

Inhibitory Effects of Some Plant Essential Oils Against *Candida* species Isolated from Otomycosis Patients in Zakho City, Iraq

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Abstract

Otomycosis is an inflammatory lesion caused by the invasion or the excessive propagation of pathogenic fungi in the external auditory canal, accounting for 10 to 20% of recurring ear infections. Our study was conducted to identify *Candida* species in patients with otomycosis using conventional methods and HiCrome *Candida* agar, as well as to evaluate the antifungal activity of certain essential oils. A total of 300 ear swab samples, 136 from males and 164 from females, were obtained from patients who attended the otolaryngology department at Bedar Teaching Hospital and outpatients in Zakho city between July and December 2025. All data regarding age, sex, occupation, presenting complaints, and type of debris were collected. These samples were collected by an otolaryngologist from patients of various ages and both genders who exhibited clinical features suggestive of otomycosis. Ear debris was collected by sterile swabs and transferred to the laboratory for direct microscopy using 10% KOH, and cultures were grown on (SDA) at 37°C for 48 h, after which purified colonies of *Candida* were cultured on HiCrome agar. Our results revealed that otomycosis was more common among patients aged 31 to 45 years; 48 (48%) were male, and 52 (52%) were female. The main complaints were itching, followed by otalgia. Culture result revealed 100 positives for *Candida* sp. out of 300 samples. Among these positive samples, *Candida krusei* 45 (45%), *C. glabrata* 38 (38%), *C. albicans* 12 (12%), and *C. tropicalis* 5 (5%), all *C. albicans* show positive for germ tube and chlamydospore formation. Clotrimazole and pumpkin oil showed the highest antifungal activity against pathogenic *Candida* spp. among the tested agents.

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1. Introduction

Otomycosis represents a superficial fungal infection of the external auditory canal, commonly encountered in both primary care and otolaryngology practice. Although the disease is globally distributed, it occurs more frequently in regions with warm, humid climates. The recent increase in incidence is largely attributed to the widespread use of topical antibiotic ear drops. Several predisposing conditions have been identified, including frequent swimming, immunocompromised states such as diabetes mellitus and acquired immunodeficiency syndrome, pregnancy, a history of canal wall down mastoidectomy, tympanic membrane perforation, hearing aid use, and self-inflicted ear canal injuries, particularly those caused by cotton swabs [1]. By overcoming the drawbacks of conventional diagnostic methods and allowing the detection and analysis of genetic variation among a variety of organisms, including *Candida*, the development of molecular biology-based classification techniques has greatly improved the precision and sensitivity of fungal identification approaches [2]. Clinical appearance and mycological

examinations are the main factors used to diagnose otomycosis. However, the detection rate in direct microscopic exams might be greatly impacted by differences in the pathogenic fungus species. About 10% to 20% of infections affecting the external auditory canal are otomycosis, which is a common disorder [3]. The natural antifungal qualities of essential oils have harmful effects on the structure and function of fungal cell membranes, which inhibit the proliferation of pathogenic fungi. The limitations and adverse effects associated with conventional antifungal agents have encouraged researchers to explore novel, cost-effective, and naturally derived alternatives. This study was conducted to isolate and identify *Candida* species through microscopic examination and culture techniques, and to assess the antifungal effectiveness of various antifungal drugs and essential oils against *Candida* species associated with otomycosis in Zakho city, Duhok province, Iraq.

2. Materials and Methods

2-1 The place of study: Mycology Department, Shiryan Pathology Lab, Shiryan Private Hospital, Duhok.

2-2 The studied sample: Patients attending the consulting clinics of ENT in Bedar Teaching Hospital and outpatients in Zakho city

2-3 Study design: A descriptive study

2-4 Study period: From July to December 2025

2-5 Sample size: 300 patients.

2-6 Study procedures: Clinical examination, questionnaire form, and laboratory diagnosis.

2-7 Inclusion criteria: Patients with itching, pain, difficulty hearing, ear discharge, headache, and aural fullness

2-8 Exclusion criteria: Patients who take antifungal therapy

2-9 Questionnaire's form aspects: After clinical diagnosis was conducted and confirmed the suspicion of otomycosis, the patients filled out the questionnaire form, which included exposure to contaminated water or ear **picking**. It also gathered information on associated conditions, such as chronic otitis media, diabetes, other fungal infections, family history of fungal infections, socio-demographic characteristics, and other potential predisposing factors.

3. Sample processing

First, the external auditory canal was cleaned using a moist swab. Then, 300 samples of debris, exudate, and scrapings were collected from the external auditory canal of the patients. The diagnosis of otomycosis was established based on a combination of clinical history, physical examination, and otoscopic findings. Two serial swabs were collected and sent immediately to the laboratory of the mycology unit for diagnosis, one swab for microscopic examination by using a 10% KOH to detect the fungal elements, and the second swab was cultured on Sabouraud dextrose agar supplemented with streptomycin (300 mg/ml) [4], incubated at 37°C for growing of suspected yeasts. Culture with no growth after 3-4 weeks of incubation was considered negative. A positive culture of *Candida* spp. was primarily identified by staining with a Gram stain to determine morphological characteristics (Figure 2). The identification of yeast was performed using the germ tube test with human serum [5], chlamydospore formation on cornmeal agar, and CHROMagar (Himedia, India). All media were prepared according to the manufacturer's instructions. All fungal isolates were maintained on Sabouraud Dextrose Agar (Oxoid) slants and stored refrigerated at 4 °C until use.

4. Antifungal susceptibility testing

A Susceptibility test for the *Candida* isolates was performed using the disk diffusion method, an agar-based testing method, on Muller-Hinton agar, with four drugs: clotrimazole 10 µg, voriconazole 1 µg, amphotericin B 100 units, and nystatin 100 units) against *Candida* species (HiMedia Laboratories). Incubation period was 24-48 hours at 37°C.[6]. Zone diameters were interpreted as susceptible, Intermediate, or resistant according to CLSI breakpoints [7].

