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Original Articles

Prevalence of Otomycosis in Constantine, Algeria: A Cross-Sectional Study of Two Months

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Abstract:

Otomycosis is a fungal infection of the external auditory canal. Over a two-month period 34 ear samples were analyzed in mycology laboratory at the Military Hospital *Cdt Abdelali Benbaatouche*, of Constantine, Algeria.

Our study revealed that the positivity rate of otomycosis is 59%, with a male predominance (79%). The age group with the highest prevalence of otomycosis was the 35-49 years-old.

The occurrence of otomycosis was statistically more common in patients using cleaning cotton bud (42.9%). The left ears were the most affected (57%). Otalgia was the most common presenting symptom (35.7%).

Mycological study revealed yeasts are the most dominant (57%) compared to filamentous fungi (43%). The predominant species was *A. niger* (43%), and four Candida genus species were found, *C. albicans* (22%), *C. parapsilosis* and *C. dubliniensis* with isolation percentage of 14% respectively, followed by *C. tropicalis* (7%).

C. dubliniensis and *C. albicans* were resistant to amphotericin B, griseofulvin, and nystatin. However, they were susceptible to ketoconazole, clotrimazole, miconazole, and econazole.

Keywords: Otomycosis; Antifungal; Filamentous Fungi; Yeast Fungi, Candida, Aspergillus; Fungal Susceptibility; Fungal Otitis.

Introduction:

The ear contains a large number of complex structures in a confined space. This organ is frequently exposed to various microorganisms, including fungi responsible for 5 to 10% of external fungal otitis [1,2]. The identification of fungal species in the external auditory canal is therefore useful for determining the potential risk of these microorganisms responsible for ear mycosis or otomycosis [3].

In 1844, Mayer was the first to report a case of otomycosis. He is the precursor of a recurring debate that attempts to determine whether fungi are primary or secondary infectious agents to bacteria [4].

Otomycosis is usually a benign condition when it is limited to the external auditory canal, but it can be life-threatening in immunocompromised patients, taking the form of internal otitis extending to the middle ear, inner ear, and adjacent anatomical regions. Currently, it is a well-defined pathology and a recurring problem whose involvement of fungi as pathogens is increasing. The main agents encountered are Aspergillus and Candida. In tropical and subtropical regions, otomycosis is mainly caused by *Aspergillus niger*

This is favored by a number of predisposing factors, namely: the use of broad-spectrum antibiotics and corticosteroids for the treatment of bacterial otitis, the terrain (diabetes, immunosuppression, AIDS, etc.), the tropical climate, and local and post-surgical trauma [5-13].

Otomycosis can sometimes be long and difficult to treat, especially in cases of underlying chronic otological pathology [14].

The aim of this study is to establish the clinical and mycological profiles of the otomycosis diagnosed in Constantine during two months.

Materials and Methods:

Patients and sampling

In period of two months; from March 10 to April 30, 2019; thirty-four (34) ear samples were analyzed in mycology laboratory at the Military Hospital *Cdt Abdelali Benbaatouche*, Constantine, Algeria.

Clinical specimens (i.e., debris and pus) were collected from the patient's ears using moisture swabs.

The swabs were directly examined and cultured on the slants of Sabouraud dextrose agar and incubated at 25-27C for 4 weeks.

Identification of causative agents

Cultures were examined weekly, and all grown fungi examined. All recovered fungi were primarily analyzed. Moreover, the colony morphology characteristics and microscopic features were used for molds like species.

The yeast-like isolates were detected using germ tube formation, growth at 37°C, (figure 1) morphology on SDA medium, Bichro-latex©albicans fumouze (figure 2), and yeast growth identification was done by the commercial kit AUXAcolor. (bioRad, France) (figure 3), which consists of microtubes containing dehydrated substrates in which enzymatic and assimilation tests are performed.

