



Original Research Article

“Pattern of Disease among the Patients Suffering from Otitis Externa in ENT Outpatient Department at Shaheed Ziaur Rahman Medical College Hospital, Bogura, Bangladesh”

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Abstract: *Introduction:* Otitis externa is a common otologic problem affecting between 5% -20% of patients seen in an otolaryngological practice in the tropical and subtropical regions of the world, a general practitioner can expect to see 16 new cases per year. *Objective:* To assess the pattern of disease among the patients suffering from otitis externa in ENT outpatient department at shaheed ziaur rahman medical college hospital, bogura, Bangladesh. *Materials and Methods:* This prospective study was carried out on the patients suffering from aural symptoms suggestive of otitis externa in ENT outpatient department of Shaheed Ziaur Rahman Medical College Hospital, Bogura, Bangladesh. Among 202 patients (222 affected ears) with the aural symptoms suggestive of otitis externa and 111 healthy control (222 ears), from January 2019 to December 2020. We also included age and sex matched 111 healthy individuals to serve as control, which provided total 222 control units. The patients having symptoms suggestive of otitis externa were randomly selected from the ENT outpatient department of SZRMCH. *Results:* Our study maximum 71(35.1%) patients were in the 21 -30 years age group followed by 47 (23.2%) were in the 11 -20 years age group. 30 (14.8%) patients were within 31 - 40 years. 18 (8.9%) patients were within both 41 -50 years and > 60 years of age groups. Out of the total 202 patients 113 (55.9%) patients were male and remaining 89 (44.0%) were female. The male -female ratio was 1.3:1. Shows that 106 (52%) patients were smoker and 96 (48%) patients were non-smoker. Maximum number of 169(76.1%) cases were acute otitis externa, which had been suffering for less than two months. Rest 53(23.8%) were chronic cases suffering for more than two months. Most of the ears had multiple complains of which commonest was itching in 203 (91.4%) affected ears, followed by earache in 177(79.7%) ears, sense of blocked ear in 132 (59.4%) ears, discharge in 114 (51.3%) ears, deafness in 26 (11.7%) ears and tinnitus in 17 (7.6%) affected ears. From the results of microscopic examination and culture of ear swab we detected pure bacterial growth in 48 (21.6%) acute cases and 10 (4.5%) chronic cases, pure fungal growth in 74 (33.3%) acute cases and 22 (9.9%) chronic cases, mixed bacterial and fungal growth in 16 (7.2%) acute cases and 10 (4.5%) chronic cases, no growth or contamination in 32 (14.4%) acute cases and 10 (4.5%) cases. Most of the ears were affected by fungal infection accounting 49.0% (109 cases), followed by bacterial infection in 31.9% ears. Out of 71 cases of otitis externa caused by bacteria 29 (40.8%) were due to *Pseudomonas aeruginosa*, 26 (36.6%) were due to *Staphylococcus aureus*, 10 (14.0%) were due to *E.coli* and 6 (8.4%) were due to *Proteus mirabilis*. Among the culture positive ears 13 (38.2%) were due to *Aspergillus*, 9 (26.4%) were due to *Candida*, 6 (17.6%) *Penicillium*, 3 (8.8%) *Mucor* and 3 (8.8%) were due to other fungal strains. The microbiological and culture finding of ear swabs among the healthy population of bacterial isolates of which 10 (16.6%) were *Staphylococcus aureus*, 26 (43.3%) were *Staphylococcus epidermidis*, 8 (13.3%) were *Diphtheroids*, 7 (11.6%) were *E. coli*. 3 (5.0%) were *Proteus* and 6 (10.0%) were *Pseudomonas aeruginosa*. *Conclusion:* From this study it is also evident that although bacteria could be detected from control cases

but the isolation of fungus were negligible. Most of the bacteria were normal commensal. Whereas in diseased ear presence of fungus in the ear canal was highly significant, which signifies the prerequisite of an altered aural flora and fauna for the development of fungal infection.

Keywords: Otitis Externa, Bacterial And Fungal Origin, ENT Outpatient.

