5 | CONCLUSION

With respect to loudness level, MCL was more normalised using VSB than HA. Patients with moderate and moderate-to-severe SNHL could tolerate VSB fitting with sufficient amplification at 1 and 2 kHz frequencies, which is critical for normalising MCL.

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CONFLICT OF INTEREST

The authors declare no competing interests.

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Otomycosis in immunocompetent patients: Clinical and mycological features. Our experience with 40 cases

1 | INTRODUCTION

Otomycosis is an infection of the ear canal by yeasts and philamentous fungus, it represents 9%-27% of all external otitis patients and it has a high prevalence in hot and humid areas near the tropic.[1] Predisposing factors are as follows: cleaning deficiency, continuous exposure to dust, foreign objects in the ear canal, excessive manipulation of the ear canal, swimming, use of earphones, diabetes, poor glucose control and overuse of antibiotics.[1-3]

The aetiologic agent varies according to geographic localisation and temperature.[4] Previous research has shown *Aspergillus niger* as the most prevalent fungal aetiologic factor in otomycosis patients; nonetheless, other studies have shown otherwise.[5-7] Fayemiwo S et al. described *Candida albicans* as the main aetiologic agent isolated.[6] Furthermore, Viswanatha et al. identified a high prevalence of Candida albicans in immunosuppressed patients (52%).[7]

Otomycosis usually progresses to a subacute or chronic infection, and common symptoms are as follows: ear pain, otorrhea, pruritus, tinnitus, hearing loss and aural fullness.[2,3]

Immunocompetent patients with otomycosis are commonly affected unilaterally, on the other hand, immunosuppressed patients have frequently a bilateral course.[7,8]

Diagnosis of this disease can be achieved by direct microscopic examination of fungal material and culture.[6] Nevertheless, direct microscopic examination could have conflicting results as ear debris could resemble candida or dematophytosis. Also, insufficient material might lead to false-negative results. Therefore, culture remains the gold standard diagnostic test in this disease.

The aim of this study was to describe the clinical and mycological characteristics of immunocompetent patients with otomycosis. Additionally, it will compare microscopic direct examination and culture as diagnostic tests in our patients.

2 | MATERIAL AND METHODS

2.1 | Ethical considerations

This study was approved by an ethical committee, and informed consent was obtained from all patients.

2.2 | Study design

Transversal study. *Setting:* Secondary care center. Department of Otolaryngology. *Participants:* We included immunocompetent patients with clinical diagnosis of otomycosis between August 2010 and January 2016. Immunocompetence was defined as patients who have the ability to perform adequate humoral and cellular immune responses, they have no comorbidities that lower immune integrity such as diabetes, acquired immune deficiency syndrome (AIDS) or are under corticotherapy or radiotherapy treatment. Clinical diagnosis includes symptoms such as pruritus, ear pain, tinnitus, aural fullness, hearing loss or otorrhea. The ear sample had to clinically resemble a fungal ear infection (characterised by white and/or black debris). Exclusion criteria were as follows: isolated otorrhea, previous treatment or debridement of the ear canal.

Clinical and demographic data were documented. Direct microscopic examination and culture were done in all patients.

2.3 | Procedure

All ear samples were acquired with an ear curette or a cotton swab (prepared with normal saline solution). Afterwards, the material was preserved in sterile media. A portion of ear sample was extended in a UniMark Slide with a dimension of 76 × 26 mm. The slide was covered and immediately analysed for fungal and non-fungal elements by a certified mycologist, with microscopic vision (10× and 40×).

The ear sample also underwent culture with Sabouraud agar as media; it was incubated at 27-30°C, during 7 to 21 days. Cultures were checked on alternate days. Culture was taken as the gold standard in the diagnosis of otomycosis.

All patients underwent empirical treatment for otomycosis, based on topical antifungals. Weekly examinations were performed until no evidence of disease was confirmed on microscopic examinations.

Keypoints

- A male patient, in his third decade, with pruritus and hearing loss is the typical clinical presentation of otomycosis in immunocompetent cases.
- Summer is the season most frequently involved in otomycosis patients; high temperature and humidity are common environmental factors.
- Microscopic direct examination has a 60% sensitivity for detecting fungal disease.
- Immunocompetent patients are infected in the majority of cases by *Aspergillus*, being *Aspergillus niger* the most frequent species.
- Culture remains the gold standard in the diagnosis of this disease.