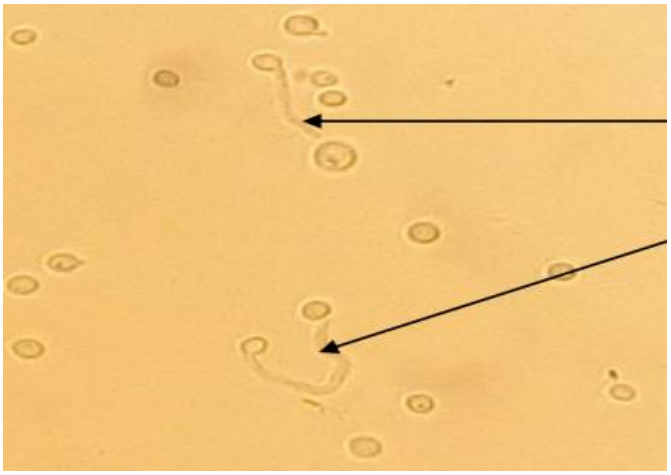

Figure 1. Blastese test based on germ tube formation

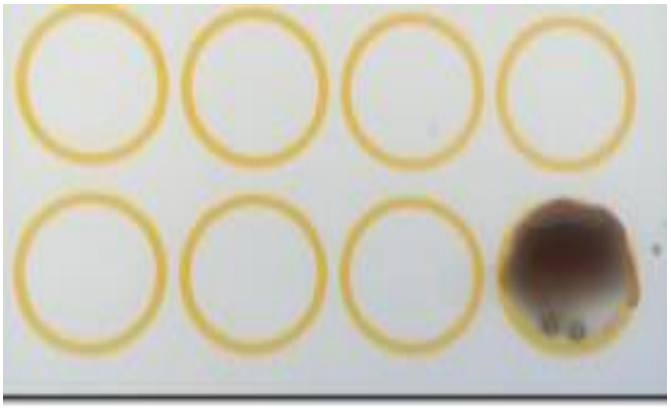

Figure 2, Bichro-latex©albicans (Fumouze)

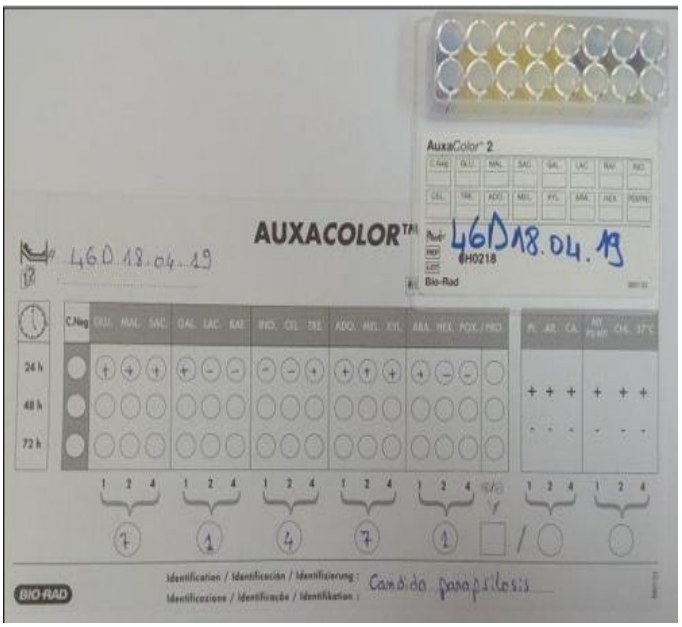

Figure 3. Auxacolor© gallery used for the identification of yeasts

Antifungal susceptibility testing

The antifungal susceptibility testing was performed using the disc diffusion method (figure 4)

In vitro antifungal susceptibility testing was performed against the commonly used antifungal drugs: polyenes; (amphotericin B and nystatin), azoles; (fluconazole, ketoconazole, clotrimazole, and itraconazole) and terbinafine. All the antifungal discs were locally prepared.

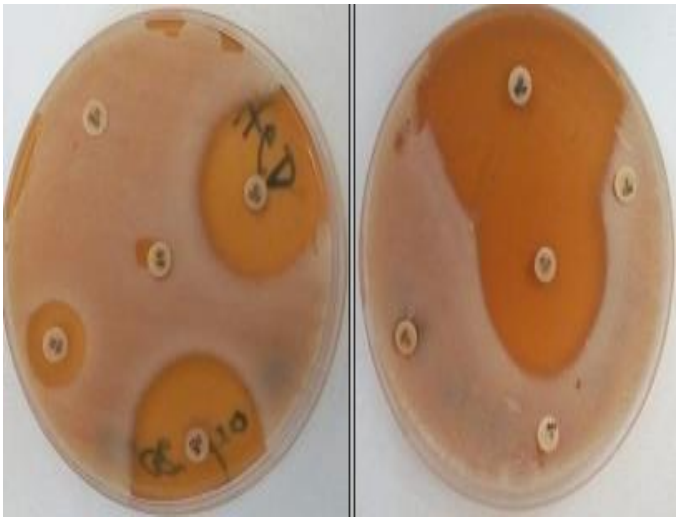

Figure 4. Antifungal susceptibility using disk technique

Results

Of the 34 patients included, 18 were positive. The overall prevalence of fungal otitis externa in the Department of Otolaryngology and Maxillofacial Surgery at the Cdt Abdelali Benbaatouche Regional Military University Hospital, Constantine (HMRUC) during the two-month period from March 10, 2019 to April 30, 2019 is 53%. Out of these 18 patients, 14 had a fungal ear infection with a prevalence rate of 78% and 4 had a bacterial infection, with a prevalence rate of 22%.

