

Prevalence of otomycosis in Khuzestan Province, south-west Iran

N SAKI¹, A RAFIEI², S NIKAKHLAGH¹, N AMIRRAJAB², S SAKI³

¹Department of ENT, Imam Khomeini Hospital, Ahvaz Jundishapour University of Medical Sciences, ²Tropical and Infectious Diseases Research Center, Ahvaz Jundishapour University of Medical Sciences, Ahvaz, and ³Medical Student, Shiraz University of Medical Sciences (International Branch), Iran

Abstract

Background: This study aimed to investigate the prevalence of otomycosis and aetiological agents in Khuzestan province, south-west Iran.

Methods: This cross-sectional study examined and cultured 881 swabs from suspected external otitis cases, collected from throughout Khuzestan province. Fungal agents were identified by slide culture and complementary tests when necessary.

Results: The mean patient age was 37 years. The 20–39 year age group had the highest prevalence of otomycosis: 293 cases, comprising 162 (55.3 per cent) women and 131 (44.7 per cent) men. The seasonal distribution of cases was: summer, 44.7 per cent; autumn, 28.7 per cent; winter, 14.7 per cent; and spring, 11.9 per cent. The fungal agents isolated were *Aspergillus niger* (67.2 per cent), *Aspergillus flavus* (13 per cent), *Candida albicans* (11.6 per cent), *Aspergillus fumigatus* (6.2 per cent) and penicillium species (2 per cent).

Conclusion: Fungal otomycosis is still one of the most important external ear diseases. In this study in south-west Iran, *Aspergillus niger* was the predominant aetiological agent. However, clinicians should be cautious of candidal otomycosis, which has a lower rate of incidence but is more prevalent among 20–39 year olds.

Key words: External Ear Canal; Fungus; Prevalence; Iran

Introduction

Otitis externa is inflammation of the external ear canal. It occurs predominantly in summer, with a prevalence of 4 per 1000 population.¹ It is caused by either infection or dermatitis. Bacterial infections are the most common cause of otitis externa in subtropical areas, followed by fungal infections, which are responsible for 10–20 per cent of otitis externa cases.^{1,2} Otitis externa is also known as ‘swimmer’s ear’ as it is more prevalent among swimmers and can appear after prolonged exposure to water.^{3–5}

Otomycosis, or fungal otitis externa, may occur as an acute, subacute or chronic infection with clinical signs such as inflammation with exudate. Acute infection presents with earache accompanied by white exudate. Subacute infection is characterised by dry dermatitis, with itching and no exudate. In chronic infection, there is itching occasionally accompanied by scaling, with little exudate and no odour. Clinical symptoms normally start with itching and reduced hearing, and continue with erythema and inflammation of the external ear. As a result, densely impacted wax may form, comprising fungal mycelia and epithelial cells. This

wax can partially close the external canal and may lead to hearing loss or even deafness. Cases of otomycosis with additional bacterial infection may develop a foul-smelling exudate, severe pain, inflammation and erythema. As such clinical symptoms are not specific to otomycosis, the definitive diagnosis should be based on direct histological examination and microbial culture.^{6,7}

Otomycosis is widespread, occurring predominantly in tropical and subtropical regions. The most common risk factors for the infection are: warm and damp weather; bacterial external otitis; swimming; close or continuous contact with water; eczema; seborrhoeic dermatitis of the external ear; external ear injury due to a foreign body; wearing headphones and hats; anatomical disorders; diabetes mellitus; and immune incompetence.^{3,8} Saprophytic fungi, candida species and dermatophytes are the main aetiological agents.^{7–13}

Otomycosis should be differentiated from seborrhoeic, streptococcal and contact dermatitis, as well as from allergic infections of the middle ear.^{2,14–16}

This study was performed to evaluate the prevalence of otomycosis and its aetiological agents in Khuzestan province in south-west Iran, previously a war zone for

many years, with a climate which is usually very hot and humid.

Patients and methods

We investigated 881 patients from different regions of Khouzestan province who were suspected of having otomycosis. After being examined by an otolaryngologist, a questionnaire was completed and samples were obtained for laboratory examination.

Mycological analysis was carried out on debris, scrapings or exudate samples obtained from the external auditory canals of patients clinically suspected of otomycosis. Samples were collected using a sterile cotton swab, placed in sterile normal saline and transferred to the laboratory.

In order to detect fungal elements, specimens were examined under direct microscopy using KOH (10 per cent), Gram staining and periodic acid Schiff staining. Samples were also inoculated onto Sabouraud's dextrose agar with and without antibiotics and incubated at 25 and 37°C, variously, for a minimum period of 4 weeks, and were evaluated every 2 days for the presence of fungi. The diagnosis of otomycosis was made based on microscopic identification of the characteristic appearance of fungal 'mats' and fruiting bodies.