2.4 | Statistical analysis

Clinical and demographic data were analysed with descriptive statistics (mean, standard deviation, median). Sensitivity, specificity, positive predictive value and negative predictive value were calculated for the diagnostic tests. SPSS version 22 was used for statistical analysis.

3 | RESULTS

We included 40 patients, 13 women (32.5%) and 27 men (67.5%), with a ratio men:women of 2:1. Mean age was 32.2 (SD 11.6), and the age range was from 17 to 71 years.

The third decade was the most commonly affected (35%), on the contrary, patients older than 60 years were the least affected.

Regarding patient occupation, students developed more fungal infections of the external ear canal (17.5%). Summer was the season with the majority of cases 55% (n = 22), which correlated to the months with the highest temperature and humidity in our country.

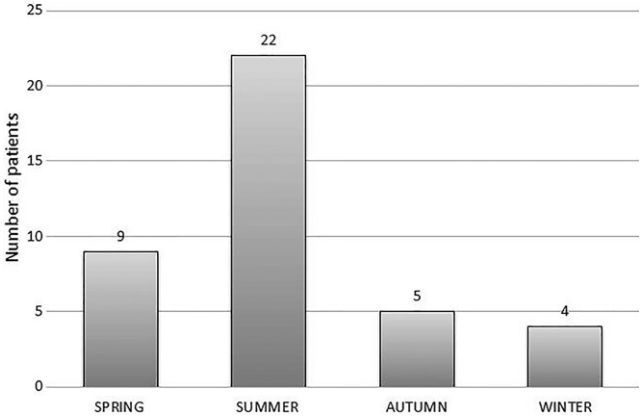

FIGURE 1 Season distribution, time of presentation of otomycosis patients

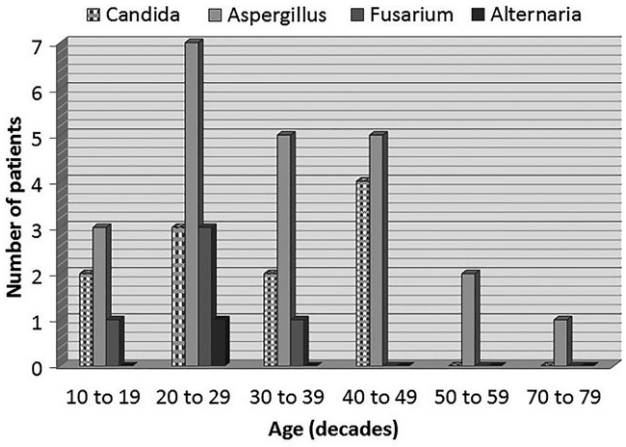

FIGURE 2 Frequency of fungal genus infection according to age of patients

In men, the disease was present most of the year, only in winter there was a relation 1:1 (men:women). See Figure 1.

The main clinical symptoms were hearing loss and pruritus (87.5%, n = 35), followed by otorrhea 65% (n = 26) and ear pain (47.5%, n = 19). Right ear was the most commonly affected in 47.5% cases (n = 19). Bilateral disease was present in 8 patients. All bilateral cases had the same fungus species in both ears.

Clinical evolution ranged from 3 to 16 weeks, with a mean of 7.2 weeks. Patients infected with candida had the longest course of presentation, more than 8 weeks in 81.8% of cases (n = 9).

Direct microscopic examination was positive in 24 patients with a sensitivity of 60%. Fungal elements most frequently found on direct microscopic examination were as follows: Mycelia 30% (n = 12), yeasts 17.5% (n = 7), *Fusarium* 2.5% (n = 1) and *Aspergillus* 10% (n = 4).

A total of 4 genus and 9 species were identified on culture. Genus found were as follows: *Aspergillus* (57.5%, n = 23), *Candida* (27.5%, n = 11), *Fusarium* (12.5%, n = 5) and *Alternaria* (2.5%, n = 1).

Aspergillus was the most frequent fungus in all patients. Regarding age and genus: more patients in their third decade had aspergillus (30.4%). On the other hand, candida was increasingly more frequent on the fifth decade (36.4%). See Figure 2.

The species most frequently identified on culture were as follows: *Aspergillus niger* 30% (n = 12), followed by *Candida albicans* (12.5%), *Candida glabrata* (12.5%), *Fusarium* sp (12.5%), *Aspergillus terreus* (12.5%), *Aspergillus flavus* (10%), *Aspergillus* sp (5%), *Alternaria* sp (2.5%) and *Candida* sp (2.5%). See Table 1.

