

Otomycosis: Epidemiological, Clinical and Mycological Profile

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ABSTRACT

Background: Otomycosis is a common fungal infection of the external auditory canal, frequently underdiagnosed owing to the nonspecific nature of its clinical signs and its resemblance to bacterial otitis externa, which justifies systematic mycological confirmation.

Objective: To describe the epidemiological, clinical and mycological profile of otomycosis and to identify its predisposing factors, in light of a review of the literature.

Methods: A prospective study was conducted over a one-year period, from October 2023 to October 2024, in the Department of Parasitology-Mycology at Moulay Ismail Military Hospital in Meknes. 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.

Results: Of 94 patients with clinical suspicion, 40 were confirmed mycologically, giving a prevalence of 42.5%. A female predominance was observed (62.5%, F/H sex-ratio 1.67). The 41-60-year age group was the most represented (57.5%). Self-cleaning of the ear canal was the main predisposing factor (90%). Ear pruritus was the most frequent symptom (72.5%), followed by otalgia (67.5%). *Aspergillus niger* was the most frequently isolated species (40%), followed by *Candida albicans* (20%).

Conclusion: 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.

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Introduction

Otomycosis is a superficial fungal infection of the external auditory canal (EAC), frequently encountered in otorhinolaryngology consultation [1,2]. Its course is most often acute or subacute, but it may become chronic; in some cases of tympanic perforation, it may also involve the middle ear, or exceptionally the inner ear, in the form of invasive necrotizing otitis [1,3].

Its prevalence varies widely across studies, ranging from 5 to 30% of all cases of otitis externa, with particularly high rates in humid tropical and subtropical regions, notably in Africa [2]. The main causative agents belong to the genera *Aspergillus* and *Candida*, with *Aspergillus niger* and *Candida albicans* being the most frequently reported species worldwide and in Africa [2,3].

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Numerous factors predispose to the occurrence of otomycosis: local trauma to the EAC (particularly related to cotton-swab use), prolonged use of topical antibiotics or corticosteroids, exposure to a hot and humid climate, frequent contact with water, prolonged wearing of a headscarf or veil, and certain conditions favoring immunosuppression such as diabetes [2].

Diagnosis relies on a combination of clinical findings (otalgia, pruritus, otorrhea) supplemented by mycological examination, the only means of confirming the fungal etiology and guiding the most appropriate antifungal treatment [1,3]. In Morocco, studies that have focused on otomycosis remain. In this context, the present study aims to describe the epidemiological, clinical, and mycological profile of otomycosis diagnosed at Moulay Ismail Military Hospital in Meknes, and to discuss its particularities through a review of the literature.

Patients and Methods

Our prospective study was conducted over a one-year period, from October 2023 to October 2024, in the Department of Parasitology-Mycology at Moulay Ismail Military Hospital in Meknes.

Patients

This study included patients attending an otorhinolaryngology consultation at Moulay Ismail Military Hospital in Meknes, in whom the diagnosis of otomycosis was suspected based on clinical and otoscopic examination.

Patients who had received antifungal therapy during the 15 days prior to their consultation were excluded from the study.

Epidemiological and clinical data, including age, sex, personal habits such as ear cleaning with cotton swabs or other objects, repeated swimming, and the use of antibiotic and/or corticosteroid ear drops, as well as personal and medical history, were collected using a standardized questionnaire. The reason for consultation and the presence of functional signs, including otalgia, otorrhea, pruritus, aural fullness, tinnitus, and hypoacusis, were also recorded.

Methods

For each patient, an ear sample was 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 were incubated in the oven at 28°C and observed daily for two weeks. The identification of yeast colonies was based first on the blastosis test and then on the study of sugar assimilation by fungi (auxanogram) using API galleries. Filamentous fungi were identified on the basis of macroscopic and microscopic criteria.

Results

Out of the patients enrolled in otorhinolaryngology consultation

during the one-year period, only 94 patients were clinically suspected of having otomycosis, from whom we collected our samples. Fungal isolates were identified in 40 specimens based on direct examination and a positive culture, with a prevalence of 42.5%.

