

ETIOLOGICAL AGENT AND RISK FACTOR OF OTOMYCOSIS AT ESSAOUIRA, WEST PROVINCE, IRAQ

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ABSTRACT : Otomycosis is a fungal infection of the external canal of the ear, is widespread in the tropics and sub-tropical regions, but is it confined to these areas or it is possible to be present in areas that have different climate which is very hot and dry in summer, very cold and rainy in winter, This is what we try to know by performing this research in the city of Essaouira, Wasit province of Iraq. The study includes 322 patients attending the ENT consulting clinic. The patients subjected to clinical diagnosis, fill questionnaire forma and the samples analysis in the laboratory. The prevalence of otomycosis was (29.5%), *Candida albicans*. *Aspergillus nigar* were the predominant isolates involve in infected patients (29.4%, 24.2%), female to male ratio was 1:2, the infection was more common in individuals with 3^{ed} and 4th decade (33.6%, 26.3%), July and August wetness the higher percent of infection (30.5%, 27.3%). Self-hygiene of the ear, abuse of ear antibiotic droplets were statistically significant ($\chi^2=8.264$, $p=0.003$; $\chi^2=23.578$, $p=0.00$).

Key words : Swimming, otomycosis, *Aspergillus*, April, yeast.

INTRODUCTION

External ear infections is an acute or subacute cases that result from the inflammation of epithelial tissue of the outer channel to the ear, and usually caused by a bacterial infection or in some cases a fungal infection (Prakash *et al*, 2015), but this disease may be more complicated when the primary bacterial infection followed by a secondary fungal infection, at this point, its represent a challenge for both the otolaryngologists and the patient because it is difficult to treat such cases, which require long-term treatment and the patient may be susceptible to recurrence if they are not treated properly (Prasad *et al*, 2014; Gupta and Mahajan, 2015). The external ear canal is in contact with various vital elements present in the outer environment, so that, the microorganism which including fungi can easily reach to it (da Silva Pontes *et al*, 2009). When appropriate conditions are available from temperature, humidity, dust, and a number of other factors such as changes in the epithelial layer, changes in ear wax, hearing aids, use of inappropriate tools for ear cleaning, swimming in contaminated water, all that make the person vulnerable for fungal otitis externa or what was known as otomycosis

(Anwar and Gohar, 2014). This disease was spread worldwide, accounting for 9-25% of total cases of ear infections, it can be caused by fungi or yeast. The most fungal species that seems to be involved was *Aspergillus* and *Candida*, while the most common associated bacteria were *Staphylococci* and *Pseudomonas* (Prakash *et al*, 2015).

MATERIALS AND METHODS

The place of study : Essaouira general hospital \ microbiological unit.

The studied sample : Patients attending the consulting clinics of ENT in Essaouira general hospital.

Study design : a descriptive study

Period of study : Out of 2 years and 6 month's starting from March 2016 to the September 2018.

Sample size : 322 patients plus 50 healthy people as control.

Study steps : clinical examination, questioner forma, lab diagnosis.

Inclusion criteria : Patients with itching, pain, difficulty hearing, discharge, headache and fullness

sensation of the ear.

Exclusion criteria : Patients with hypertension, diabetes, malignancies tumours, infants and children younger than 5 years.

Questioners' forma aspects : After the local clinical diagnosis was done and confirmed the suspected of otomycosis, the patients fall the questioner forma that include (socio-demographic characteristic and suspected predisposing factors).

Sample processing : First of all, clean the outer ear canal by moist swab, we used another three serial swabs to collect the sample, which transport to the microbiological unit for diagnosis, one for microscopic examination by 10% KOH slide preparation methods, the second swab was cultured on blood, mannitol salt and McConkey agar that incubated at 37°C for 24 h then examined for bacterial growth farther investigation was performed by using chrome agar and gram stain, the third swab was cultured on Sabouraud dextrose agar incubated at 25°C for fungal growth. Culture with no growth after 3-4 weeks was considered negative, the identification of fungi was performed regarding the morphology, the texture of colony, pigmentation, plus additional stander procedure, the identification of yeast was done by germ tube test, candida chromogenic agar.

