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**Evaluating the Outcomes of Iraqi Patients with Otomycosis Through a Cross-Sectional Study at Ages from 20 to 45 Years**

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| **Abstract: Background:** Aspergillus was defined as the main etiology of otomycosis, which covered 80% of cases of outer ear infection as well as 9% of external otitis cases. **Objective:** Our study contributed to the analysis and assessment of the clinical results of Iraqi people who have otomycosis. **Patients and methods:** This cross-sectional study enrolled data from 70 patients ages 20–40, collected from hospitals located in different hospitals in Iraq for people who were diagnosed with otomycosis symptoms, including ear discomfort, itching, tinnitus, and hearing loss, where the Chronic Otitis Media Questionnaire 20 (COMQ-20) scale and the Sartorato categorization system were used for determining the impact of chronic otitis media on their quality of life. Also, the COMQ-20 scale assessed items related to quality of life in terms of hearing challenges, whereas the Sartorato categorization system assessed chronic venous insufficiency, particularly varicose veins. **Results:** Our findings found that males had a greater prevalence of the cases than females, within a rate of 60% and 40%, the rate of comorbidities was 35.71%, smoking rate was 34.29%, most prevalent symptoms in patients were itching (64.29%) and pain (20%), most prevalent fungal species in patients were Aspergillus niger (60%) and Candida albicans (24.29%), severity of otomycosis was identified into mild in 12 cases, moderate in 25 cases, and severe in 33 cases. The most significant impacts on quality of life were hearing function (45.35 ± 23.76) and emotions and activities (52.72 ± 10.25). Factors that had a significant impact on quality of life were observed in hearing function (45.35 ± 23.76), followed by emotions and activities (52.72 ± 10.25). **Conclusion:** Our study identified that itching is the common clinical sign of otomycosis related to fungi infection, which otomycosis is more prevalent in men and is caused by earbuds, where it has negatively impacted individuals' quality of life, emotions, activities, and hearing function.**Keywords:** Otomycosis; Complications; QoL scale; Type of Fungus; and Severity scores. |

**INTRODUCTION**

A superficial fungal infection of the outer ear is known as otomycosis. As a component of the external auditory canal's natural flora, fungi can act as opportunistic agents in conditions which reduce cellular immunity generally, such as diabetes, long-term steroid use, HIV infection, chemotherapy, as well as neoplastic disorders. The most frequent reason for immunocompromised people is Candida albicans. Nevertheless, immunocompetent individuals could potentially become infected in this agent [Kurnatowski, P. *et al*., 2001 - Jia, X. *et al*., 2012]. Otomycosis often manifests with a unilateral, subacute, and chronic infection involving inflammation and exudate; pruritus, otalgia, otorrhea, tinnitus, and hearing loss are the primary symptoms. [Kaur, R. *et al*., 2000; Wadhwani, K. *et al*., 1984]

Otitis, which can affect the exterior, middle, or interior parts of the ear, is a condition that frequently arises in small animal medicine. It can be defined as an infection of the ear canal. Pain, itching, and unusual discharges could all be observed associated with these inflammations. It's a complex illness which frequently does not improve with therapy and has been attributed to infections caused on by yeast and bacteria. [Sangavi, A. K. B. *et al*., 2018–Chandrasekhar, S. B. V. *et al*., 2022]

Otitis externa (OE) was the most prevalent ear canal disease in dogs, with an estimated frequency of 20% across the canine community [Kazemi, A. *et al*., 2015]. These are complex disorders, having multiple authors characterizing their causes as primary, predisposing, or perpetuating. [Jyoti, D. *et al*., 2019]

The prevalence of parasites, allergic illnesses, foreign bodies, endocrine abnormalities, and dermatological issues are among the most frequent primary reasons [Suraneni, V. R. *et al*., 2017]. The most important predisposing condition is the abnormal ear canal shape [Jahan, T. *et al*., 2019]. On the other hand, the ones that persist include otitis media, bacterial, yeast, as well as progressive medical changes that occur all through the course of the same illness. [Geaney, G. P, 1967]

Despite the fact that it frequently occurs unilateral, immunocompromised patients are considered to be more susceptible to experience bilateral occurrences [Prasanna, V. *et al*., 2014]. of the temporal bone, primarily linked to immunocompromised individuals, and of the tympanic membrane accompanying middle ear infection [Chander, J. *et al*., 1996]. Tympanic membrane perforations were observed more frequently in patients infected with Candida albicans. Since the most common signs of otomycosis are not particular in their presentation, a high index in suspicion is necessary for the diagnosis [Mittal, S. *et al*., 2018]. Direct microscopic inspection and culture in certain media can confirm the diagnosis [Senturia, B. H. *et al*., 1980].