Demographic Data

In this group of patients with otomycosis, a peak of incidence was noted in the 41–60-year age group, with 23 cases (57.5%) (Figure 1). A female predominance was noticed (female: 25 [62.5%], male: 15 [37.5%]), with a sex ratio (F/H) of 1.67 (Figure 2).

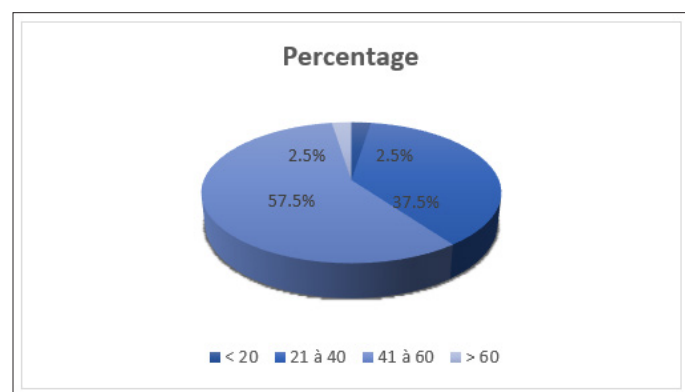


Figure 1: Distribution of otomycosis cases by age group.

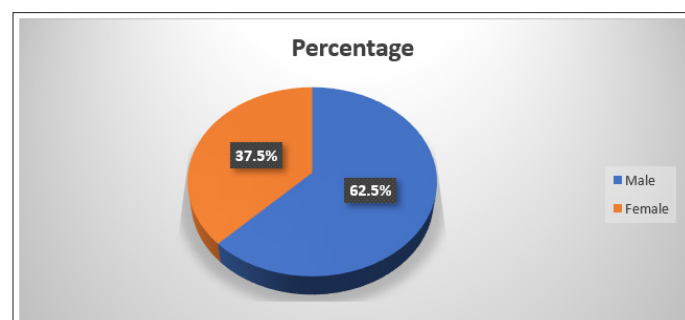


Figure 2: Distribution of otomycosis cases by sex.

Preexisting Diseases

Among the 40 patients with otomycosis, preexisting diseases were identified in 7 patients (17.5%). Type 2 diabetes mellitus was the most frequently reported condition, affecting 3 patients (7.5%), followed by hypertension in 2 patients (5%). Type 1 diabetes mellitus and Behçet's disease were each reported in 1 patient (2.5%) (Figure 3).

Favoring factors	Number (%)
Frequent cleaning with cotton buds	36(90%)
Use of ear drops containing corticosteroids, antibiotics, or antiseptics	29(72,5%)
Bathing	25(62,5%)
Veil-wearing	20(37,5%)
Eczema of the external auditory canal	3(7,5%)
Hearing-aid use	1(2,5%)
Previous otologic surgery or tympanoplasty	1(2,5%)

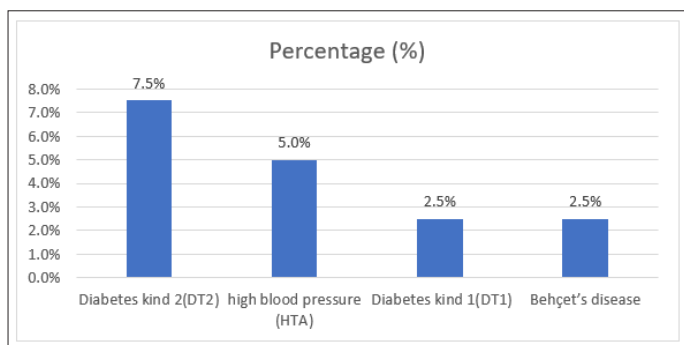


Figure 3: Preexisting diseases among patients with otomycosis.

Predisposing Factors

Frequent cleaning of the ear canal with cotton swabs (90%) has been shown to be the predominant predisposing factor for otomycosis. Pre-diagnosis use of antibiotic-based aural therapy was reported in 72.5% of patients with otomycosis, followed by frequent swimming in a pool or the sea (62.5%) (Figure 4).

