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Mycological Profile of Otomycosis in Patients Attending a Tertiary Hospital in Cameroon

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Abstract: The diagnosis of otomycosis is usually based on clinical signs, symptoms and predisposing factors to which the patient is exposed. Mycologic examination of samples is required for an adequate antifungal treatment. However, the access to this analysis is very low in low-income settings, and most of the treatments are probabilistic. We aimed to provide the mycologic profile of otomycosis in our environment. We carried out a descriptive and cross sectional study from October 2016 to May 2017 in the University Teaching Hospital of Yaounde. Consenting patients with symptoms of otomycosis were included and samples from the external auditory canal were collected for fresh mount-analysis and culture on Sabouraud dextrose agar medium was done for up to 5 days. Pathogens were identified from their morphologic characteristics on low magnification. The prevalence was reported with 95% confidence interval, and qualitative variables were described with numbers and percentages. A total of 60 participants were included, with a mean age of 32.8 ± 15.8 years and a predominance of female participants (62%). The use of cotton swabs was the most frequent predisposing factor for otomycosis (50%). Itching was the commonest symptom (85%). The overall prevalence of otomycosis in the population was 66.7% (95% CI: 54.1-77.3%), with *A. niger*, *Candida* species, *A. flavus* and other *Aspergillus* species representing the most encountered fungi. Otomycosis is common in the otolaryngology service, affecting mostly young people and females. Treatment targeting *A. niger* like imidazole may be used as first line probabilistic antifungal treatments.

Keywords: Mycologic, Profile, Otomycosis, Tertiary Hospital, Cameroon

1. Introduction

Otomycosis is an infection of the External Auditory Canal (EAC) caused by fungi [1]. The major symptoms of otomycosis are earache, ear discharge, and hearing loss [2]. Other clinical manifestations of the infection usually include itching of the ear, otalgia, otorrhea, hearing impairment and tinnitus. Tenderness of the ear's canal during movement of the auricle, edema, redness of the EAC's walls and blotting paper appearance of matted mycelia are found on otoscopic examination [3]. Although otomycosis is rarely a life-threatening disease, it is a real public health issue because of the long-term treatment required and its tendency

for recurrence [4]. Several predisposing factors have been reported, including trauma to the EAC or instrumentation of the ear, use of topical antibiotic/steroid eardrops, exposure to humid atmospheres, close contact with water, accumulation of cerumen, immunocompromised states and frequent water intake. Its worldwide prevalence varies between 9% and 30% among patients with signs and symptoms of otitis externa in otolaryngology units [5]. The diagnosis is usually based on patient's history (with a focus on predisposing factors) and clinical examination [6]. However, adequate treatment with antifungals must be directed specifically against the causative agent in order to avoid the development of resistance and to increase the success rate of the treatment. Microscopic examination of EAC samples and culture on specific media permits to identify the fungi. These tests are not usually available in low-income settings like tropical and subtropical regions where the incidence is highest. Most of the practitioners therefore rely on previous epidemiological studies for probabilistic antifungal treatment. Data on the mycologic profile of otomycosis remain however scarce in these settings. Only few studies have been reported in Cameroon [7, 8]. This study aimed to reduce this gap and improve the quality of probabilistic antifungal prescription by describing the mycologic profile of otomycosis in a low-income tertiary hospital.

2. Materials and Methods

2.1. Study Design and Settings

This was a descriptive cross sectional study conducted from October 2016 to May 2017 at the outpatient unit of the Ear, Nose and Throat (ENT) department of the university teaching hospital of Yaounde, Cameroon. This hospital is a tertiary and referral hospital where most of the patients with ENT affections are referred in the town, especially from surrounding clinics.

2.2. Study Population and Selection Criteria

All consenting patients with a clinical diagnosis of otomycosis were consecutively sampled and included in the study. The diagnosis was made by an ENT specialist after a thorough clinical examination. The following symptoms were considered as manifestations of otomycosis: black, white or brown ear discharge with or without blotting paper appearance of matted mycelia, otalgia, pruritis and hearing loss. Patients with other ENT pathologies and those on current antifungal medication were excluded from the study.

2.3. Data Collection and Samples Examination

Sociodemographic data including age and gender, as well as otomycosis predisposing factors were collected on a pre-tested data collection form. A complete clinical examination of the ENT sphere was performed to collect data on otomycosis signs and symptoms.

Prior to sample collection, the outer portion of patients' external auditory canal (EAC) was cleaned with a sterile cotton swab moistened with physiologic saline. Other sterile cotton swabs were then used to collect sample from the deeper portion of the EAC. The specimens were collected in duplicate and inoculated in a labelled cork screw glass tube containing Sabouraud dextrose agar (SDA) supplemented with chloramphenicol which had undergone sterility checks. Inoculation was done by gentle streaks on the surface of the SDA medium, and the tubes were incubated at room temperature for up to 5 days.