Gender distribution

Among the 14 patients with otitis externa, there was a predominance of males, with 11 cases (79%) versus 3 cases of females, sex ratio = 0.3.

Age distribution

In our sample 34 patients assessed ranged from [23 to 80] years with an average age of 42.44 years. In the 14 patients with otomycosis, the most affected age group was between (35-49 years-old) with a percentage of 67% as showed in figure 5.

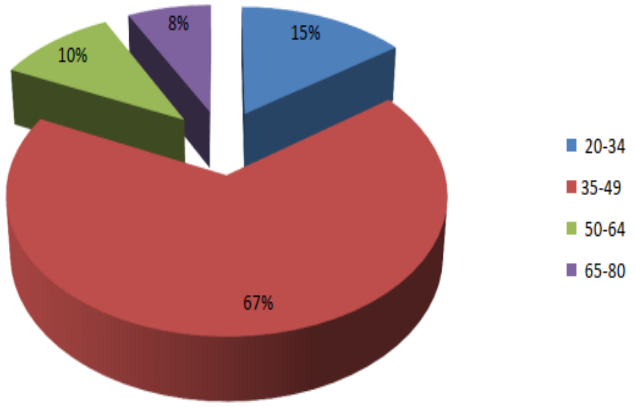

Figure 5. Age distribution of the otomycosis cases

Risk factors

The occurrence of otomycosis was statistically more frequent in patients who had a habit of cleaning their ears daily with cotton swabs and bathing in natural water reservoirs or swimming pools, more details are showed in table 1.

Table 1. distribution of the risk factors for otomycosis

Risk factors	N (number of cases)	Frequency %
Ear cleaning	6	42.90%
Swimming, Bathing	4	28.60%
Diabetes mellitus	3	21.40%
Eczema	1	07.14%

Infection localization

According to the location of fungal otitis

69% of fungal infections were located in the external ear (fungal external otitis), while middle ear infection accounts for only 31% of cases.

Ear laterality

8 cases were observed on the left ear of the patients, while the right ears were affected in 43% (only 6 cases).

Clinical signs

The most common clinical signs found were otalgia (35.7%), followed by otorrhea (28.6%), pruritus

and sensation of ear fullness (14.28% respectively), and hearing loss (7.14%), the results are depicted in table 2.

Table 2. distribution of the clinical signs

Clinical signs	N (number of cases)	Frequency %
Otalgia	5	35.70%
Otorrhea	4	28.60%
Sensation of ear fullness	2	14.28%
Pruritus	2	14.28%
Hearing loss	1	07.14%

Mycological data

Regarding the origin of otomycosis, we found 8 positive cultures for yeasts (57%) and 6 cases of molds (46%). In the table 3, we summarized all the isolation results for yeasts and molds.

Table 3. distribution of the different fungal isolates

Fungi	N (number of cases)	Frequency %
Aspergillus niger	6	43%
Candida albicans	3	22%
Candida parapsilosis	2	14%
Candida dubliensis	2	13%
Candida tropicalis	1	7%
Total	14	100,00%

Antifungal susceptibility

C. dubliniensis and *C. albicans* are resistant to metronidazole, flucytosine, amphotericin B, griseofulvin, and nystatin, but they are susceptible to ketoconazole, clotrimazole, miconazole, and econazole, as summarized in table 4.

Based on these results, it is concluded that ketoconazole, clotrimazole, miconazole, and econazole are the antifungals of choice for the treatment of otomycosis

Table 4. Yeasts antifungal susceptibity

Fungi	MET	AFY	KTC	AMB	CLO	MCZ	GRS	ECO	NY	ITR
C. dubliniensis	R	R	36S	R	55S	34S	R	30S	R	16I
C. albicans	R	R	27S	13	38S	30S	R	35S	R	19I

Discussion:

Considering the climate of our region, the prevalence of otomycosis is relatively high, in concordance with previous studies [1,3,6,7].