Reported symptoms	Number (%)
Pruritus	29(72.5%)
Otalgia	27(67.5%)
Clogged ear sensation	10(25%)
Otorrhea	8(20%)
Tinnitus	5(12.5%)
Hypoacusis	4(10%)

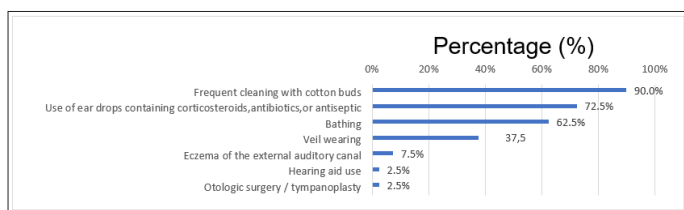


Figure 4: Reported favouring factors for otomycosis.

Clinical Presentation

Pruritus was the most common symptom in 72.5% of otomycotic patients, followed by otalgia (67.5%). Other symptoms were blocked ear sensations (25%), otorrhea (20%), tinnitus (12.5%), and hypoacusis (10%) (Figure 5).

Fungal species	Number (%)
Aspergillus niger	16(40.0%)
Candida albicans	8(20.0%)
Aspergillus fumigatus	6(15%)
Candida parapsilosis	5(12.5%)
Aspergillus flavus	3(7.5%)
Trichophyton mentagrophytes	2(5%)

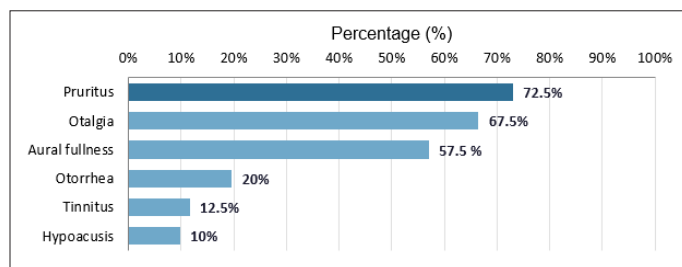


Figure 5: The different reasons for consultation.

Mycological Results

The culture allowed the isolation of 40 strains, including 62.5% of molds (25 strains), 32.5% of yeasts (13 strains), and 5.0% of dermatophytes (2 strains). The most frequently encountered fungal agents are *Aspergillus niger* (40.0%), *Candida albicans* (20.0%), and *Aspergillus fumigatus* (15.0%). *Aspergillus flavus* accounted for 7.5% of the isolates, while *Candida parapsilosis* and *Trichophyton mentagrophytes* represented 12.5% and 5.0%, respectively. The association of two fungal species was not observed (Figure 6).

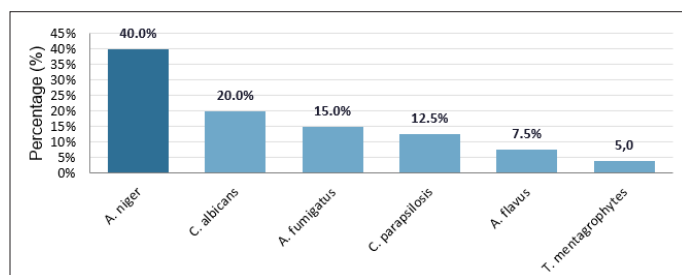


Figure 6: Etiological agents of otomycosis.

Discussion

Otomycosis is a superficial fungal infection of the external ear, mainly located in the external auditory canal. It corresponds to a fungal infection of the epithelium of the external auditory canal and constitutes a frequent condition in otorhinolaryngological practice. Its diagnosis relies on the combination of clinical data and the results of mycological examination, given the nonspecific nature of several clinical manifestations [1,2].