The other ear specimen collected with the cotton swab was mounted on a new glass slide containing a drop of sterile normal saline which was examined with low magnification. The morphologic characteristics of the fungus (if present) were recorded.

The incubated media were macroscopically examined daily for growth. Specimens that failed to produce growth within 5 days were considered negative. One or two colonies in the tubes that showed growth were collected with a sterile wire loop and then mounted on a new glass slide containing a drop of sterile normal saline and examine with low magnification. The morphologic characteristics were used to identify the fungi. The Germ tube test was used to identify yeast isolates. One colony of the yeast isolated from the culture was incubated in 5mL animal serum (sheep or rabbit) for 3 hours at 37°C. After incubation, microscopy of a drop of the incubated mixture was done at low magnification.

2.4. Ethical Considerations

An ethical clearance was obtained from the institutional ethical review board of the faculty of medicine and biomedical sciences, as well as an administrative authorization from the Director of the University Teaching Hospital of Yaounde. Prior to inclusion, a written informed consent was requested from each participant. Data collection and management was done in accordance with the ethical principles for medical research involving human subjects as stated in the Helsinki declaration and updated versions [10]. An antifungal treatment was prescribed to participants with positive results.

2.5. Statistical Analysis

Epi info software was used for data entry and data analysis [9]. Qualitative variables were described with numbers and percentages. Normally distributed quantitative data were described with mean ± standard deviation, and the range was reported. The prevalence of otomycosis was calculated with the 95% confidence interval. Positive cases were considered both from the fresh mounts samples and from SDA medium culture.

3. Results

3.1. Characteristics of Participants

We included 60 participants with one EAC sample collected from each participant. The mean age of the study population was 32.8 ± 15.8 years, ranging from one to 75 years. Most of the participants (55%) were aged between 21

years and 40 years (Table 1). Females were most represented (62%). The first predisposing factor for otomycosis in the population was the use of cotton swabs found in half of participants, followed by chronic otitis present in 25% of patients (Table 1).

Table 1. *Description of the characteristics of participants.*

Parameter	Characteristics	Number (n=60)	Percentage (%)
Sex	Male	23	38
	Female	37	62
Age range (years)	< 10	5	8
	[10 – 20]	7	12
	[20 – 30]	21	35
	[30 – 40]	14	23
	[40 – 50]	1	2
	[50 – 60]	10	17
	≥ 60	2	4
Predisposing factors	Use of cotton swabs	30	60
	Chronic otitis	15	25
	Antibiotic use	6	10
	Ear trauma	4	6.7
Others*		5	8.3

*Others included use of bamboo sticks, atopic pregnancy, polyp in external auditory canal and immunodeficiency.

3.2. Clinical and Mycologic Features of Otomycosis

Clinical manifestations were characterized by ear itching, otorrhea, otalgia and deafness, found respectively in 51 (85%), 47 (78.3%), 36 (60%), and 21 (35%) participants (Table 2). The prevalence of otomycosis on microscopy of fresh mounts was 41.7% (95% CI: 30.1-54.3%). Out of the 35 samples that were negative on fresh mounts, 42.9% (95% CI: 27.9-59.1%) showed visible growth on culture. The overall prevalence of otomycosis in the population was therefore 66.7% (95% CI: 54.1-77.3%). Figure 1 presents the distribution of fungal elements found in positive fresh mounts. Filaments were most frequent with a proportion of 40%, followed by *Aspergillus niger* and Aspergillar head and filaments with respective proportions of 24% and 12%.

Table 2. *Distribution of clinical features of otomycosis in the population.*

Clinical features	Number (n=60)	Percentage (%)
Ear itching	51	85
Otorrhoea	47	78.3
Otalgia	36	60
Deafness	21	35
Tinnitus	9	15
Red EAC	8	13.6
Tinnitus and fullness of ear	4	6.7
Fullness of ear	2	3.3
Sensation of blocked ears	2	3.33
Perforation of eardrum	1	1.7
Swollen right tonsil	1	1.7

EAC: External Auditory Canal.