5. Antifungal activity of plant extraction

The antifungal potential of three essential oils (clove Oil, pumpkin oil, and olive oil) and apple cider vinegar, at varying concentrations, was determined using the agar well diffusion method. Three concentrations (25%, 50%, and 100%) were prepared through serial dilution with dimethyl sulfoxide (DMSO). The essential oils and apple cider vinegar were obtained from local commercial sources in Erbil and were of analytical grade. All samples were used without further purification and stored in sterile, airtight containers at 4°C until use. [8]

6. Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistical methods were employed to estimate the prevalence of otomycosis during the study period. The relationship between categorical variables was evaluated using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

7. Results and discussion

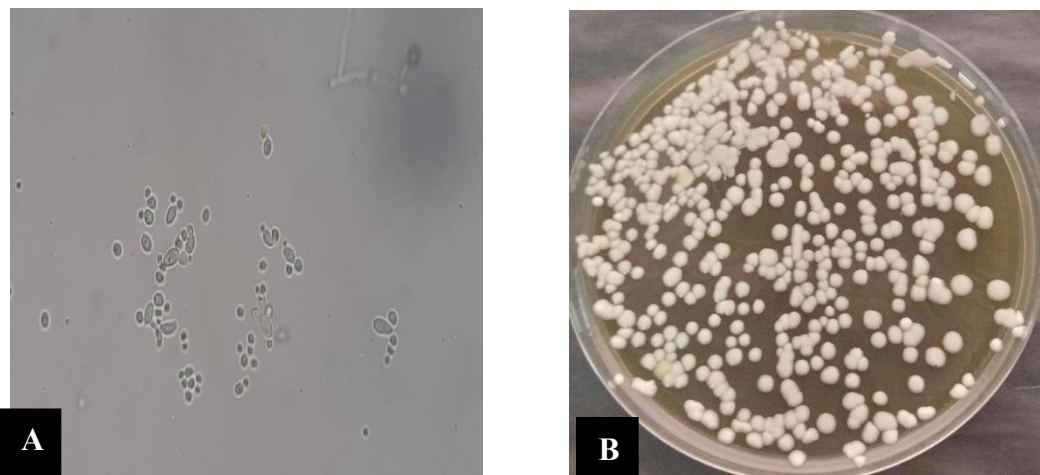


Figure 1. A direct microscope examination with 10% potassium hydroxide (KOH). B- Growth of *Candida* species on SDA

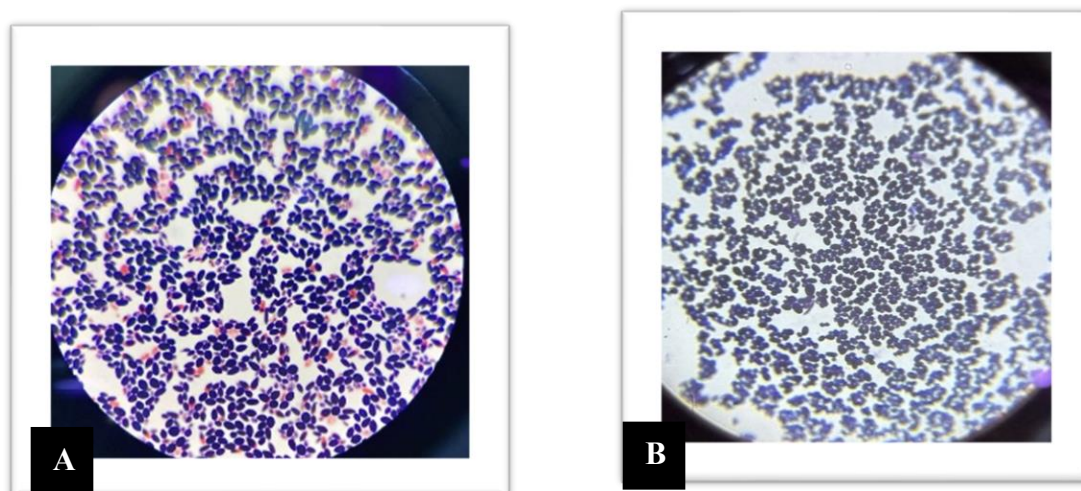


Figure 2: Microscopic picture of A. *Candida tropicalis* B- *C. albicans* using Gram stain.

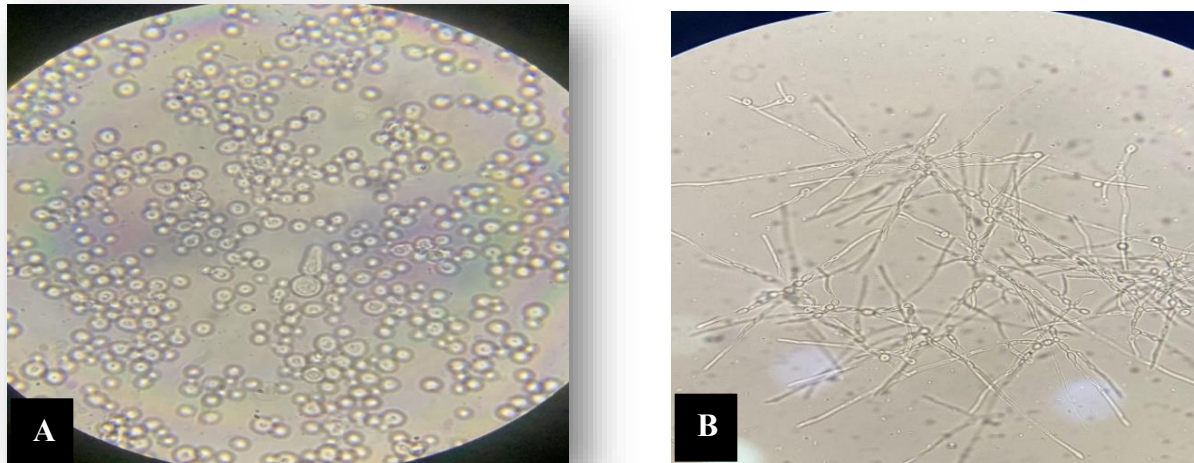


Figure 3: (A) Germ tube production by *Candida albicans* in human serum observed at 100× magnification. (B) Chlamydospores and pseudohyphae of *Candida albicans* observed at 100× magnification