Otomycosis is a cosmopolitan condition whose prevalence varies according to geographic region, tropical and subtropical areas being particularly exposed owing to climatic and environmental factors, and the literature generally indicates that the diagnosis is most often made in adults over 35 years of age [4]. It may occur in otherwise healthy individuals with no notable history, but several contributing factors are frequently identified, including recent antibiotic therapy, alterations in skin pH or in the antibacterial properties of cerumen, and recent otologic surgery or trauma to the external auditory canal; more generally, any condition favoring local immunosuppression, such as topical corticosteroid treatment for eczema of the external auditory canal, increases the risk of developing otomycosis [5]. In recent years, a marked increase has been observed in the incidence of fungal ear infections and in the diversity of the causative fungal species involved.

In our series, 40 of the 94 patients with clinical suspicion of otomycosis were confirmed mycologically on the basis of direct examination and positive culture, giving a prevalence of 42.5%. This frequency lies within the range reported in several Moroccan and African series. Aboulmakarim et al. reported a frequency of 41% in Rabat, while Ait Ouzdi et al. found a comparable frequency of 41% in Marrakech [3,6]. Iken et al. had reported a frequency of 37.5% at Mohammed V Military Hospital, Rabat [7]. Conversely, Zekri et al. recently reported a higher frequency of 66.4% in a series conducted in Rabat [8]. Considerably higher prevalences have also been described outside Morocco, particularly in tropical and subtropical countries: rates of 78.3% in India, 80% in Ivory Coast and up to 95.5% in Nigeria have been reported, likely reflecting the influence of a hot, humid climate and greater environmental dust exposure, conditions known to favor fungal growth and dissemination [9-11].

The differences observed between studies may be related to the characteristics of the populations studied, the inclusion criteria, recruitment methods, the geographic and climatic context, and the diagnostic methods used. In our series, the prevalence of 42.5% confirms the substantial frequency of this infection among patients with clinical suspicion and underlines the value of mycological confirmation.

In our series, middle-aged adults were predominant. The 41-60-year age group accounted for 23 of the 40 cases, i.e. 57.5%. This was followed by the 21-40-year group with 15 cases (37.5%), while patients under 20 years and those over 60 years each accounted for 2.5% of cases. This distribution is consistent with that reported by Zekri et al., in whom the 40-60-year group was also the most represented [8]. These findings may be related to the cumulative effect over time of ear-manipulation habits and repeated use of topical treatments, as well as to the age structure and occupational characteristics of the populations studied. These findings are also in line with the literature, which generally indicates that otomycosis is most often diagnosed in patients over 35 years of age [4].

A female predominance was observed in our series, with 25 women (62.5%) versus 15 men (37.5%), giving a sex ratio (F/H) of 1.67. A female predominance has also been reported in several Moroccan and African series, notably by Aboulmakarim et al. in Rabat, who similarly found that women accounted for nearly three-quarters of otomycosis cases, and by Djafarou et al. in Niamey [3,12]. A markedly female-predominant sex ratio (8/2) has also been described in Turkey, where the authors attributed this imbalance to the frequent wearing of headscarves, a factor that may plausibly contribute to the high frequency of veil-wearing observed among our own female patients [13]. Zekri et al. also found a female predominance [8]. Conversely, some series have reported a more balanced distribution between sexes [7].

Diabetes was the main comorbidity found in our series, present in four patients (10%), including three patients with type 2 diabetes and one with type 1 diabetes. Arterial hypertension was found in 5% of patients and Behçet's disease in 2.5%. Diabetes is regularly cited in the literature among conditions likely to predispose

to fungal infections, notably through impairment of immunity and of the epithelial barrier [2,14]. However, in the absence of a control group, these results do not allow determination of whether these comorbidities constitute independent risk factors. Self-cleaning of the external auditory canal was the most frequently reported predisposing factor in our series, concerning 36 patients (90%). This manipulation included the use of cotton swabs, wooden sticks, metal ear-picks or hairpins. Repeated mechanical manipulation may cause epithelial microtrauma and impair the protective barrier of the ear canal, thereby facilitating fungal colonization. Prasad et al. also identified compulsive cleaning of the ear canal with hard objects among the main predisposing factors [14]. A comparably high frequency of self-cleaning has been reported in Nigeria, where Fasunla et al. found this habit in 82.54% of otomycosis patients [15]. In southern India and Ivory Coast, the prevalence of self-cleaning history was found to be significantly higher in otomycosis patients than in matched controls, further supporting the role of this behavior as a predisposing factor rather than a mere coincidental finding [14,16].