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INTRODUCTION

Otitis externa is a common otologic problem affecting between 5% -20% of patients seen in an otolaryngological practice in the tropical and subtropical regions of the world [1], a general practitioner can expect to see 16 new cases per year [2]. The confusion concerning otitis externa begins with the failure still today to distinguish between cases of bacterial and fungal origin, Much less common is the failure, formally quite frequent, to classify cases clinically into acute, subacute, chronic or recurrent [2]. Observers in widely scattered localities around the world emphasize its frequent occurrence in general as well as specialist practice during hot humid summer months [3]. On an average, a general practitioner can expect to see 16 new cases per year [1]. Most of the cases are acute and involves the canal diffusely. A small number of cases becomes chronic, with symptoms persisting for more than two months and may be even for years [4]. The unique structure of the external auditory canal contributes to the development of otitis externa. It is the only skin lined cul-de-sac in the human body. During survey of the available literatures regarding previous related studies, following were considered appropriate to be mentioned here: -In 1952, Singer David et al, [3] published a paper regarding their study on bacteriological and mycological studies of otitis externa. In their study during the summer and fall of 1951, in Florida, America, they included 646 diseased ears and 1377 normal ear for bacteriological and mycological study. In 69% of diseased ear they found bacterial growth and in 31% fungal growth. Among the bacterial growth 65.5% were Pseudomonas and rest were Staphylococcus and Proteus group. Otitis externa is one of the common ear conditions causing a significant morbidity and a rare cause of mortality. 30-36 % of the patient found otitis externa to be disabling enough to interrupt their daily activities and 21% of them require bed rest [5], Bangladeshi population is particularly vulnerable to fungal infection of external canal [6]. Majority of our rural population enjoy free bath in river, canal, and pond etc inviting water contamination. Moreover, the hot humid climate, illiteracy, poverty, poor personal hygiene, peculiar ear cleaning habit, lack of health education and medical care are some of the contributing factors favourable for acquiring fungal infection of ear. In 1997, Khan A.F.M.[6] in Bangladesh

conducted a bacteriological and mycological study on 180 patients of otitis externa (200 affected ears) from September 95 to August 1996, of which 68.5% were acute and 31.5% are chronic. Most patients (33.3%) belonged to the age of 21 years to 30 years. Male to female ratio was 1.5: 1. Majority (42.33%) of the patients were labourer and most were during the summer and rainy season. Common symptoms were itching (90%), otalgia (75%), and sense of blocking of ears (55%), Otolgia was common in acute cases whereas itching in chronic cases, Among the predisposing factors, self-manipulation was responsible for 42.5% cases, swimming for 17.5% ears, head cloth for 7.5%, eardrops for 10%, hearing aid for 2.5% and no factor for 20% of cases. Fungus was isolated in 62% ears, bacteria 15% cases, and mixed growth in 18% ears. Many studies were carried out to compare the bacteriological and mycological cause of otitis externa in different countries and a very few of the same studies were carried out in our country. Acute otitis externa was prevalent among younger patients and chronic otitis externa among adult patients. Maximum numbers of both acute and chronic cases were seen during the months of August September and October. Chronic otitis externa occurred approximately twice as frequently as acute otitis externa. In acute case otalgia, discharge, hearing loss and itching were most common in chronological orders In chronic cases the order of symptoms were itching, discharge, pain, hearing less. The most common predisposing factors in both acute and chronic cases were the exposure to water, use of eardrops and aural toileting.

MATERIALS AND METHODS

This prospective study was carried out on the patients suffering from aural symptoms suggestive of otitis externa in ENT outpatient department of Shaheed Ziaur Rahman Medical College Hospital, Bogura, Bangladesh. Among 202 patients (222 affected ears) with the aural symptoms suggestive of otitis externa and 111 healthy control (222 ears), from January 2019 to December 2020. We also included age and sex matched 111 healthy individuals to serve as control, which provided total 222 control units. The patients having symptoms suggestive of otitis externa were randomly selected from the ENT outpatient department of SZRMCH. At first all the patients were evaluated by detail history and then through ear,

nose and throat examination performed. Finally swabs were taken from the affected ear and were sent for culture for identification of both the bacterial and fungal species and the report of which was correlated clinically. The clinical diagnosis of otitis externa then made based on history, presenting symptoms, examination finding and culture report. The relevant information of the study subjects (case and control) were recorded in a preformed data sheet and statistical analysis performed.