The research involved a total of 300 patients. Among them, 100 cases of Direct microscopic examination were used to confirm otomycosis. Various fungal structures were identified, with yeast cells and pseudohyphae being the most common (Figure 1). As shown in Figure 4, 52 (52%) of the patients were female, while 48 (48%) were male. Approximately 20% of all cases in the otorhinolaryngology outpatient department are due to otomycosis, making it the most common clinical disease in this group. This relatively high occurrence may be linked to local activities like swimming in the Khabur River in Zakho city, as well as climatic factors such as high temperatures and humidity. [9] [10]

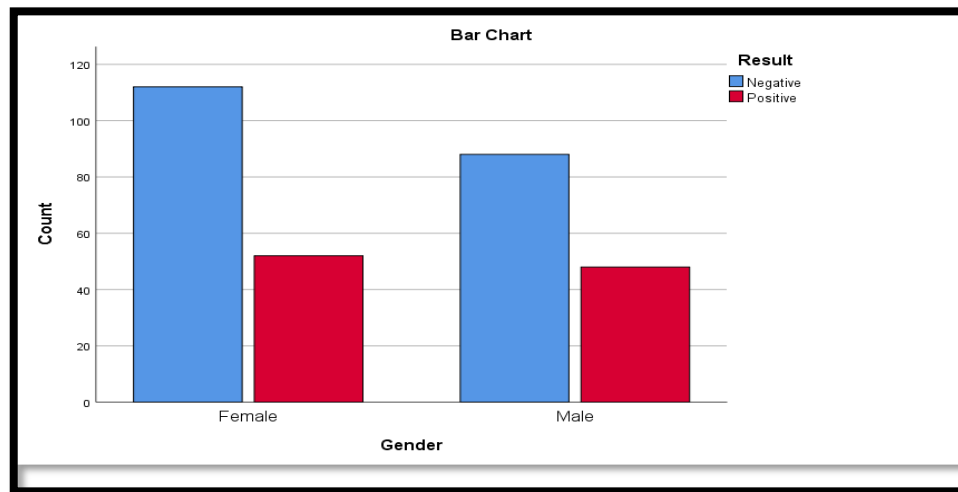


Figure 4: Percentage of otomycosis among males and females

Unilateral cases were more prevalent than bilateral cases. In terms of sex distribution, 52% of the cases were female, and 48% were male. These findings are consistent with those reported in a previous study[11]. Rather than biological differences, social and behavioral patterns are typically blamed for the increased rate of infections in females. Fungal spores can enter the ear canal through microtrauma caused by frequent use of cotton swabs and hairpins for ear cleaning. Head coverings may restrict airflow to the ear canal, thereby creating a warm and humid environment that promotes fungal growth and moisture retention. This fosters the growth of fungi by creating a warm, humid atmosphere and retention of moisture. Similarly, long hair that covers the ears may hinder adequate drying of the external auditory canal following a bath or perspiration. Housewives are identified as a high-risk category in certain studies due to their frequent contact with dust and water while performing domestic tasks,

which might raise the possibility of spores getting into a wet ear canal. Certain hair colors and sprays can occasionally irritate the ear canal, causing inflammation that increases the skin's vulnerability to secondary fungal infections.

Table 1: Otomycosis distribution by residence

Residence	Positive	Negative	P-value
Urban	79(79%)	131(65.5%)	0.014*
Rural	21(21%)	69(34.5%)	
Total	100(100%)	200(100%)	

*Significant at $P \leq 0.05$

According to Table 1, in the current study, Otomycosis was more prevalent in the urban population (79%) compared to the rural population. On the other hand, several previous studies have reported that this phenomenon is more common in rural areas. This discrepancy has frequently been attributed to factors such as poor nutritional status in children, poor hygiene habits, a lack of knowledge about appropriate ear care, and crowded living conditions during the winter, all of which may promote the spread and development of fungal organisms [12]

