

## Original Research Article

# Associated factors with otitis externa in the city of Antsiranana, Madagascar

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## ABSTRACT

**Background:** Otitis externa is common in medical practice. This study aims to identify the contributing factors of otitis externa in the city of Antsiranana, Madagascar.

**Methods:** This is an analytical case-control type study, concerning patients with otitis externa, seen from January to July 2019, at the university hospital of place Kabary and at the grand Pavois medical practice, all in Antsiranana. The epidemiological, behavioural and clinical parameters were evaluated.

**Results:** We included 153 patients, among which 51 were cases and 102 controls. The average age was 32.9 years ( $\pm 19.41$ ). The occurrence of otitis externa was significantly associated with the existence of a history of otitis externa, as well as ear cleaning 4 to 6 times per week ( $p=0.00$ ; OR=46.17; CI=5.90-361.02). The diabetes exposure ratio was 18.79 in the 'cases' ( $p=0.00$ ; CI=2.27-154.88), this ratio was 10.71 in the event of repeated swimming in pool ( $p=0.00$ ; CI=2.22-51.70), 3.94 in case of ear cleaning with the cotton swab ( $p=0.00$ ; CI=1.34-11, 60), and 2.23 when using headphones ( $p=0.02$ ; CI=1.05-4.75). The treatment of a previous otological pathology was a protective factor against otitis externa (OR=0.1500,  $p=0.0159$ , CI=0.0259-0.8689).

**Conclusions:** The occurrence of otitis externa is related to well define daily behaviours and to other associated clinical factors. Managing these risk factors is the first step in treatment of otitis externa.

**Keywords:** Ears, Earaches, External otitis, Madagascar

## INTRODUCTION

Otitis externa (OE) is an inflammation of the external acoustic meatus (EAM). There are several clinical forms of otitis externa: localized acute OE, diffuse acute OE, malignant OE, chronic OE and complicated OE.<sup>1</sup> In 2006, the global incidence of the acute form of this condition

was around 4 per thousand and 0.3-0.5 per thousand for the chronic form was. Likewise, 10% of the world's population has been shown to have at least one episode of OE in their lifetime.<sup>1</sup> In the USA in 2013, out of 190, 309 consultations for ear problems, 11.8% of patients had been diagnosed with OE.<sup>2</sup> In Australia, otitis externa represented 11.9% of consultations.<sup>3</sup> In Kaduna, Nigeria,

in 2013, out of 13,328 patients with ear diseases, 5% of cases of OE were recorded with a female predominance and an average age of 24 years.<sup>4</sup>

Few studies have been carried out in Africa and Madagascar on this pathology. According to the registers of consultations at the ENT department of CHU Place Kabary and the grand Pavois medical office in Antsiranana over the past three years, the EO represented 10.44% of ENT consultations. The purpose of this study is to identify the involved factors for otitis externa in the city of Antsiranana Madagascar.

**METHODS**

It is an analytical, bi-centric and case-control study type, carried out on patients seen in an ENT in the city of Antsiranana, i.e. at the service of ENT, head and neck surgery of place Kabary’s university hospital and the ‘grand Pavois’ medical office all in Antsiranana, Madagascar. These two sites are the main centers for the treatment of ENT pathologies in the city of Antsiranana, but also in all the surrounding districts. The study was carried out from December 2018 until October 2019 and the investigation from January to July 2019.

The ‘cases’ were patients of all ages and all genders who were diagnosed with otitis externa. The ‘control’ were patients of all ages and all genders, who consult for ENT reasons, but did not present with otitis externa. Patients with other otological pathologies associated with otitis externa in the same and those who refused to participate in the study were excluded. Patient recruitment was done by simple random selection for both cases and controls.

After explaining the theme, objectives and course of the study, a written consent was signed by the patients or parents who were free to accept or refuse to participate or to quit from the study at any time. A total of 153 patients or 51 cases for 102 controls were investigated individually. The variables studied included the epidemiological and clinical profile (age, gender, domicile, profession, otological history, treatment received and their way of administration, the medical history) and the behavior of the patients (the frequency swimming and the type of bathing water, the weekly frequency of ear cleaning and the type of instrument used, the use of headphones and their duration of use, the wearing of hearing aids).

Data analysis was carried out with epi info 7.2 software. For rates, the statistical test used was the chi-square test ( $\chi^2$ ). The measure of association between otitis externa and risk factors was the Odds Ratio (OR). A p value  $\leq 0.01$  was considered significant with a 95% confidence interval.

The lack of identification of the responsible germs, the short duration of the study and the bias of information constituted the limits of this work.

**RESULTS**

We included 51 cases of otitis externa, which represented 11.35% of patients seen in ENT consultation. The mean age was 32.9 ( $\pm 19.41$ ) years. The extreme ages were 3 years and 86 years. Young adults, aged 21 to 30 years, predominated (n=18 or 35.3% of cases). The sex ratio was 0.7.