Results

Upon laboratory examination, 293 patients were diagnosed with otomycosis: 162 (55.3 per cent) women and 131 (44.7 per cent) men. The highest prevalence was seen in the 20–39 year age group. There was a male preponderance amongst patients younger than 20 years, but in other age groups the disease was more prevalent amongst women (Table I).

When patients' occupations were analysed, we found a preponderance of homemakers, animal husbanders, private sector employees, farmers and students (Table II).

The aetiological agents were *Aspergillus niger* (67.2 per cent), *A flavus* (13 per cent), *Candida albicans* (11.6 per cent), *A fumigatus* (6.2 per cent) and penicillium species (2 per cent) (Table III).

The seasonal distribution was: summer, 44.7 per cent; autumn, 28.7 per cent; winter, 14.7 per cent; and spring, 11.9 per cent.

TABLE I
OTOMYCOSIS CASES BY SEX AND AGE

Age (y)	Males	Females	Total
<10	8	6	14
10–19	25	14	39
20–29	25	49	74
30–39	36	51	87
40–49	19	22	41
50–59	11	11	22
>59	7	9	16
Total	131	162	293

Data represent patient numbers. Y = years

Discussion

Otomycosis is one of the most common infections especially in humid tropical and subtropical climates.¹⁷ The differentiation of otomycosis from other types of otitis externa is important to enable appropriate treatment.¹⁸ In this study, otomycosis was diagnosed in 33.25 per cent of patients suspected of otitis externa.

Similar studies have reported different rates of infection.^{2,13,16,19–21} The high prevalence found in our study may be associated with the humid and subtropical climate, dusty conditions, high prevalence of immune incompetency, and low hygiene standards common in the study region. Although infection occurred in all age groups, the highest prevalence was observed in 20–39 year olds; this is similar to most other studies.^{21,22} There is no clear explanation for this finding, but the greater range of activities undertaken in this age group may lead to greater exposure to environmental fungal agents.

- This study assessed otomycosis in Khouzestan province, south-west Iran
- This area was previously a war zone, and is very hot and humid
- *Aspergillus niger* was the commonest fungal aetiology
- *Candida albicans* was less common, but more prevalent in 20–39 year olds

Our study identified more cases of otomycosis amongst women (55.3 per cent) than men (44.7 per cent), consistent with other studies.^{22,23} This may be because women are more conscious of their health and thus use cotton swabs to clean their ears more frequently, resulting in a higher moisture level in the external auditory canal, which is a risk factor for otomycosis.^{11,20} On the other hand, swabs can protect the ear from environmental contaminations and reduce the level of exposure to environmental fungal agents.¹² This aspect of otomycosis aetiology needs further investigation.

TABLE II
OTOMYCOSIS CASES BY OCCUPATION

Occupation	Men	Women	Total
Homemaker	–	52	52
Animal husbandry	31	18	49
Labourer	39	8	47
Private sector	4	32	36
Farmer	19	15	34
Student	16	12	28
Clerical	15	18	33
Hairdresser	2	5	7
Teacher	3	1	4
Doctor	2	1	3
Total	131	162	293

Data represent patient numbers.

TABLE III
OTOMYCOSIS CASES BY FUNGAL AETIOLOGY AND SEX

Pt sex	<i>A niger</i>	<i>A flavus</i>	<i>A fumigatus</i>	<i>C albicans</i>	Penicillium sp	Total
Female	113	17	10	20	2	162
Male	84	21	8	14	4	131
Total	197	38	18	34	6	293

Data represent patient (Pt) numbers. A = Aspergillus; C = Candida; Sp = species

Aspergillus niger was the most common fungal aetiological agent in this study, consistent with most previous studies.^{7,21,24–26} This finding might be explained by the fact that aspergillus is present in polluted air, although no clear explanation yet exists.

This study found no significant relationship between occupation and fungal infection, probably because saprophytic fungi are distributed in all environments.

Clinicians should be aware that 20–39 year olds are at a higher risk of otomycosis.^{12,22,24}

The limitations of this study include a possible selection bias given the referral pattern of our practice. In addition, the high heat and humidity in our study region may limit the applicability of our findings in regions with a more temperate climate.

Nevertheless, to our knowledge this series represents one of the largest otomycosis surveys reported worldwide.

Conclusion

Fungal otomycosis is still one of the most important types of external ear infections. In the region in which this study was conducted in south-west Iran, *Aspergillus niger* was the predominant fungal aetiological agent. Although candidal otomycosis had a lower rate of incidence, clinicians should be aware of this aetiology especially among 20–39 year olds.

Acknowledgement

This study was supported by the Research Deputy of Ahvaz Jundishapour University of Medical Science (registration number 85105); we are very grateful for their support and permission to publish the study data.