Regarding the microscopic direct examination, *Candida* was the main fungus identified by this method (sensitivity 63.6%), which was observed on the microscope as yeasts. *Aspergillus*, on the other hand, had a sensitivity of 60.9% by microscopic direct examination. With this method, *Aspergillus* was observed as mycelia and aspergillus heads.

4 | DISCUSSION

4.1 | Synopsis of key findings

Otomycosis is a fungal infection of the external ear canal. In our series, the majority of patients with immunocompetence were men in their third decade, and summer was the season most commonly involved. Pruritus and hearing loss were the main symptoms. Direct examination test had low sensitivity in the diagnosis of otomycosis. *Aspergillus* is the most frequent fungus identified and *Aspergillus niger* the most prevalent species.

4.2 | Comparison with other studies

A gender specificity is variable and there is conflicting data through the literature,[3,5,8] in our study, men were more commonly affected with a relation 2:1.

According to previous reports, individuals in their third and fourth decade are more likely to be infected.[9] In our study, 35% of our population was on their third decade.[7]

Jobs such as construction, homeworker and fieldworker have been associated with otomycosis.[2,9] In our study, housewives and students were the most affected, 27.5% (n = 11) and 17.5% (n = 7), respectively. This could be due to the high affluence of students in our hospital.

It is important to remark that although otomycosis has a worldwide distribution, there is a high prevalence in tropical zones.[5] In the

TABLE 1 Results of microscopic direct examination and culture

	Culture									
Direct Microscopic Examination	*Candida glabrata*	*Candida albicans*	*Fusarium* sp	*Aspergillus terreus*	*Aspergillus niger*	*Aspergillus flavus*	*Aspergillus* sp	*Alternaria*	*Candida* sp	Total
Positive										
Yeasts	2 (5%)	4 (10%)	–	–	–	–	–	–	1 (2.5%)	7 (17.5%)
Mycelia	–	–	2 (5%)	1 (2.5%)	8 (20%)	–	–	1 (2.5%)	–	12 (30%)
Aspergillus	–	–	–	1 (2.5%)	1 (2.5%)	1 (2.5%)	1 (2.5%)	–	–	4 (10%)
Fusarium	–	–	–	–	–	–	1 (2.5%)	–	–	1 (2.5%)
Negative	3 (7.5%)	1 (2.5%)	3 (7.5%)	3 (7.5%)	3 (7.5%)	2 (5%)	1 (2.5%)	–	–	16 (40%)
TOTAL	5 (12.5%)	5 (12.5%)	5 (12.5%)	5 (12.5%)	12 (30%)	4 (10%)	2 (5%)	1 (2.5%)	1 (2.5%)	40 (100%)

TABLE 2 Main clinical and mycological results in the previous literature

Author, year	Country	Patient number	Immunosuppressed patients (%)	Age, decade (%)	Principal symptoms (%)	Fungus identified (%)	Bilateral disease (%)	Season (%)
Ozcan K.M., et al.[5] 2003	Turkey	87	–	4th 32.1%	Pruritus 95.4% Hearing loss 54%	*Aspergillus niger* 44.8%	11.5%	Summer and Autumn 65.5%
Fasunla J, et al.[1] 2007	Nigeria	378	6.08%	4th 19.3%	Pruritus 90.2% Ear pain 83.8%	*Aspergillus niger* 48.35%	12.1%	–
Aneja k, et al.[9] 2010	India	118	–	4th 28.8%	Pruritus 72% SEar pain 62%	*Aspergillus niger* 39.8%	10.1%	Autumn 51.6%
Baratti B, et al.[2] 2011	Iran	118	0%	4th 30.4%	Pruritus 65% Ear pain 55%	*Aspergillus flavus* 49%	–	Autumn 36.8%
Jia X, et al.[3] 2011	China	108	11.11%	6th 26.8%	Pruritus 57.4% Otorrhea 53.7%	*Aspergillus niger* 54.7%	13.8%	–
Viswanatha B. et al.[7] 2012	India	100 50 immunocompetent	50%	3rd 48%	Pruritus 92% Otorrhea 76%	*Aspergillus niger* 56%	16%	–
		50 immunosuppressed		5th 52%	Pruritus 80% Otorrhea 64%	*Candida albicans* 52%	40%	
Prasad, S.C. et al.[8] 2014	India	100	0%	3rd 32%	Pruritus 73% Otorrhea 38%	*Aspergillus niger* 38%	5%	Summer 78%
Our study	México	40	0%	3rd 35%	Hearing loss 87.5% Pruritus 87.5%	*Aspergillus niger* 30%	20%	Summer 55%

location of the current study, the weather is predominately warm and humid most of the year, with an average annual temperature of 25°C. Additionally, otomycosis cases increase in high temperature and humidity months[5,8]; coincidentally, summer was the season where more cases were included.