**Table 1: Distribution of patients by medical history.**

Variables	Cases N (%)	Controls N (%)	Total N (%)	OR	CI (95%)	P value
<b>Otological history</b>						
Otorrhea	6 (11.7)	6 (5.8)	12 (7.8)	2.1	[0.651-6.982]	0.1135
Ear pruritus	1 (1.9)	2 (1.9)	3 (1.9)	1.0	[0.088-11.295]	0.4822
Otitis media	3 (1.9)	3 (1.9)	2 (1.3)	2.02	[0.123-32.970]	0.3333
Otitis externa	16 (31.3)	1 (0.9)	17 (11.1)	46.1	[5.904 -361.020]	0.0001
No	27 (52.9)	92 (90.1)	119 (77.7)			
<b>Specific immune terrain</b>						
Pregnancy	6 (11.7)	0	6 (11.7)	-	-	0.0005
Diabetes	8 (15.6)	1 (0.9)	9 (5.8)	18.7	[2.279-154.882]	0.0003
No	37 (72.4)	101 (98.9)	138 (90.1)			
<b>Allergy</b>						
Yes	7 (13.8)	4 (3.9)	11 (7.2)	3.8	[1.084-14.004]	0.0199
No	44 (86.2)	98 (96.1)	142 (92.8)			
<b>Having received treatment</b>						
Yes	9 (37.5)	8 (80)	17 (50)	0.15	[0.02-0.86]	0.015
No	15 (62.5)	2 (20)	17 (50)			
<b>Way of drug administration</b>						
Topical	7 (29.1)	5 (50)	12 (35.2)	0.4	[0.090-1.883]	0.1412
General	2 (8.3)	3 (30)	5 (14.1)	0.2	[0.029-1.538]	0.0783
Untreated	15	2	17			

**Table 2: Distribution of patients according to behavioral factors.**

Variables	Cases N (%)	Controls N (%)	Total N (%)	OR	CI (95%)	P value
<b>Frequency of monthly swimming</b>						
>4	2 (3.9)	0	2 (1.3)	-	-	0.0548
1 a 4	24 (47.1)	16 (15.7)	40 (26.1)	4.7	[2.220-10.280]	0.0000
<1	25 (49.0)	86 (84.3)	111 (72.6)			
<b>Type bathing water</b>						
Sea	13 (25.4)	7 (6.8)	20 (13)	4.6	[1.720-12.531]	0.0011
Ponds	4 (7.8)	7 (6.8)	11 (7.1)	1.1	[0.322-4.142]	0.4069
Swimming pool	9 (17.6)	2 (1.9)	11 (7.1)	10.7	[2.220-51.707]	0.0004
No swimming	25 (19.3)	86 (0.0)	5 (12)			
<b>Ear cleaning frequency per week</b>						
>6	9 (17.7)	0 (0.0)	9 (5.9)	-	-	0.0000
4 to 6	16 (31.4)	1 (0.9)	17 (11.1)	46.1	[5.904-361.02]	0.0000
<4	26 (50.9)	101 (99.1)	127 (83.0)			
<b>Instruments used for cleaning ear</b>						
Cotton-swab	34 (66.7)	14 (13.7)	48 (31.3)	3.9	[1.342-1.603]	0.0067
Pin	5 (9.8)	4 (3.9)	9 (5.8)	0.7	[0.188-3.195]	0.3663
Feather	0	1 (0.9)	1 (0.6)	0	-	0.1956
Toothpick	1 (1.9)	0 (0.0)	1 (0.6)	-	-	0.3043
Piece of wood	2 (3.9)	3 (2.9)	5 (3.2)	0.4	[0.062-2.568]	0.1848
Pen cap	0	5 (4.9)	5 (3.2)	0	-	0.0035
<b>Use of headphones</b>						
Yes	18 (35.2)	20 (19.6)	38 (24.8)	2.2	[1.05-4.75]	0.0200
Long-term phone call	3 (5.9)	0	3 (1.9)	-	-	0.0177

In this study from the city of Antsiranana, 82.3% of patients (n=42) lived in urban areas, while 5.9% (n=3) of patients were domiciled in rural areas. Patients from towns and villages around Antsiranana accounted for 11.8% (n=6) of the cases. The profession was dominated by students who represented 35.2% (n=18) of the study population. Company employees covered 25.5% of cases, housewives 15.8%, tradespeople 11.8%, and retirees 7.9%.

The presence of a history of OE and diabetes were very significant risk factors for a new episode of OE. For the patients with a history of EO and coming from the “case” group, we report the plurality of history of OE: 1 of the patients was in the fifth episode, 2 in the fourth episode, 4 in the third episode and 9 in the second episode. The rest (n=35 or 68.62%) were in their first episode. Having received treatment for these investigative otological pathologies was a protective factor against otitis externa. The use of an ear topical application was a protective factor, but not very significant against OE. Table 1 shows the implication of this medical history in the occurrence of OE.

The frequency of bathing ranging from one to four times per month, swimming in the pool, ear cleaning ranging from 4 to 6 times per week was very significant risks factors for the occurrence of otitis externa. The use of cotton swabs for ear cleaning was frequently reported.

Table 2 represents the implication of these behavioral factors in the occurrence of OE.