Inclusion criteria

1. Age and sex matched patients attending to the E.N.T. outpatient department with typical signs and symptoms of otitis externa were included for the study. Symptoms considered were itching in the ear, pain in the ear, feeling of blocked ear, ear discharge, tinnitus and deafness.
2. Patients who gave consent to participate in this study.

Exclusion criteria

1. Patients with otitis externa secondary to otitis media and infected mastoid cavities were excluded.
2. Patients with any abnormalities of the external auditory meatus e.g. stenosis, exostosis, tumor etc. were excluded.

STATISTICAL ANALYSIS OF DATA

All relevant collected data were compiled and then organized by scientific calculator and standard appropriate statistical formulae. Percentages were calculated to find out proportion of the finding. Further statistical analysis of the results was done by using software devised with statistical package for social sciences (SPSS). The results were presented in Tables, Figures and Diagrams. Statistical tests for significance of differences were done using 'Z' test where applicable. A p value <0.05 was considered to be statistically significant.

RESULTS

Table -1: Shows that the maximum 71(35.1%) patients were in the 21 -30 years age group followed by 47 (23.2%) were in the 11 -20 years age group. 30 (14.8%) patients were within 31 - 40 years. 18 (8.9%) patients were within both 41 - 50 years and > 60 years of age groups. 10 (4.9%) patients were within less than 1-10 years and remaining 8 (3.9%) patients were within 51 60 years of age. From the data it was seen that young adolescent and adult patients suffered most. Table - 2: Out of the total 202 patients 113 (55.9%) patients were male and remaining 89 (44.0%) were female. The male -female ratio was 1.3:1. Shows that 106 (52%) patients were smoker and 96 (48%) patients were non-smoker.

Table-1: Distribution of the patients by age group (n=202)

Age of the study population	Patient No (%)	Control No (%)
<1-10 years	10(4.9%)	4(3.6%)
11-20 years	47(23.2%)	20(18.0%)
21-30 years	71(35.1%)	27(24.3%)
31-40 years	30(14.8%)	16(14.4%)
41-50 years	18(8.9%)	18(16.2%)
51-60 years	8(3.9%)	16(14.4%)
>60 years	18(8.9%)	10(9.0%)
Total	202(100%)	111(100%)

Table-2: Distribution of the patients by sex (n=202)

Sex of the patient	Patient No (%)	Control No (%)
Male	113(55.9%)	63(56.7%)
Female	89(44.0%)	48(43.2%)
Total	202(100%)	111(100%)

Table-3: Seasonal variation of the prevalence of otitis externa among study population (n=222)

Season	No of EARS (Units)	Percentage
Summer and rainy	153	68.9%
Winter and spring	69	31.0%
Total	222	100%

Table 3: Shows that the maximum numbers of patients were affected during summer and Rainy season (between March to August), which were

153(68.9%). Rest 69 (31.0%) was seen during winter and spring (between September to February).

Table-4: Distribution of patients according to duration of illness (n=222)

Type of illness	No of EARS (Units)	Percentage
Acute	169	76.1%
Chronic	53	23.8%
Total	222	100%

Table-4: Shows that maximum number of 169(76.1%) cases were acute otitis externa, which had been suffering for less than two months. Rest

53(23.8%) were chronic cases suffering for more than two months.

Table-5: Distribution of patients according to presenting symptoms (n=222)

Complaints	No of EARS (Units)	Percentage
Itching	203	91.4%
Earache	177	79.7%
Sensation of blockage	132	59.4%
Discharge	114	51.3%
Deafness	26	11.7%
Tinnitus	17	7.6%

Table-5: Symptoms of each affected ear was considered separately. Most of the ears had multiple complains of which commonest was itching in 203 (91.4%) affected ears, followed by earache in

177(79.7%) ears, sense of blocked ear in 132 (59.4%) ears, discharge in 114 (51.3%) ears, deafness in 26 (11.7%) ears and tinnitus in 17 (7.6%) affected ears.