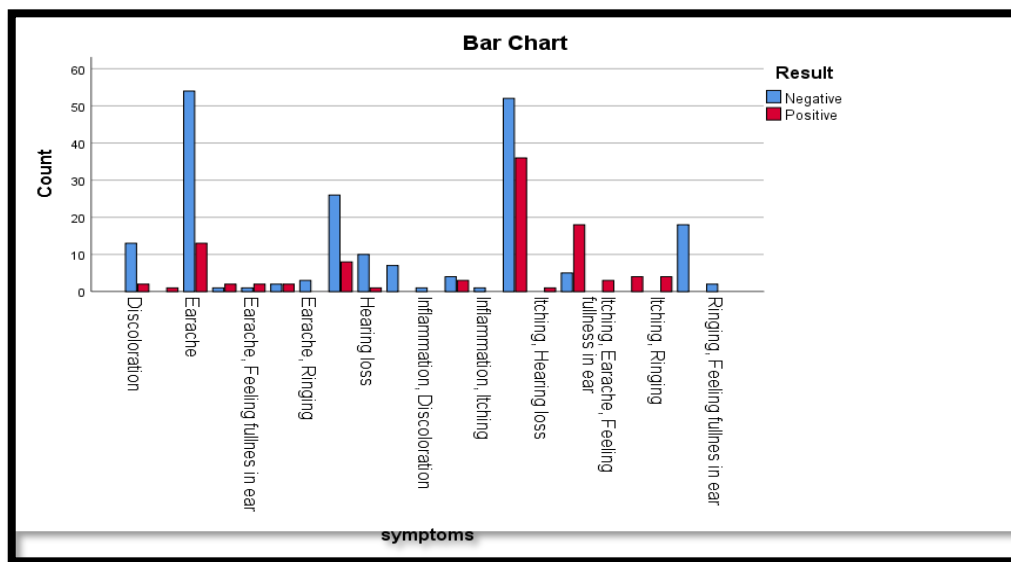


Figure 5. Percentage of different symptoms among otomycosis patients during the study.

Regarding the clinical manifestations, itching was the most frequently reported symptom, occurring in 36% of the patients. Other symptoms included ear pain (13%), a sensation of ear fullness (8%), ear discoloration (1%), and hearing impairment (1%), as illustrated in Figure 6. These findings are comparable with those reported by others documenting ear pruritus in 77% of cases. Similarly, [13] observed pruritus in nearly 93% of patients, while a study conducted in Turkey reported itching in all examined cases. Ear pain was the second most common complaint, occurring in 72.7% of cases in some studies. In contrast, [14] reported ear pain in only 41% of patients. The relatively high occurrence of acute otitis externa observed in the present study may be associated with repeated scratching of the ear caused by intense itching.

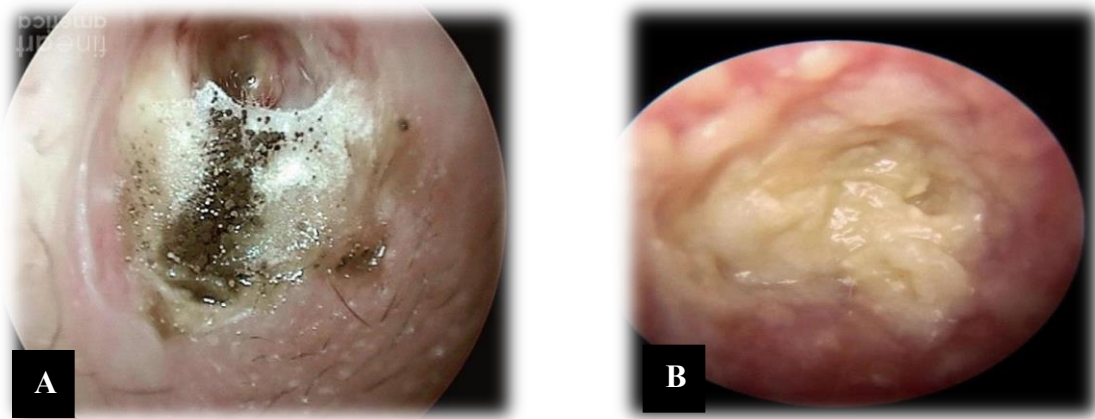


Figure 6. Otoscopic findings in patients with otomycosis : (A) visible fungal hyphae, (B) obstruction of the external ear canal

Table 2. Distribution of otomycosis among different age groups

Age (in years)	Positive	Negative	P-value
1-15	11(11%)	3(1.5%)	0.002**
16-30	25(25%)	70(35%)	
31-45	31(31%)	75(37.5%)	
46-60	24(24%)	41(20.5%)	
61-65	9(9%)	11(5.5%)	
Total	100(100%)	200(100%)	

**P-value is statistically highly significant at the 0.001 level

The highest occurrence of otomycosis was observed among adults aged 31–45 years, with 31 patients representing 31% of the total cases. The frequency of infection declined progressively with increasing patient age, as illustrated in Table 2, and this difference was statistically highly significant ($P \leq 0.01$). These findings are consistent with those reported by [15], who found that 50.9% of affected individuals were between 30 and 50 years of age. Favorable environmental conditions such as high temperature, humidity, and dust, along with several contributing factors, including alterations in the epithelial lining of the ear canal, changes in earwax composition, use of hearing aids, improper ear-cleaning practices, swimming in contaminated water, and occupational exposure to dry and dusty environments, may increase susceptibility to infection. Although otomycosis occurs less frequently in children, our observations are comparable with the findings of others. Nevertheless, cases [16] have been reported across different age groups, indicating that no age category is completely protected from otomycosis.