RESULTS AND DISCUSSION

The prevalence rate

The study included 322 patients who attended the consulting clinic of ENT suffering from deferent symptoms, all patients subjected to a clinical examination. The laboratory results showed that 95(29.5%) of them had otomycosis, of which 73 cases gave positive results for both the culture and the wet mount test (KOH), 22 cases positive culture, negative KOH, while only 17 cases are positive for KOH negative for culture as it is written in Table 1. The prevalence of the disease varied from very high as in the study of Pardhan B *et al* (2003), Kour *et al* (2000) and Mahmoudabadi (2006) (81.3%, 74.7% & 53.9%), respectively to low as in the study of Prakash *et al* (2015) (20%). The incidence of otomycosis varies from place to place around the world, depending on the climate, population and habits of these areas, as well as the kind of predominant and fungal population in the environment (Joy *et al*, 1980; Bradhan *et al*, 2003; Prakash *et al*, 2015).

Gender and age association with otomycosis

The age of patients ranged from five years to more than fifty-five years, with the highest rate of infection among patients in the 3rd and 4th decades (33.6%, 26.3).

Table 1 : The laboratory diagnosis profile.

	Variables	Culture +	Culture -	Total
Patients	KOH+	73	17	90(27.9%)
	KOH -	22	210	232(72.1%)
	Total	95(29.5%)	227(70.5%)	322(100%)
Control	Variables	Culture +	Culture -	Total
	KOH+	5	0	5(10%)
	KOH -	2	43	45(90%)
	Total	7(14%)	43(86%)	50(100%)

These results coincide with the reports of other studies of Gupta and Mahajan (2015), Fasunla *et al* (2008) and Ahmed *et al* (2010). In spite of this, the infection has appeared in the other age groups in varying degrees, therefore no age is immune against otomycosis, Moreover males were more effected compared to female (68.4% vs 31.5%) as it was written in Table 2. The relationship between the prevalence of otomycosis and gender was very contrastive according to the different study report, some of it shows higher prevalence of infection in man like Pradhan *et al* (2003) and Borlingegowda Viswanatha *et al* (2012), while others clarify that female more susceptible to otomycosis like Gupta and Mahajan (2015), Ahmed *et al* (2010) and Mahmoudabadi (2006) (55.6%,73% and 74%), respectively. This variation in results may be due to a difference in the ratio of males to females in the studied sample.

Predisposing factors

There are many factors that can make a person more susceptible to have otomycosis. The habit of abuse to the antibiotics without medical consultation and the habit of self-ear cleaning, both of which has a statistically significant value ($\chi^2 = 8.964$, $p = 0.003$; $\chi^2 = 23.578$, $p = 0.000$, while the statistical analysis did not show any significant value between otomycosis and swimming ($\chi^2 = 3.734$, $p = 0.053$). As we referred to it in Table 3. Prasad *et al* (2014) and Prakash *et al* (2015) both of them were on the same line with us. The indiscriminate use of antibiotics effects on the balance of microbial flora population, which protects the body from pathogenic microbes, in addition, the use of inappropriate tools to clean the ear. Do not clean it periodically may lead to the accumulation of dirt in the ear and thus provide suitable conditions and nutrients for opportunistic and pathogenic microbes to grow and multiply (Rao and Rao, 2016; Kiakojuri *et al*, 2016).

Season and otomycosis

The study lasted for two years and six months, during which the highest percentage of otomycosis was in the very hot summer months, July and August (27.3%, 30.5%)

Table 2 : The destruction of age and gender with otomycosis.