Table-6: Distribution of patients according to site of involvement (n=222)

Ear involved	Number	Percentage
Right ear	133	59.9%
Left ear	89	40.0%
Total	222	100%

Table-6: Out of 202 patients 21(10.3%) had bilateral involvement and 181(89.6%) had unilateral involvement. Of the 202 study population we had

included 222 affected ears for study purpose of which 133 (59.9%) were right ears and 88 (40.0%) were left ears.

Table-7: Distribution of the patients by causative organisms (n=222)

Isolates on culture	Acute No (%)	Chronic No (%)	Total
Pure bacteria	48(21.6%)	10(4.5%)	58(26.1%)
Pure fungus	74(33.3%)	22(9.9%)	96(43.2%)
Mixed bacteria and fungus	16(7.2%)	10(4.5%)	26(11.7%)
Contamination/no growth	32(14.4%)	10(4.5%)	42(18.9%)
Total	170 (76.5%)	52(23.4%)	222(100%)

Table-7: From the results of microscopic examination and culture of ear swab we detected pure bacterial growth in 48 (21.6%) acute cases and 10 (4.5%) chronic cases, pure fungal growth in 74 (33.3%) acute cases and 22 (9.9%) chronic cases,

mixed bacterial and fungal growth in 16 (7.2%) acute cases and 10 (4.5%) chronic cases, no growth or contamination in 32 (14.4%) acute cases and 10 (4.5%) cases.

Table-8: Distribution of ears according to growth of the causative organisms (n=222)

Isolates on culture	Number of patients	Percentage
Bacteria	71	31.9%
Fungus	109	49.0%
No growth or Contamination	42	18.9%
Total	222	100%

Table-8: Shows that most of the ears were affected by fungal infection accounting 49.0% (109 cases), followed by bacterial infection in 31.9% ears.

No growth or contamination is seen in remaining 18.9% cases.

Table-9: Distribution of fungal otitis externa according to causative agents (n=109)

Name of fungus	Member	Percentage
Aspergillus niger	79	72.4%
Aspergillus fumigatus	19	17.4%
Candida albicans	8	7.3%
Penicillium	3	2.7%
Total	109	100.00%

Table-9: Shows that out of 109 cases of otitis externa caused by fungus 79 (72.4%) were due to Aspergillus niger, 19 (17.4 %) were due to Aspergillus fumigatus, 8 (7.3%) were due to Candida

albicans and 3 (2.7%) were due to penicillium strains, From the table it is evident that Aspergillus group constitutes about 90% of the total cases.

Table-10: Distribution of bacterial otitis externa according to causative agents (n=71)

Name of organisms	Member	Percentage
Pseudomonas aeruginosa	29	40.8%
Staphylococcus aureus	26	36.6%
E. coli	10	14.0%
Proteus	6	8.4%
Total	71	100%

Table-10: Shows that out of 71 cases of otitis externa caused by bacteria 29 (40.8%) were due to Pseudomonas aeruginosa, 26 (36.6%) were

due to Staphylococcus aureus, 10 (14.0%) were due to E.coli and 6 (8.4%) were due to Proteus mirabilis.

Table-11: Distribution of fungal strains among the culture positive ears of control healthy population (n=34)

Types of fungus	Number	Percentage
Aspergillus	13	38.2%
Candida	9	26.4%
Penicillium	6	17.6%
Mucor	3	8.8%
Others	3	8.8%
Total	34	100%

Table-11: Shows that among the culture positive ears 13 (38.2%) were due to Aspergillus, 9 (26.4%) were due to Candida, 6 (17.6%) Penicillium,

3 (8.8%) Mucor and 3 (8.8%) were due to other fungal strains.