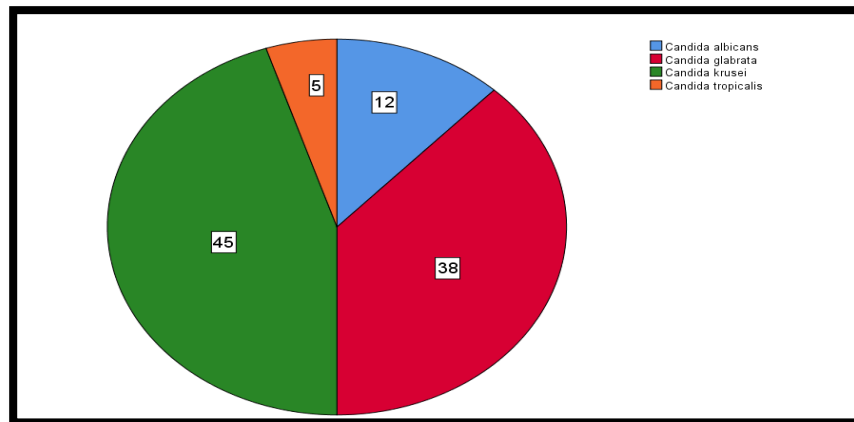
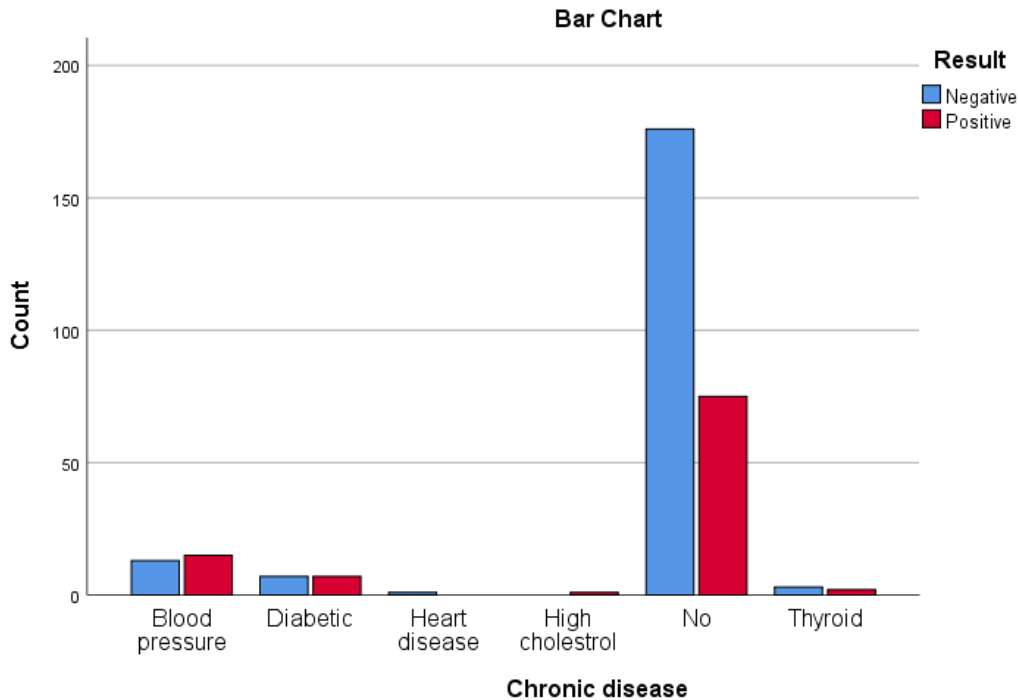


Figure 7. Distribution of *Candida* species among otomycotic cases

Table 3: Distribution of otomycosis according to chronic disease

Chronic disease	Positive	Negative	P-value
Blood pressure	15(15%)	13(6.5%)	0.052 ^{NS}
Diabetic	7 (7%)	7(3.5%)	
High cholesterol	1(1%)	0(0%)	
Thyroid	2(2%)	3 (1.5)	
No diseases	75 (75%)	176(88%)	
Total	100(100%)	200(100%)	

NS: Non-significant

*Figure 8: Relationship between otomycosis and chronic disease*

The Impact of Chronic Illness on otomycosis is primarily defined by the body's immune resilience. **Diabetes Mellitus:** This is perhaps the most common chronic link. Elevated blood sugar levels can alter the pH of earwax and skin, creating a glucose-rich environment that fungi like *Aspergillus* and *Candida* thrive in. Furthermore, poor microcirculation associated with long-term diabetes impairs the body's ability to deliver immune cells to the ear canal. **Immunocompromised States:** Chronic conditions that require long-term use of corticosteroids or chemotherapy weaken the body's natural defense mechanisms. In these patients, a standard fungal infection can transition into malignant otitis externa, where the infection spreads from the soft tissue into the skull base.

Secondary Infections: Chronic skin conditions, such as psoriasis or eczema, compromise the integrity of the ear canal's skin barrier. This chronic inflammation provides "entry points" for fungal spores, often leading to a cycle of recurring infections that are difficult to eradicate.

Recurrent or treatment-resistant otomycosis frequently acts as a clinical indicator of undiagnosed metabolic or immunological conditions. In such instances, successful resolution of the fungal infection is typically contingent upon the effective management of the underlying systemic disorder.[17]

Table 4. Effect of different predisposing factors on the incidence of otomycotic

Factors	Positive	Negative	P-value
Swimming			0.78
Yes	10(10%)	18(9%)	
No	90(90%)	182(92%)	
Total	100(100%)	200(100%)	
Use hairpins/cotton swabs.			0.14
Yes	58(58%)	98(49%)	
No	42(42%)	102(51%)	
Total	100(100%)	200(100%)	
Earpods uses			0.28
Yes	6(6%)	19(9.5%)	
No	94(94%)	181(91.5%)	
Total	100(100%)	200(100%)	

The incidence of otomycotic infection is significantly influenced by a complex interplay of host-related and environmental predisposing factors that disrupt the ear's natural defense mechanisms. Environmental conditions and mechanical trauma caused by the insertion of foreign objects (such as cotton swabs or hearing aids) are major contributors to the breakdown of the epithelial barrier.

The use of EarPods and in-ear headphones has emerged as a significant modern predisposing factor for otomycosis, primarily by altering the microenvironment of the external auditory canal. These devices act as a mechanical plug that restricts natural airflow, leading to a phenomenon known as **occlusion**, which traps humidity and metabolic heat within the canal. This creates a warm, moist "incubator" effect that is highly conducive to the germination of fungal spores, particularly *Aspergillus niger* and *Candida albicans*.