Frequent swimming in a pool or the sea was reported in 25 patients (62.5%) in our series. In Turkey, Ozcan et al. similarly found that 27% of otomycosis patients bathed frequently in a pool or the sea, and 23% had attended thermal baths, findings broadly consistent with the high frequency of swimming-related exposure observed in our population [17]. Repeated exposure to water is classically considered a predisposing circumstance for otomycosis, as it reduces the acidity of the skin of the external auditory canal and alters the protective ceruminous film. However, recent data suggest that swimming is not necessarily an independent risk factor after adjustment for other variables [18]. In our descriptive study, it should therefore be interpreted as a frequently observed exposure rather than as a demonstrated independent risk factor.

Veil-wearing concerned 15 of the 25 women in our series, i.e. 60.0% of women and 37.5% of the entire cohort of 40 patients. This high frequency is of interest in our context. Prolonged wearing of a veil or headscarf could theoretically contribute to maintaining a warmer, more humid environment around the ear, an explanation similar to that proposed for the female predominance reported in Turkey [13]. However, in the absence of a control group, our study does not allow an independent statistical association to be established between veil-wearing and otomycosis. It is therefore preferable to consider it as a potentially predisposing exposure rather than as an established risk factor.

The use of ear drops containing antibiotics, corticosteroids or antiseptics was reported in 29 patients (72.5%). Topical treatments may alter the local microbial ecosystem and, when used repeatedly or for a prolonged period, favor fungal overgrowth. Jackman et al. described cases of otomycosis occurring after topical antibiotic treatment, while Prasad et al. also identified antibiotic ear drops among important predisposing factors [19,14]. In Ivory Coast, Yavo et al. found that the risk of developing otomycosis was nine-fold higher among patients who misused such ear treatments, and in India, the prevalence

of ear-drop use was reported to be significantly higher in the otomycosis group than in controls (20% versus 9%) [16,14]. In Rabat, Aboulmakarim et al. likewise found that prior antibiotic-based ear treatment was associated with the occurrence of otomycosis in as many as 90% of cases, a proportion that underscores the potential contribution of local antibiotherapy to fungal overgrowth of the external auditory canal [3].

The clinical diagnosis of otomycosis relies on the combination of functional signs and otoscopic examination. However, clinical manifestations remain nonspecific and may be observed in other causes of otitis externa. In our series, ear pruritus was the most frequent symptom (72.5%), followed by otalgia (67.5%). A sensation of aural fullness (blocked ear) was found in 25% of patients, otorrhea in 20%, tinnitus in 12.5% and hypoacusis in 10%.

The predominance of pruritus and otalgia is consistent with several data from the literature. Ho et al. reported otalgia and otorrhea among the most frequent manifestations, while Zekri et al. also found otalgia and otorrhea to predominate [20,8]. Differences between studies may be related to the duration of infection, the degree of ear-canal inflammation, the presence of fungal debris, and the criteria used to collect symptoms.

The nonspecific nature of these manifestations is an important consideration. Pruritus, otalgia, otorrhea, a sensation of obstruction, or hypoacusis may also be observed in the course of bacterial otitis externa or dermatoses of the ear canal. Thus, clinical examination allows otomycosis to be suspected but is not always sufficient to establish its fungal etiology with certainty, which justifies recourse to mycological examination [1,4].

Mycological confirmation is an important step in the diagnosis of otomycosis. In our study, the diagnosis was retained on the basis of direct examination and positive culture. Direct examination allows rapid detection of fungal elements, while culture allows isolation and identification of the causative agent. This confirmation is particularly useful when the clinical presentation is nonspecific or when infection persists despite initial treatment.