Otomycosis risk factors

Cotton swab cleaning (42.9%) and frequent bathing (28.6%) were the main risk factors in patients with otomycosis. Ear cleaning with cotton swabs is thought to cause trauma and imbalance of the ear's microbial flora, which can increase the frequency of otomycosis. Moreover, the use of hearing aids and ear injuries are also considered as predisposing factors for otomycosis [10,13,7,15]. On the contrary, in a study conducted in Slovakia, the most frequent predisposing factors for otomycosis were swimming in public pools and/or bath, spa and diabetes mellitus [16].

Otitis localisation

Based on these results, it appears that this type of fungal infection prefers the external ear (fungal external otitis) as its anatomical location, with 69%. However, middle ear infection accounts for only 31% of cases. In general, our results are similar to the results obtained by Cheriet N et al.

(2017) [17], who noted that 95% of cases are external otomycosis. However, the study by Aboulmakarim et al. (2010) found that middle ear infection was more common than external ear infection [1].

Ear laterality

It is clear from the information collected from the sampling sheets that the left ear was more affected in all 14 positive cases with 57%, 8 cases were observed on the left ear of the patients. While, the right ears were affected in 43% (only 6 cases). In fact, when these observations are compared with those of Lecanu et al. (2008) [2], they also recorded that the left ear was involved in 28 cases (53.8%), while the right ear was affected only in 19 cases (36.6%). Therefore, we have noticed that the frequency of left ear infection is higher than the right ear.

Clinical signs

In our study, the most frequent symptom in patients diagnosed with otomycosis was otalgia (36%), followed by otorrhea (29%), pruritus (14%), sensation of ear fullness (14%), and hearing loss (7%). Our results are different from those reported in 2010 by Aboulmakarim [1], who found (62%) otalgia, (70%) otorrhea, (62%) pruritus, (34%) sensation of ear fullness, and (24%) hearing loss.

In another North African study, conducted in Egypt, the most common symptoms of otomycosis were relatively the same: pruritis (92.16%) and otalgia (50.98%) [18].

Mycological data

The predominant species was *Aspergillus niger*, followed by *Candida albicans*, *Candida parapsilosis*, *Candida dubliniensis* were isolated in the same proportions and *Candida tropicalis*. Our result is totally different from that of Djohan et al who found *C. albicans* as the dominant species (48.9%) followed by *Aspergillus niger* (21.4%).

In a study performed in Egypt, the most common isolate was *A. niger* (50.98%) [17], In accordance with another study from Turkey. *A. niger* was the most frequent pathogen (44.8%) [15].

In Poland, otomycoses are most often caused by fungi of the genus Candida (60%) than by fungi of the genus Aspergillus (40%) [19].

In Slovakia, the following Candida species were identified in the aural material examined: *C. albicans* (n = 21; 52.5 %), *C. parapsilosis* (11; 27.5), *C. tropicalis* (3; 7.5), *C. krusei* (3; 7.5), *C. guilliermondii* (2; 5.0) [16].

In Brazil, yeasts predominated with *Candida albicans* (30%), *C. parapsilosis*, *C. tropicalis* (5%) and *Trichosporon asahii* (5%) over molds represented by *Aspergillus niger* (20%), *Aspergillus flavus*(10%), *Aspergillus fumigatus*(5%) [20].

In a study conducted in Nigeria, the most common fungi isolated from patients with otomycosis were *Aspergillus fumigatus, Aspergillus niger, Aspergillus flavus, Candida albicans*, and *Candida parapsilosis* [21].

Antifungal susceptibility

In a study conducted in Egypt, the highest percentage of sensitivity among yeast isolates was to nystatin (88%), while the highest resistance was to Fluconazole (Ali)

Conclusion:

Our study, although conducted on a limited sample and for a limited period of time, reveals that the positivity rate of cases is 59%. The highest prevalence of clinical otitis was recorded in the 35-49 age group. On the other hand, the lowest value was noted in the 65-80 age group.

The predominant species was *Aspergillus niger* (43%). In addition, we recorded in the present study, four species of the genus Candida, *C. albicans* (22%), *C. parapsilosis* and *C. dubliniensis* with a percentage of isolation of (14% respectively) followed by *C. tropicalis* (7%). The isolated fungi were susceptible to ketoconazole, clotrimazole, miconazole, and econazole.

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