Gender			Age						
			5-15	16-25	26-35	36-45	46-55	more than 55	Total
Male	Patients	No.	7	13	23	17	3	2	65
		%	7.3	13.6	24.2	17.8	3.1	2.1	68.4
	Control	No.	6	6	8	8	4	0	32
		%	1.2	1.2	16	16	8	0	64
Female	Patients	No.	4	8	9	8	1	0	30
		%	4.2	8.4	9.4	8.4	1	0	62.5
	Control	No.	2	3	4	8	1	0	18
		%	4	6	8	16	2	0	36
Total	Patients	No.	11	21	32	25	4	2	95
		%	11.5	22	33.6	26.3	4.2	2.1	100
	Control	No.	8	9	12	16	5	0	50
		%	16	18	24	32	10	0	100

Table 3 : The comparison of risk factors between control and patients with otomycosis.

Variable		F	Patients	Control	Total	P-value & χ^2
Abuse of antibiotic	yes	No.	59	18	77	$\chi^2 = 8.964$ P-value = 0.003
		%	40.7	12.4	53.1	
	no	No.	36	32	68	
		%	24.8	22.1	46.9	
Total		No.	95	50	145	
		%	65.5	34.5	100.0	
Clean the ear	not at all	No.	35	7	42	$\chi^2 = 23.578$ P-value = 0.000
		%	24.1	4.8	29.0	
	alittle	No.	32	11	43	
		%	22.1	7.6	29.7	
	moderate	No.	19	12	31	
		%	13.1	8.3	21.4	
	mostly	No.	3	10	13	
		%	2.1	6.9	9.0	
completly	No.	6	10	16		
	%	4.1	6.9	11.0		
Total		No.	95	50	145	
		%	65.5	34.5	100.0	
Swimming in the river	yes	No.	45	15	60	$\chi^2 = 3.734$ P-value = 0.053
		%	31.3	10.4	41.7	
	no	No.	50	34	84	
		%	34.7	23.6	58.3	
Total		No.	95	49	144	
		%	66.0	34.0	100.0	

as clarified in Table 4, which are a very dry and hot month in summer where the ambient temperature from minimum 27°C to a maximum 47°C the range of rainfall was 5.5 mm this is the whither of Essaouira city where the present study has been done, increase the environment temperature result in the excessive sweating which dilutes the wax of the ear and minimize its protection role, provide humidly environment and shift the PH of the ear to alkaline all these habitat factors facilitate fungi growth. Mugistont and Odonghue (1985). Prakash *et al* (2015) report that (81%) of cases occur during April and December while Prasad (2014) report that the rate of otomycosis was high (76%) in the Jul, Augst and September. All this opinion clarified that otomycosis becomes more common when the hot and humid present in the area of their studies in spite of the difference in the location (Rao and Rao, 2016; Kiakojuri *et al*, 2016).

Etiological agents

A clinical examination and laboratory test showed that 95 patients have otomycosis, in which the *candida albicans* was the main isolate in 28(29.4) followed by *Aspergillus niger* 23(24.2%), *Aspergillus fumigatus* 18(18.9%) and the rest were respectively shown in Table 5. The main bacterial isolate in patients was *Staphylococcus aureus* 26(20.4%), *S. epidermidis* 22(17.3%) and *Pseudomonas aeruginosa* 21(16.5%), while

Table 4 : The allocation of otomycosis according to months.

Years Months	2016	2017	2018	Total No (%)
January	-	2	1	3 (3.1%)
February	-	1	2	3 (3.1%)
March	1	0	0	1 (1.0%)
April	2	0	0	2 (2.1%)
May	2	1	3	6 (6.3%)
June	7	3	2	12 (12.6%)
July	14	7	5	26 (27.3%)
August	12	9	8	29 (30.5%)
September	4	1	0	5 (5.2%)
October	1	0	-	1 (1.0%)
November	2	2	-	4 (4.2%)
December	3	0	-	3 (3.1%)
Total No.%	48(50.5%)	26(27.3%)	21(22.1%)	95(100%)

Table 5 : The distribution of fungal species.