In addition, individuals with diabetes and immunocompromised conditions should have the necessary hematological testing, as well as blood glucose levels must be closely watched to avoid issues. [Krishna, H, 2020]

Local antifungal medications should be used as well, as the external auditory canal is cleaned as part of the treatment [Mistry, M. *et al*., 2020]. The most effective medication in treating otomycosis agents without causing ototoxicity areazoles [Then, K. M. *et al*., 1980]. Conversely, oral and intravenous antifungal medicines are used for treating serious infections in immunocompromised people; nevertheless, without local care, there is little hope of recovery. [Agrawal, S. R. *et al*., 2001]

**PATIENTS AND METHODS**

**Study Design**

Seventy patients suffering from otomycosis participated in this cross-sectional investigation conducted in a hospital. The investigation was conducted up throughout a 16-month duration, from August 2022 to December 2021, at different hospitals in Iraq. The study consisted of male and female patients older than the age of 20 who were diagnosed with otomycosis symptoms and signs, such as ear discomfort, itching, tinnitus, feeling like their ears were plugged and hearing loss. The study excluded individuals with benign or malignant ear tumors, people with chronic or acute suppurative otitis media (CSOM), as well as patients who had undergone any ear surgery. Demographic and clinical findings included age, sex, BMI, [kg/m2], comorbidities, ASA classification (%), smoking status, education status, working, and marital status. In terms of diagnostic findings, our study shown participants who underwent to diagnosis techniques regrading to type of Fungus, predisposing factors, and the determination of complications who spread in the patients.

**Collecting Sample Data**

Data on otomycosis in cases which were clinically diagnosed was collected employing aseptic procedures. To handle the otomycotic debris from the deeper section of the canal, we used two thin, sterile cotton wool swabs. The microbiology portion was given the swabs right away within a clean container alongside an inquiry for a fungal culture. 10% of potassium hydroxide (KOH) was applied to the specimen for direct microscopy. Once the material was cleaned, the potassium hydroxide preparation was stored at room temperature. To expedite the cleansing process, the slide was periodically heated. To raise the likelihood that infections caused by fungi would recover, all inoculation media were incubated at both 25°C and 37°C and checked every day over a week along with twice weekly for a further week. Lactophenol cotton blue mount microscopy and colony morphology were utilized to perform the identification. Variations in the length in conidiophores and the level of phialide and conidia coverage on vesicles were observed in Aspergillus isolates. After 2-4 hours in incubation at 37°C, the development of germ tubes on the isolates in serum was seen for the aim of characterizing the Candida isolates. The colonies were then injected on HiChrome agar to facilitate species identification. In addition, an approach to measure how chronic otitis media affects the quality of life is the Chronic Otitis Media Questionnaire 20 (COMQ-20) scale, which consists of the 20 items on the scale evaluate a variety of factors, including quality of life, ear complaints, and hearing challenges, where higher scores indicate the greater effect from chronic otitis media upon the quality of life, which scale normally has a ranged of 0 to 100. Also, the Sartorato categorization system scale goes from mild (0–2) to moderate (3-5) to severe (6–10) in assessing the degree of chronic venous insufficiency—more particularly varicose veins—the Sartorato categorization system is used.

**Statistical Analysis**

By using descriptive statistics to a collection of demographic data—which can be obtained as frequency and percentages—the data were evaluated. To express continuous data, the mean as well as standard deviation were employed. To find out if the characteristics had a connection, inferential statistics were employed, that is, Fisher's exact and Chi-square tests. Any statistical analysis was deemed significant if the P-value was below 0.05.

**RESULTS**

**Table 1:** Clinical and demographic characteristics findings related to patients with otomycosis

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| **Characteristics** | **Number of patients [70]** | **Percentage [%]** |
| Age |  |  |
| 20 – 25 | 14 | 20.0% |
| 26 – 30 | 21 | 30.0% |
| 31 – 40 | 17 | 24.29% |
| 41 – 45 | 18 | 25.71% |
| Sex |  |  |
| Male | 42 | 60.0% |
| Female | 28 | 40.0% |
| BMI, [kg/m2] |  |  |
| Underweight | 5 | 7.14% |
| Normal weight | 20 | 28.57% |
| Overweight | 26 | 37.14% |
| Obesity | 19 | 27.14% |
| Comorbidities |  |  |
| Yes | 25 | 35.71% |
| No | 45 | 64.29% |
| Hypertension | 22 | 31.43% |
| Diabetes | 20 | 28.57% |
| Anemia | 4 | 5.71% |
| Cardiovascular diseases | 11 | 15.71% |
| Chronic obstructive pulmonary disease | 6 | 8.57% |
| Kidney diseases | 8 | 11.43% |
| ASA classification (%) |  |  |
| I | 12 | 17.14% |
| II | 14 | 20.0% |
| III | 26 | 37.14% |
| IV | 18 | 25.71% |
| Smoking status |  |  |
| Yes | 24 | 34.29% |
| No | 46 | 65.71% |
| Education status |  |  |
| Elementary | 11 | 15.71% |
| Secondary | 17 | 24.29% |
| College/university | 42 | 60.0% |
| Marital status |  |  |
| Single | 24 | 34.29% |
| Married  | 37 | 52.86% |
| Divorced | 5 | 7.14% |
| Widow | 4 | 5.71% |
| Work status |  |  |
| Working | 26 | 37.14% |
| Not – working | 44 | 62.86% |