Swimming is a primary predisposing factor for otomycosis, as frequent and prolonged water exposure disrupts the ear canal's natural protective mechanisms. This condition, often termed "tropical ear" or a fungal variation of "swimmer's ear," occurs when water remains trapped in the external auditory canal, creating a persistently moist environment that encourages fungal germination.[18]

Candida isolates were differentiated by culturing them on CHROMagar *Candida* differential medium and incubating the plates aerobically at 37 °C for 24–48 hours (Fig. 9). Identification of the species was determined according to the colony morphology and the characteristic color produced on the medium. Colonies of various *Candida species* develop distinct colors because the medium contains chromogenic substrates linked to specific enzymatic reactions. Enzymes produced by different *Candida species* interact with these substrates, resulting in color variations that assist in the presumptive identification of certain *Candida species* [19]

Candida species are among the most frequently reported etiological agents of otomycosis worldwide. Similarly, in the present investigation, *Candida species* were the predominant isolates. This may be attributed to the ability of these organisms to grow optimally at human body temperature as part of the normal mycobiota. Moreover, *Candida* acts as an opportunistic pathogen capable of invading host tissues when the immune defense mechanisms are compromised [20]. In the current study, *Candida krusei* accounted for 45% of the isolates, followed by *C. glabrata* (38%), *C. albicans* (12%), and *C. tropicalis* (5%). These findings differ from many previous studies, which have reported *Candida albicans* as the most prevalent species associated with otomycosis.

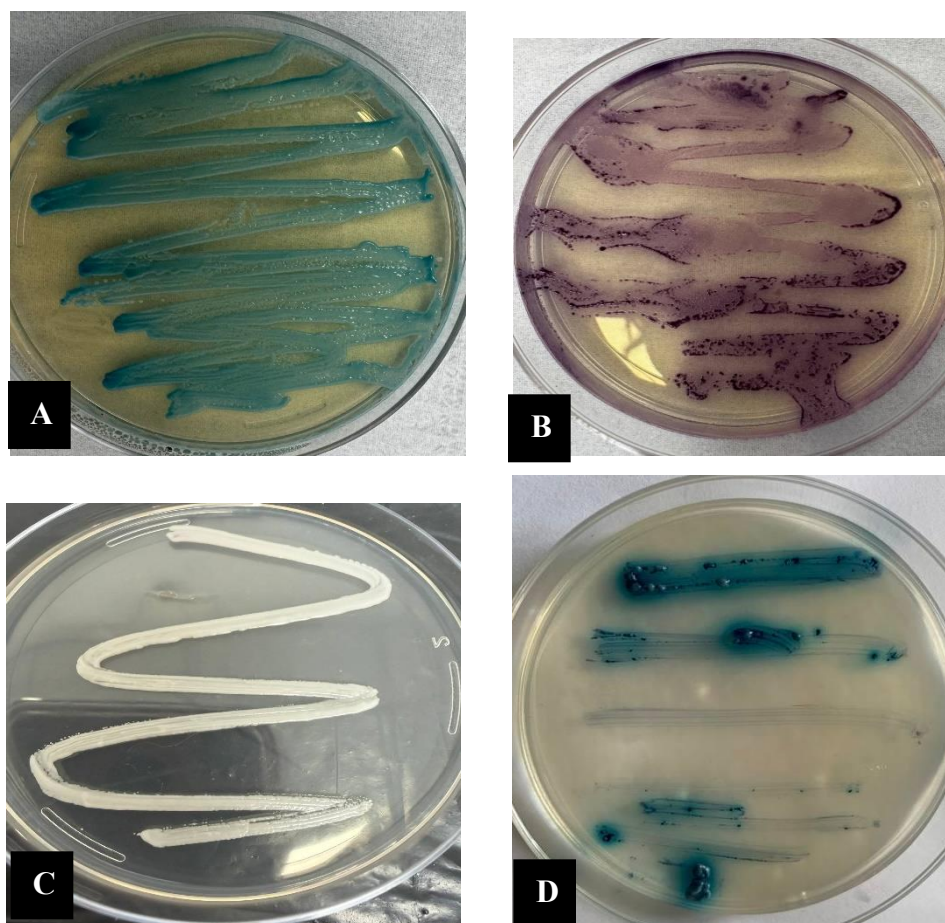


Figure 9: Colonies of Candida species on CHROMagar medium at 37°C for 24-48h. A= *C. glabrata*, B= *C. krusei*, C= *C. tropicalis*, and D= *C. albicans*

In this study, the in-vitro antifungal susceptibility patterns of fungal isolates from otomycosis patients were evaluated against four commonly used antifungal agents: using the disc diffusion method on Mueller-Hinton agar for the most commonly used antifungals: amphotericin B (20 µg), nystatin (100 units), clotrimazole (10 µg), and voriconazole (1 µg) (HiMedia Laboratories). The results revealed variable activity across species, highlighting differences in intrinsic susceptibility and potential clinical implications. The susceptibility of each agent was evaluated by measuring the diameter of the inhibition zone against *Candida* species, as shown in Table 5 and Figure 10. *Candida* species showed high susceptibility, consistent with previous reports [21]. Voriconazole exhibited the highest antifungal activity, producing inhibition zones ranging from 32 to 50 mm and showing sensitivity against most candidal isolates. Regarding Amphotericin B, it was generally effective. However, *C. krusei* showed only intermediate susceptibility, while Nystatin displayed the weakest overall activity, with complete resistance observed in *C. glabrata* (0mm) and Intermediate against *C. albicans* (7 mm) and *C. krusei* (10 mm). Sensitive against *C. tropicalis* (20 mm). Among the species tested, *C. tropicalis* was the most susceptible to all antifungal agents, whereas *C. glabrata* exhibited the highest resistance, particularly to nystatin. *C. tropicalis* was found to be 100% susceptible to all tested antifungals.

All *Candida* species showed sensitivity to clotrimazole, so Clotrimazole, a topical imidazole, is considered the drug of choice for the treatment of uncomplicated otomycosis [22]. Our results were in agreement with reports citing it as one of the most effective antifungal agents.[23] However, our data did not support 100% efficacy, possibly due to strain or regional differences. The reduced susceptibility observed in some isolates may be associated with the development of resistance mechanisms, including gene-mediated resistance, which can influence responsiveness to specific antifungal agents.