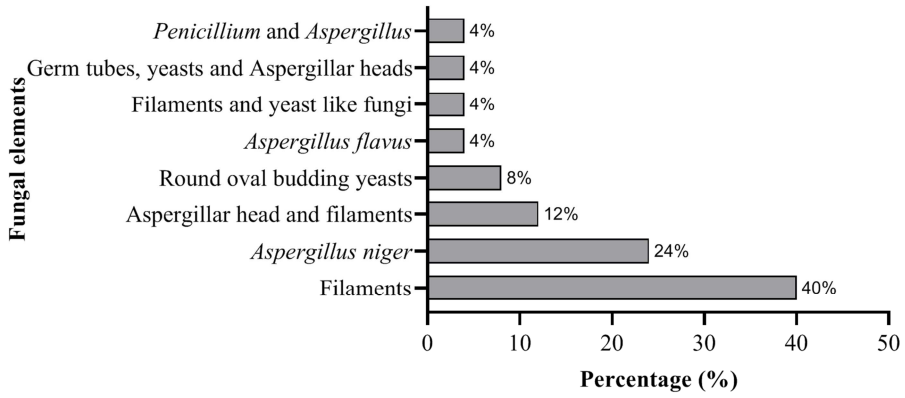

Figure 1. *Distribution of fungal elements in positive fresh mounts.*

4. Discussion

The diagnosis and treatment of otomycosis is a great challenge for ear nose and throat (ENT) specialist in low-income areas as there is a poor access to mycological sample examination. Most of the antifungal prescriptions are probabilistic, based on previous studies of mycologic profiles. This study aimed to provide more data on the mycologic profile of otomycosis in our context.

The most frequent fungi isolated were *A. niger* followed by *Candida* species, *A. flavus* and other *Aspergillus* species. The genus *Penicillium* was isolated together with *Aspergillus* species. These results are similar to others in which *A. niger* was the most frequent fungus isolated [11, 12]. However, our findings are different from those by Lohoue et al. in Yaounde, Cameroon. In her report, *A. fumigatus* was the most frequent isolated fungus [7]. These differences in the results might be related to several issues: climate change, period of enrolment of participants (rainy or dry season), incubation of specimens at room temperature instead of 37°C. Moreover, there is a period of more than 20 years between the two studies, emphasizing the need of regular update on the microbiological profile of infections, especially fungal infections. We may also suggest the use of enilconazole, voriconazole or other imidazole as first line probabilistic treatment of otomycosis when mycological examination is not available [13].

Most of our participants were aged between 21-40 years; similar to the age range of 21-30 years reported by Arora et al [14]. This finding might be attributed to the fact that this is the

age group at which individuals are in active service at work, thus they might encounter fungi responsible for otomycosis in different settings. Females were also mostly affected than males. This may be explained by the fact that females may be more exposed to water in their daily activity, exposure to water has been one of the key predisposing factors. Sensitization messages on predisposing factors targeting young people and females may contribute to reduce the burden of otomycosis in our setting.

The difference between the results of fresh mounts and culture confirmed the superiority of culture over fresh mounts in the diagnosis of otomycosis. The study by Ashish Kumar elucidates similar findings. In that study 34 (31.48%) of the 82 specimens that were negative in fresh mounts were positive in culture [15]. Contrasting results were obtained by Degerli et al. In that study microscopy of fresh mounts revealed 28% (638/2279) positivity against 24% (544/2279) positivity on culture [12]. However, we think that our results should not have been due to contamination since growth in the duplicate tubes was homogenous from bottom to top. This eliminates all possible environmental contamination since you have more than two colonies when the tube is filled with the growth. Our findings are further comforted by the report of McClenny which highlights that the presence of more than two colonies predicts infection [16]. And effort should be done in every laboratory analyzing EAC samples to performed culture and avoid limiting on fresh mounts analysis.

Our study presents some limitations. Samples were collected only from participants with signs and symptoms of otomycosis, and we may have missed some cases with few or no symptoms. This number of missed cases may however be very few, as fungal infections of EAC are usually symptomatic in adults. More accurate diagnosis technics for identification of fungi in samples may yield more specific identification of pathogens. Access to these technics are unfortunately reduced in our context. One of the key strength of this study is the fact that the description of mycological profile of otomycosis in Cameroonian context is rarely reported [8]. This is thus an update which may strongly influence the decision of clinicians for the management of otomycosis when fungal analysis is not available.

5. Conclusion

The prevalence of otomycosis in patients with clinical signs and symptoms was very high, affecting about two patients out of three. Young people and females were mostly affected. Ear itching, otorrhoea and otalgia were the most common symptoms found in more than half of the population. The most frequent fungi isolated were *A. niger* followed by *Candida* species, *A. flavus* and other *Aspergillus* species, suggesting that, voriconazole or other imidazole may be used as first line probabilistic treatment of otomycosis when mycological examination is not available. Further studies using more accurate fungi identification methods may help to improve the quality of these results.

Conflicts of Interest

Authors have declared that no competing interests exist.

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