## DISCUSSION

OE is a common disease.<sup>3</sup> 10% of the world's population will experience at least one episode of OE in their lifetime.<sup>1</sup> Its prevalence from one country to another, is 5 to 20%.<sup>4</sup> Close to that of Bathokedeou et al in Togo, the frequency of otitis externa reported in this study was 11.35%.<sup>3</sup> The female predominance found in this study is also reported by some authors, but another one observed a male predominance.<sup>3-5</sup> The average age ranged from 24 years to 32 years, with a high frequency in children.<sup>3-5</sup> In our study, OE interested to all ages (mean age 32.9 years, and extremes 3 and 86 years). However, young adults, aged 21 to 30, of working age were the most affected. Therefore, and given that the Malagasy population is largely made up of young people, OE could be considered a public health problem. The professions exercised outside and at home in dusty areas, in precarious living conditions are reported to be significant factors in the occurrence of otitis externa.<sup>6,7</sup> The city of Antsiranana is under the action of ‘Varatraza’, very strong winds evolving in gusts, which would favor the occurrence of otitis externa.

The occurrence of otitis externa is triggered by an imbalance in the protective bacterial flora of the EAM.<sup>8</sup> Humidity and repeated local care on, are elements which

play an important role in this mechanism. In this study, a history of otitis externa involved (OR=46.1714) the risk of contracting an OE again.<sup>3,7-9</sup> The weakness of the immune system is a factor frequently associated with the occurrence of otitis externa. Among these factors are HIV infection and diabetes.<sup>10</sup> Hormonal impregnation also promotes the development of mycosic otitis externa during pregnancy.<sup>11</sup> According to our observations, the diabetic field constituted a major risk factor for OE. The allergic state of patients with contact dermatitis, atopy, eczema or psoriasis, responsible for local chronic inflammation, is also a factor associated with the occurrence of otitis externa.<sup>3,9</sup> The use of local ear drops of antibiotics or antibiotic-corticosteroid combinations alters the protective bacterial flora of the EAM.<sup>8</sup> It makes this area more vulnerable to bacterial or mycosic infections.<sup>11,12</sup> For Prasad et al, the incidence of mycosic OE is higher in patients with a history of using coconut oil in the ear, and in patients with a habit of using antibiotic ear drops.<sup>11</sup> In our work where the responsible germs were not considered, the administration of drugs by local way constituted a protective factor, but not very significant, of otitis externa.

In our context, some habits are factors that favor otitis externa. The risk of contracting an OE was higher in subjects who bathed more than 4 times per month than those who bathed only once a month at most. High frequencies of bathing is confirmed by Asperen et al to train OE.<sup>13</sup> Swimming without proper drying of the ear would lead to a permanent state of humidity of the EAM, favouring the development of mycosic external otitis.<sup>14</sup> Swimming in pools provide the occurrence of otitis externa, even if the conditions are deemed to be healthy by the health services.<sup>15</sup> Stagnation of water in the EAM and its perspiration train the skin maceration and raise its pH. This alters the bacterial flora, promoting the proliferation of pathogenic germs. It is the origin of otitis externa.<sup>8,16</sup> Proper drying of the EAM after each swim would be a means of protection against the occurrence of otitis externa. For the type of water used, people swimming in swimming pools in this series were 10 times more exposed to the occurrence of otitis externa, with a significant difference ( $p=0.0004$ ). The implication of swimming in swimming pools was also reported by Yavo et al.<sup>17</sup>

Daily cleaning of the ears with various utensils is believed to cause an imbalance in the protective microbial flora of the EAM. This modifies the pH and eliminates the earwax barrier.<sup>18</sup> We noticed that cleaning the ear 4 to 6 times a week was a major and very significant risk factor for otitis externa (OR=46.1714). Frequent rubbing by the cotton swab leads to scratching lesions on the EAM skin and the removal of the coating of earwax, impairing two of the ear's protective means.<sup>8,18</sup> There are many utensils used for cleaning the ear, but they have in common the potential to cause micro trauma to the skin of the EAM.<sup>11</sup> The present study proves the use of the cotton swab as being a factor associated with

the occurrence of otitis externa (OR=3.9464). This finding can be explained by the predominance of women in our study population. Women would tend to be more meticulous with regard to their physical appearance and to be concerned about their state of health. Avoiding cleaning the inside of the ear would therefore prevent the occurrence of otitis externa. The use of headphones is common worldwide. According to a microbiological study, wearing earphones multiplies commensal germs in EAM, while OE will then be triggered by the slightest disturbance in the balance of the homeostasis of the skin of the EAM.<sup>19</sup> In this work, the prolonged use of headphones exposed patients twice to the development of otitis externa compared to those who did not use it. Headphones can be considered as foreign bodies that maintain and block heat and humidity in the EAM. They can also carry germs in the EAM, responsible for ear infections. Information education communication of population about these factors is essential to avoid occurrence of OE.

## CONCLUSION

The occurrence of otitis externa is observed on a skin of the EAM previously damaged by various factors. In our series, otitis externa most commonly affected young women and people of working age. The OE was favoured here by the history of otitis externa, immunosuppression, bathing, and too much hygiene of the ear especially with the cotton swab. Public education is necessary to prevent the occurrence of EO.

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