Table 5. In vitro antifungal susceptibility assessment for *Candida* species isolated from otomycosis patients

Candida species	Antifungal agent	Inhibition zone diameter (mm)	Susceptibility
<i>C .albicans</i>	Nystatin	7	Intermediate
	Clotrimazole	30–40	Sensitive
	Voriconazole	35–45	Sensitive
	Amphotericin B	15–19	Sensitive
<i>C .glabrata</i>	Nystatin	0	Resistant
	Clotrimazole	25–30	Sensitive
	Voriconazole	32–40	Sensitive
	Amphotericin B	12–18	Sensitive
<i>C .krusei</i>	Nystatin	10	Intermediate
	Clotrimazole	15–20	Sensitive
	Voriconazole	15	Intermediate
	Amphotericin B	14	Intermediate
<i>C .tropicalis</i>	Nystatin	20	Sensitive
	Clotrimazole	35–40	Sensitive
	Voriconazole	50	Sensitive
	Amphotericin B	30 –35	Sensitive

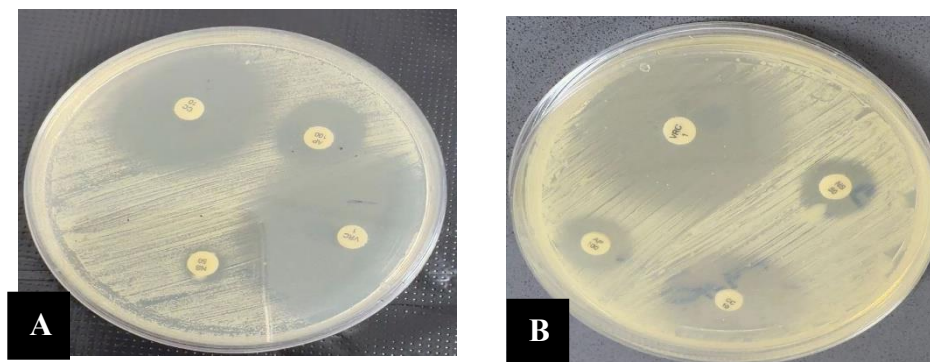


Figure 10: Antifungal susceptibility testing of *Candida* spp. by the disc diffusion method on MHA
A: *C. albicans* B: *C. krusei*

Several challenges may arise when using antifungal medications, including the development of fungal resistance and concerns related to toxicity and safety.[24] These limitations highlight the need to explore safe and effective alternatives with proven antifungal properties. The well diffusion method was used to assess the antifungal activity of olive oil, pumpkin oil, clove oil, and apple cider vinegar (ACV), an acetic acid solution made by fermenting apples. Sterile dropping pipettes were used to add the essential oils to the wells, which were left to diffuse for two hours at room temperature. The plates were then incubated aerobically for 24 to 48 hours at 37 °C. The diameter of the inhibition zones (DIZ) in millimeters was used to assess the antifungal activity. [25]

Table 6: Diameter of the inhibition zone (DIZ) of the antifungal activity of essential oils against *Candida* species using the well diffusion technique

Candida species	Essential oils													
	Glove oil MIC (%)			Pumpkin oil MIC (%)			Apple vinegar cider MIC (%)			Olive oil MIC (%)				
	25	50	100	25	50	100	25	50	100	25	50	100		
<i>Candida krusei</i>			20	25	30	40	45	50	9	10	28	45	40	47
<i>C. albicans</i>			15	20	27	20	20	50	11	12	10	10	12	17
<i>C. tropicalis</i>			17	16	47	20	20	30	13	10	15	10	10	17
<i>C.glabrata</i>	13	25	20	25	25	35	15	10	10	10	10		17	

