.4%), *A. niger* (35.9%) and *A. fumigates* (12.5%). While in Poland otomycosis is most often caused by fungi of the genus *Candida* (60%) [32]. In our study, the culture allowed the isolation of 29 strains, the filamentous fungi come at the top of our isolates, represented exclusively by molds (72%) and yeast-like fungi (28%). *Aspergillus* is the most predominant pathogens, with a particularly high frequency of *A. niger* (35%) probably due to its preference for the external auditory canal and its ability to produce a large quantity of conidia [31]. For yeasts, only the genus *Candida* was isolated with *C. albicans* (17%) seeded. This difference in the prevalence of pathogens in different countries is related to the environmental and climatic conditions of the development of each fungal species.

5. Conclusion

In Morocco, the prevalence of otomycosis in the otolaryngology department of the Military Hospital Avicenne of Marrakech is 41%. In our study, the genus *Aspergillus* was found to be the most common fungus involved in otomycosis. Since the clinical aspects are not specific, the mycological diagnosis is essential to know the exact etiology of the otomycosis in order to establish an appropriate antifungal treatment. The education of the population is a nother important concern and must be taken in to account.

Conflicts of Interest

There are not any potential or actual competing interests.

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