References

- Flint PW, Haughey BH, Lund VJ, Niparko JK. Infections of the external ear. In: Cummings CW, ed. *Otolaryngology Head and Neck Surgery*, 4th edn. Amsterdam: Elsevier Health Sciences, 2005;972–4
- Kumatowski P, Filipiak A. Otomycosis: prevalence, clinical symptoms, therapeutic procedure. *Mycoses* 2001;**44**:472–9
- Lee KJ. Infection of the ear. In: Lee KJ, ed. *Essential Otolaryngology Head & Neck Surgery*. New York: McGraw Hill, 2003;462–511
- Wang MC, Liu CY, Shiao AS, Wang T. Ear problems in swimmers. *J Chin Med Assoc* 2005;**68**:347–52
- Kaushik V, Malik T, Saeed SR. Interventions for acute otitis externa. *Cochrane Database Syst Rev* 2010;(1):CD004740
- Yamashita M, Hashimoto S, Ezaki M, Iwami M, Komori T, Kohsaka M *et al*. A novel penicillin with b-lactamase inhibitory activity. *J Antibiot (Tokyo)* 1983;**36**:1774–6
- Fasunla J, Ibebwe T, Onakoya P. Otomycosis in western Nigeria. *Mycoses* 2007;**51**:67–70
- Jadhav VJ, Pal M, Mishra GS. Etiological significance of candida albicans in otitis externa. *Mycopathologia* 2003;**156**: 313–15
- Paulose KO, Al Khalifa S, Shenoy P, Sharma RK. Mycotic infection of the ear (otomycosis): a prospective study. *J Laryngol Otol* 1989;**103**:30–35
- Gugnani HC, Okafor BC, Nzelibe F, Njoku-Obi AN. Etiological agents of otomycosis in Nigeria. *Mycoses* 1989;**32**:224–9
- Donamayor Hernandez C. Ear infections by Aspergillus [in Spanish]. *An Otorrinolaringol Ibero Am* 1990;**17**:535–44
- Burgos SA, Menaches GM, Gras AJ, Talavera SJ. Descriptive study of infectious ear disease in relation to summer [in Spanish]. *Acta Otorrinolaringol Esp* 2000;**51**:19–24
- Nwabuisi C, Ologe FE. The fungal profile of otomycosis patients in Ilorin, Nigeria. *Niger J Med* 2001;**10**:124–6
- Loh KS, Tan KK, Kumarasinghe G, Leong HK, Yeoh KH. Otitis externa: the clinical pattern in a tertiary institution in Singapore. *Ann Acad Med Singapore* 1998;**27**:215–18
- Egami T, Noguchi M, Ueda S. Mycosis in the ear, nose and throat [in Japanese]. *Nippon Ishinkin Gakkai Zasshi* 2003;**44**: 277– 83
- Mishra GS, Mehta N, Pal M. Chronic bilateral otomycosis caused by *Aspergillus niger*. *Mycoses* 2004;**47**:82–4
- Munguia R, Daniel SJ. Otological antifungals and otomycosis: a review. *Int J Pediatr Otorhinolaryngol* 2008;**72**:453–9
- Martin TJ, Kerschner JE, Flanary VA. Fungal causes of otitis externa and tympanostomy tube otorrhea. *Int J Pediatr Otorhinolaryngol* 2005;**69**:1503–8
- Pradhan B, Tuladhar NR, Amatya RM. Prevalence of otomycosis in outpatient department of otolaryngology in Tribhuvan University Teaching Hospital, Kathmandu, Nepal. *Ann Rhinol Laryngol* 2003;**112**:384–7
- Yehia MM, Al-Habib HM, Shehab NM. Otomycosis: a common problem in north Iraq. *J Laryngol Otol* 1999;**104**:387–9
- Fasunla J, Ibebwe T, Onakoya P. Otomycosis in western Nigeria. *Mycoses* 2007;**51**:67–70
- Ologe FE, Nwabuisi C. Treatment outcome of otomycosis in Ilorin, Nigeria. *West Afr J Med* 2002;**21**:34–6
- Brobby GW. The discharging ear in the tropics: a guide to diagnosis and management in the district hospital. *Trop Doct* 1992; **22**:10–13
- Kazemi AH, Ghiaei S. Survey of otomycosis in north-western area of Iran, 1997–2004. *Medical Journal of Mashhad University of Medical Sciences* 2009;**52**:233–8
- Shokoohi T, Ahanjan M, Kasiri AM. Bacteriological and mycological study of external otitis in patients referred to ENT clinic of Boo Ali Sina Hospital in Sari in summer 1999. *Journal of Mazandaran University of Medical Sciences* 2001;**32**:1–10
- Sefidgar AA, Kiakoouri K, Mirzaei M, Sharifi F. Fungal infections of external ear canal in patients with otomycosis. *Babol Journal of Babol University of Medical Sciences* 2002;**13**:29–5

Address for correspondence:

Dr Soheila Nikakhlagh,
Department of ENT,
Imam Khomeini Hospital,
Ahvaz Jundishapour University of Medical Sciences,
Ahvaz, Iran

Fax: +98 611 291838

E-mail: nikakhlagh.s@gmail.com

Dr S Nikakhlagh takes responsibility for the integrity of the content of the paper

Competing interests: None declared