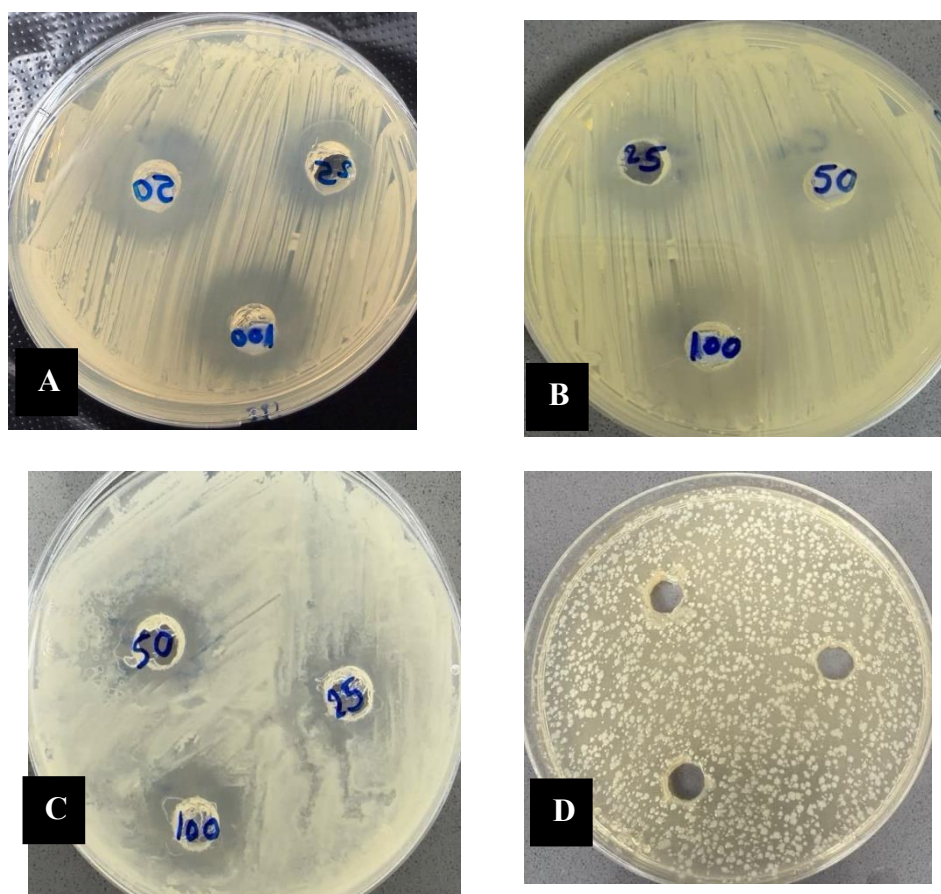


Figure 11: Inhibition zone of A (Pumpkin oil), B (Clove oil), C (Olive oil against *Candida* species, (D-control)

By assessing the antifungal activity of essential oils against *Candida* species as shown in Table 6 and Figure 11, we identified pumpkin essential oil with notable efficacy against all species (20-50mm) zone of inhibition colony, followed by glove oil (13-47mm) DIZ, olive oil (10-30mm) DIZ, while less effect has been seen for apple vinegar cider (9-28mm) DIZ. Recently, there has been a great interest in using essential oils as possible natural substitutes for conventional synthetic antifungal agents [26]

8. Conclusions

The results of this study indicate that fungal ear infections are among the common cases in the external ENT clinics in the city of Zakho, with a noted increase in the infection rate among females, especially within the age group of 31 - 45 years. It was found that *Candida krusei* is the most common fungal type among the diagnosed cases, and ear itching was the most prominent clinical symptom among the patients.

The study also showed that both clotrimazole topical drops and pumpkin seed oil have comparable therapeutic efficacy in managing otomycosis, opening the door to the use of safe and effective alternative treatments. These results confirm the importance of early and accurate diagnosis of the condition to ensure treatment success and reduce complications. Accordingly, it is recommended to increase the awareness of both healthcare staff and patients about risk factors and prevention methods, which include avoiding the unjustified use of broad-spectrum antibiotics, refraining from cleaning the ear with tools that may cause harm, and maintaining the dryness of the ear canal. Adopting these preventive measures, along with appropriate diagnosis and treatment, can contribute to reducing the spread of this disease and improving patients' health outcomes.

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10. Ethics and Consent

Written informed consent was obtained from all participants before sample collection. The study protocol received ethical approval from the Research Ethics Committee of the Duhok Directorate General of Health, Kurdistan Region, Iraq (Reference No.: 19112025-9-15; approved on 19 November 2025).

11. Conflict of interest

The authors declare that there is no conflict of interest.

12. Funding

The authors declare that they have no financial interests or personal relationships that could potentially have influenced the outcomes or interpretation of the research presented in this study.

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التأثيرات التثبيطية لبعض الزيوت النباتية الأساسية ضد أنواع المبيضات المعزولة من مرضى التهاب الأذن الفطري في مدينة زاخو، العراق

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المستخلص :

داء الفطريات الأذنية هو آفة التهابية ناتجة عن غزو أو تكاثر مفرط للفطريات الممرضة في القناة السمعية الخارجية، وتكرر الإصابة به في 10 إلى 20% من الحالات. أجريت دراستنا للكشف عن فطريات المبيضات *Candida sp*. لدى مرضى داء الفطريات الأذنية باستخدام وطرائق تشخيص تقليدية *HiCrome*، بالإضافة إلى دراسة النشاط المضاد للفطريات لبعض الزيوت العطرية. جُمعت 300 عينة مسحة أذن، 136 منها لذكور و164 لإناث، من مرضى راجعوا قسم الأنف والأذن والحنجرة في مستشفى بدار التعليمي، ومن مرضى العيادات الخارجية في مدينة زاخو، خلال الفترة من يوليو إلى ديسمبر 2025. سُجلت جميع البيانات المتعلقة بالعمر والجنس والمهنة والأعراض ونوع الإفرازات. جُمعت هذه العينات من قبل أخصائيين من مختلف الأعمار ومن كلا الجنسين ممن ظهرت عليهم أعراض تشير إلى الإصابة بداء الفطريات الأذنية. جُمعت بقايا الأذن بمسحات معقمة ونُقلت إلى المختبر لإجراء فحص مجهري مباشر باستخدام محلول هيدروكسيد البوتاسيوم بتركيز 10%، ثم زُرعت على وسط SDA عند درجة حرارة 37 مئوية لمدة 48 ساعة. بعد ذلك، زُرعت مستعمرة المبيضات النقية على وسط *HiCrome agar*. أظهرت نتائجنا أن داء الفطريات الأذنية أكثر شيوعاً بين المرضى الذين تتراوح أعمارهم بين 1 و65 عاماً؛ 48 منهم (48%) من الذكور، و52 (52%) من الإناث. كانت الشكوى الرئيسية هي الحكّة، تليها ألم الأذن. أظهرت نتائج الزرع أن 100 عينة (33.3%) من أصل 300 عينة كانت إيجابية لفطريات المبيضات. من بين هذه العينات الإيجابية، كانت المبيضات الكروزية 45 عينة (45%)، والمبيضات الملساء 38 عينة (38%)، والمبيضات البيضاء 12 عينة (12%)، والمبيضات الاستوائية 5 عينات (5%). جميع عينات المبيضات البيضاء أظهرت نتائج إيجابية لتكوين الأنبوب الجرثومي والأبواغ الكلاميدية. كان الكلوتريمازول وزيت اليقطين أكثر العوامل المضادة للفطريات فعالية ضد أنواع المبيضات الممرضة.