Main signs and symptoms are as follows: ear pain, otorrhea, pruritus, ear fullness, tinnitus and hearing loss.[10] Predominant symptoms in our patients were hearing loss and pruritus, both symptoms in 87.5% of our patients. On the other hand, Fasunla J et al.[1] reported hearing loss in only 14.8% of their patients. Pruritus has been reported in 90% of patients in other studies.[1-3] Bilateral infections have been described to occur in 10.1% of immunocompetent patients[9] and 40% in immunosuppressed patients.[7] Twenty per cent of our patients had bilateral infections.

The majority of studies have found *Aspergillus niger* as the most common species[3,5] in immunocompetent patients, while *Candida* was the principal agent in immunosuppressed patients.[7] We support what is currently described on the literature, we found *Aspergillus niger* as the main species in our study (30%). Other studies report a range of presentation of this fungus from 38% to 56%.[7,8] *Candida* was also highly found in our patients, although this fungus is predominantly identified in immunosuppressed patients.[7]

A brief review on the clinical and epidemiological data of otomycosis patients is described on Table 2.

4.3 | Limitations of our study

The main limitation of our study is the small sample size and the fact that is a transversal study.

4.4 | Strengths of the study

A strong feature of this study is that sensitivity was calculated of direct microscopic examination for each fungal genus; also, a comprehensive literature review is provided in immunocompetent patients with otomycosis.

According to our results, culture remains the gold standard for the diagnosis of this disease. Further studies of immunocompetent patients with otomycosis are required to understand fully the immunocompetent status of these patients, with complete laboratory studies.

4.5 | Clinical applicability

In general, sensitivity for direct microscopic examination was 60%, no specificity or negative predictive value could be calculated as all patients had positive culture.

In the current review of the literature, there is contrasting data regarding age, sex and season. The main constant feature was that aspergillosis was more frequent in immunocompetent patients. Our results could apply to other populations with this disease, especially, in tropical areas.

5 | CONCLUSIONS

Otomycosis by *Aspergillus* should be suspected in immunocompetent patients. Main symptoms are pruritus, hearing loss and otorrhea. Direct microscopic examination has a low sensitivity but can be the first approach in the diagnosis of otomycosis patients, ultimately culture is the gold standard to confirm the diagnosis.

CONFLICT OF INTEREST

None to declare.

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Arabic validation of the tinnitus handicap inventory and the mini-tinnitus questionnaire on 100 adult patients

1 | INTRODUCTION

Tinnitus is a medical condition with significant cross-cultural prevalence.[1,2] Often associated with some degree of hearing loss, its severity varies among individuals, ranging from mild discomfort to insomnia and depression.[3]

In Arabic-speaking populations, physicians rely on non-authenticated instruments to evaluate tinnitus and monitor its therapeutic response. Due to insufficient precision of the patient's evaluation, tinnitus assessment could be difficult. We hence decided to translate and validate the Tinnitus Handicap Inventory (THI) and Mini-Tinnitus Questionnaire (Mini-TQ) into Arabic in order to provide researchers and clinicians reliable tools for tinnitus evaluation and management.

Investigation was performed in the Department of Otorhinolaryngology Head and Neck Surgery, Saint Joseph University, Hotel Dieu de France Hospital, Beirut, Lebanon

2 | MATERIALS AND METHODS

2.1 | Ethical considerations

The study was approved by the Institution Review Board. It was verbally explained to all participants, who gave verbal and written consent before filling the questionnaires. They were assured that their identity and information would be kept confidential.

2.2 | Questionnaires

Based on their English versions, THI (Appendix S1) and Mini-TQ (Appendix S2) were forwardly and backwardly transliterated into modern-standard Arabic and English by three bilingual translators, respectively. The final versions of the local THI (Appendix S3) and Mini-TQ (Appendix S4) were reviewed and agreed upon by two ENT physicians. Permission from the authors of the original versions was obtained for both THI and Mini-TQ validation. The translation was