Fungal Isolates	Patients	Control
<i>Aspergillus nigar</i>	23(24.2%)	2(28.5%)
<i>A. fumigatus</i>	18(18.9%)	1(14.2%)
<i>A. flavus</i>	13(13.6)	0(0%)
<i>Candida albicans</i>	28((29.4)	2(28.5%)
<i>C. parapsilosis</i>	7(7.3)	1(14.2%)
<i>C. tropicalis</i>	4(4.2)	1(14.2%)
<i>Mucor</i>	1(1.01%)	0(0%)
<i>Pencilum</i>	1(1.01)	0(0%)
Total	95	7

in the control grope it was *S. epidermidis* 7(53.8%), *Diphtheroid* spp. 4(30.7%) and *Staphylococcus aureus* 2(15.3%) as clarified in Table 6. De silva pontes *et al* (2009), Barati *et al* (2011) and Wadhvani and Srivastava (1984) clarified that the prevalence of *Candida albicans* was higher than *Aspergillus nigar* in their studies while the results of Fasunla *et al* (2008), Pradhan *et al* (2003)

Table 6 : Bacterial species associated with otomycosis.

Fungi		Bacteria									
		<i>S. aureus</i>	<i>S. epidermidis</i>	<i>Streptococcus Spp.</i>	<i>Diphtheroid Spp.</i>	<i>Bacillus Spp.</i>	<i>Proteus Spp.</i>	<i>P. aeruginosa</i>	<i>Klebsiella Spp.</i>	Total	
<i>A.nigar</i>	Pa	No	9	3	4	2	1	5	3	2	29
	Co		1	2	0	0	0	0	0	0	3
<i>A.fumigatus</i>	Pa	No	0	2	2	1	1	4	6	2	18
	Co		0	1	0	1	0	0	0	0	2
<i>A.flavus</i>	Pa	No	3	4	3	4	4	1	3	1	23
	Co		0	0	0	0	0	0	0	0	0
<i>C.albicans</i>	Pa	No	3	5	2	3	4	5	6	3	31
	Co		1	2	0	1	0	0	0	0	4
<i>C.parapsilosis</i>	Pa	No	5	3	0	1	0	1	2	0	12
	Co		1	1	0	1	0	0	0	0	3
<i>C.tropicalis</i>	Pa	No	4	2	0	0	0	0	0	1	7
	Co		0	1	0	1	0	0	0	0	2
<i>Mucor</i>	Pa	No	1	0	0	0	0	1	0	0	2
	Co		0	0	0	0	0	0	0	0	0
<i>Mucor</i>	Pa	No	1	1	0	0	0	0	1	0	3
	Co		0	0	0	0	0	0	0	0	0
Total	Pa	No	26	22	11	11	10	17	21	9	127
		%	20.4	17.3	8.6	8.6	7.8	13.3	16.5	7	99.5
	Co	No	2	7	0	4	0	0	0	0	13
		%	15.3	53.8	0	30.7	0	0	0	0	99.8

Not: Pa = patients, co = control.

and Joy *et al* (1980) indicate that *Aspergillus nigar* and *A. fumigatus* were the most common species. The individual external ear canal contains a bacterial normal flora also many species of bacteria and yeast could be transmitted from other parts of the body and stilled in it. as well as it is exposed to the fungal spore dust of the atmosphere, furthermore the anatomical form, carbohydrates, suitable humidity and temperature, all that represent an ideal condition for the growth of bacteria and fungi (Barati *et al*, 2011). Farthermore, the types of bacteria associated with otomycosis in our studies was *Staphylococcus aureus*, which is the dominant bacterial pathogen followed by *S. epidermis* and *P. aeruginosa*. Which confirms by previous reports Joy *et al* (1980), Mugliston and Odonoghue (1985) and Fayemiwo (2010).

CONCLUSION

Know we can see that otomycosis distributed in different parts with varying climate across the world, in the study we determined the fungi and bacteria in 95 otomycosis patients and compared it with 50 healthy individuals, in a study performed in Essaouira, Wasit province, Iraq. *C. albicans* was the most prevalent yeast pathogen isolated from patients. Self-ear clean indiscriminate use of steroid antibiotic ear drop, gender, age, season are all predisposing factors.

Conflict of interest : Nil

Source of funding : self

Ethical clearance : This study was approved by the Ethics committee (948-27-7) of Anbar University.

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