Mycologically, *Aspergillus niger* was the most frequently isolated species, found in 16 patients (40%), followed by *Candida albicans* (20%), *Aspergillus fumigatus* (15%), *Candida parapsilosis* (12.5%), *Aspergillus flavus* (7.5%) and *Trichophyton mentagrophytes* (5%). The predominance of *A. niger* is consistent with several Moroccan and African studies.

Aboulmakarim et al. reported *A. niger* in 35% of patients in Rabat, while Ait Ouzdi et al. found this species in 46% of cases in Marrakech [3,6]. In Niamey, Djafarou et al. also reported a predominance of *A. niger* [12]. A genus-level analysis conducted in Nigeria similarly identified *Aspergillus* species in 63.2% of cases, with *A. fumigatus* accounting for 39.5%, and *Candida* species in 35.5%, with *C. albicans* representing 18.4% [11]. Conversely, another Nigerian study reported *C. albicans* as the predominant agent (28.3%), followed by *A. fumigatus* (5.7%) [21].

In our series, *Candida albicans* ranked second (20%), ahead of *A. fumigatus* (15%) and *C. parapsilosis* (12.5%). The frequency of *Candida* species varies according to region and population studied. Pontes et al. also showed that *Candida* constitutes an important component of the spectrum of agents responsible for otomycosis in Brazil [22].

The relative distribution of causative agents also varies markedly across geographic regions, reflecting differences in climate and environmental exposure. In Europe, *Candida albicans* is generally reported as the most common agent, followed by *Aspergillus niger* and *Aspergillus flavus*, with *Aspergillus fumigatus*, which poses the greatest therapeutic difficulties, remaining comparatively rare [23]. In Mexico, molds predominate (63.9%), with *A. flavus* accounting for 26% of isolates, while yeasts are dominated by *C. albicans* (26.8%) [24]. In Brazil, by contrast, yeasts predominate, led by *C. albicans* (30%), with *C. parapsilosis* and *C. tropicalis* each representing 5%, compared with filamentous fungi such as *A. niger* (20%), *A. flavus* (10%) and *A. fumigatus* (5%) [22]. In the Indian subcontinent, filamentous fungi are similarly predominant, with *A. fumigatus* (41.1%), *A. niger* (36.9%) and *C. albicans* (8.2%) [4]. In Iran, *A. niger* is reported as the leading agent, accounting for 62.9% of isolates [25]. In Spain, filamentous fungi likewise predominate, with *A. flavus* (42.4%), *A. niger* (35.9%) and *A. fumigatus* (12.5%) [26]. In Poland, however, otomycosis is most often attributed to *Candida* species, which account for up to 60% of cases [27]. This geographic heterogeneity in the distribution of causative agents is thought to reflect differences in environmental and climatic conditions favoring the growth of particular fungal species, and reinforces the need for systematic mycological identification to guide antifungal therapy adapted to the local epidemiological context.

The isolation of *Trichophyton mentagrophytes* in two patients (5%) deserves particular attention. Dermatophytes are less frequently implicated in otomycosis than *Aspergillus* and *Candida*, but they constitute recognized etiological agents. Özcan et al. reported an association between otomycosis and dermatomycoses and emphasized the value of searching for associated cutaneous or nail involvement when a dermatophyte is isolated from the ear [28].

Overall, our results show that otomycosis represents an important cause of external-auditory-canal involvement in our population. The prevalence of 42.5%, the predominance among middle-aged adults, the frequency of ear manipulation and topical treatments, and the predominance of *A. niger* underline the importance of an approach combining prevention, clinical examination and mycological confirmation.

Conclusion

In Morocco, the prevalence of otomycosis in the otolaryngology department of the Military Hospital Moulay Ismail of Meknes was 42.5%. In our study, the genus *Aspergillus* was found to be the most common fungus involved in otomycosis. Since the clinical aspects are not specific, mycological diagnosis is essential to determine the exact etiology of otomycosis in order

to establish an appropriate antifungal treatment. The education of the population is another important concern and must be taken into account.

Conflicts of Interest

The authors declare no conflict of interest.

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