**Table 2:** Detecting the common symptoms prevalence in otomycosis patients.

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| **Symptoms** | **Number of patients [70]** | **Percentage [%]** |
| Itching | 45 | 64.29% |
| Pain | 14 | 20.0% |
| Sense of blocked ear | 5 | 7.14% |
| Ear discharge | 3 | 4.29% |
| Tinnitus | 2 | 2.86% |
| Hearing impairment | 1 | 1.43% |

**Table 3:** Distribution of patients with otomycosis regrading to the type of fungus.

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| **Type of Fungus** | **Number of patients [70]** | **Percentage [%]** |
| Aspergillus niger | 42 | 60.0% |
| Candida albicans | 17 | 24.29% |
| Aspergillus fumigatus | 4 | 5.71% |
| Aspergillus glaucus | 4 | 5.71% |
| Penicillium | 2 | 2.86% |

**Figure 1:** Distribution of severity scores on patients with otomycosis in terms of mild, moderate, and severe using the Sartorato classification system scale.

**Table 4**: Identify the causative factor associated with patients who have otomycosis by Chronic Otitis Media Questionnaire 20 (COMQ-20).

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| **Predisposing factors** | **Number of patients [70]** | **Percentage [%]** |
| Earbud usage | 23 | 32.86% |
| Water in the ear | 17 | 24.29% |
| Other factors | 14 | 20.0% |
| Oil in the ear | 11 | 15.71% |
| Ear drops | 5 | 7.14% |

**Table 5**: Determining main complications prevalence in the patients with otomycosis.

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| **Complications** | **Number of patients [70]** | **Percentage [%]** |
| Hearing loss | 4 | 5.71% |
| Chronic/recurrent infections | 10 | 14.29% |
| Spread of infection | 6 | 8.57% |
| Tympanic membrane perforation | 3 | 4.29% |
| Tinnitus | 4 | 5.71% |
| Facial nerve paralysis | 1 | 1.43% |
| Total | 28 | 40.0% |

**Table 6:** Assessment of quality of life-related to patients with otomycosis.

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| **Items** | **COMQ-20 scale, (mean ± SD)** |
| Hearing loss | 54.23 ± 12.60 |
| Ear symptoms | 59.88 ± 9.82 |
| Hearing function | 45.35 ± 23.76 |
| Mental health | 64.60 ± 8.44 |
| Emotions and activities | 52.72 ± 10.25 |

**DISCUSSION**

Recent research indicates that otomycosis is quite common and other nations as an outcome of environmental dust, humidity, and temperature. People who labor outside, where they were surrounded by fungal spores, are more likely to get the illness. In 2010, the most commonly detected fungus species from people who had otomycosis were Aspergillus and Candida albicans. In addition, a 2014 study carried out in the USA revealed the frequency in Aspergillus fumigatus, Aspergillus niger, as well as Candida albicans.

According to prior research, Aspergillus niger (60%) as well as Candida albicans (24.29%) were the most frequently isolated fungus from patients in the current study. According to some studies, the main causes of the high frequency of Aspergillus species are the acidity for the ear canal and the species' high concentration in dust, that grows more readily at pH values of 5 to 7. Consistent with the outcomes of previous researchers, Aspergillus niger was found to be the most prevalent species of Aspergillus in these investigations.

According to an Indian study, Candida species are the most common fungus, which is in line with data from other studies. Study shows that the pathophysiology of Candida-caused otomycosis involves the creation of protease by Candida species. The colonization of different kinds of Candida in the skin and ears is facilitated by this enzyme.

Itching (64.29%) as well as pain (20%) were found to be the most prevalent clinical signs of otomycosis in our study, showing that laboratory testing is required in identifying the illness given that clinical symptoms alone were inadequate.

Previous study investigated the influence for preoperative comorbidities upon surgical outcomes, determining patients with depression as less likely to gain anything in surgery and diabetic patients as having a higher incidence for postoperative complications, most likely as an outcome of a greater inability to heal wounds and re-epithelialise the surgical cavity. According to the results of our study, the prevalence of comorbidity was 35.71%, and the two most common problems affecting the patients were diabetes (28.57%) and hypertension (31.43%).

**CONCLUSION**

According to this study, itching seems to be the initial along with the most common clinical sign of otomycosis, indicating that early diagnosis is essential to avoid any potential long-term effects. Aspergillus niger, a common kind of fungi infection, was the most popular type among the patients. The condition is more prevalent for men than in women, as well as unilateral left-sided otomycosis was the most common kind. Earbuds are the most common cause, and they also remove protective wax. As a result, otomycosis negatively impacted their quality of life and increased the prevalence of poor indications for the individuals, which include emotions, activities, and hearing function.

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