Table-12: Distribution of bacterial strains among the culture positive ears of control healthy population (n=60)

Types of organisms	Number	Percentage
Staphylococcus aureus	10	16.6%
Staphylococcus epidermidis	26	43.3%
Diphtheroids	8	13.3%
E. coli	7	11.6%
Proteus	3	5.0%
Pseudomonas aeruginosa	6	10.0%
Total	60	100.00%

Table-12: shows the microbiological and culture finding of ear swabs among the healthy population of bacterial isolates of which 10 (16.6%) were Staphylococcus aureus, 26 (43.3%) were Staphylococcus epidermidis, 8 (13.3%) were Diphtheroids, 7 (11.6%) were E. coli. 3 (5.0%) were

Proteus and 6 (10.0%) were Pseudomonas aeruginosa.

DISCUSSION

Otitis externa is one of the most common otologic conditions encountered in ENT and general

practice. Patients who have been suffering from it frequently seek advice from the general practitioner, neighbouring quacks, pharmacy holders, directly or referred to the otolaryngologist. Although it is sometimes dismissed as a simple disease easily amenable to treatment, there is increasing concern now a days due to difficulty in eradication of this infection on account of its notorious rate of recurrence. It is frequently seen during hot humid summer months is emphasized by observers in widely scattered localities. Bangladesh is situated in the tropics where the climate is hot and humid especially in the summer and rainy season. Many studies in different parts of the world were carried out to evaluate the comparative prevalence of fungal and bacterial causes, to find out predisposing factors responsible for its occurrence, its prevention and treatment and also to search out the causes of its recurrence and chronicity. Age range of study population was from less than 1 to more than 60 years because no age is immune.

In our study table -1: Shows that the maximum 71(35.1%) patients were in the 21 -30 years age group followed by 47 (23.2%) were in the 11 -20 years age group. 30 (14.8%) patients were within 31 - 40 years. 18 (8.9%) patients were within both 41 -50 years and > 60 years of age groups. 10 (4.9%) patients were within less than 1-10 years and remaining 8 (3.9%) patients were within 51 60 years of age. From the data it was seen that young adolescent and adult patients suffered most. Table - 2: Out of the total 202 patients 113 (55.9%) patients were male and remaining 89 (44.0%) were female. The male -female ratio was 1.3:1. Shows that 106 (52%) patients were smoker and 96 (48%) patients were non-smoker. These findings are in accordance with those of Yassin *et al.* [7] in Egypt, Rahman and Nhan *et al.* [8] and Khan A.F.M. *et al.* [6] in Bangladesh, Anwarullah and Jayader (1985)[9] in Visakhapatnam, Hawke *et al.* [10] in Canada, Mungliston *et al.* [11] in London had also shown similar incidence in male and female patients in their studies. Walsh *et al.* [12] and Bojrab *et al.* [13] of America, Rowland and Smith *et al.* [14] of U.K. found no gender predilection and a similar 12-month prevalence for individuals aged 5-64 years and a slight increase in the prevalence for those older than 65 years. Waitzman *et al.* [15] and Timon *et al.* [16] of U.S.A. found otitis externa to be most prevalent in the older paediatric and young adult population which affects both sex equally. This indicates that otitis externa is more prevalent in lower and middle-income family groups in Bangladesh. In the present study educational status showed that only 2.5% were illiterate and remaining patients were literate varying from primary education to master's level, Nazma K *et al.* [17] in reported higher number of chronic middle ear

inflammation in illiterate population. In our study table 3: shows that the maximum numbers of patients were affected during summer and Rainy season (between March to August), which were 153(68.9%). Rest 69 (31.0%) was seen during winter and spring (between September to February). This observation indicates that otitis externa, especially fungal otitis externa is a disease of hot and humid climate. Yassin *et al.* [7] of Egypt, Khan and Rahman *et al.* [8] and Khan A.F.M. *et al.* [6] of Bangladesh, Pulsivia *et al.* [18] of Pune, India, and Hawke *et al.* [10] of Canada had also provided similar results in their studies. Marcy *et al.* [19] found an incidence 10-20 times higher in the summer than during cooler months and Roland and Stroman [20] of America found 80.5% cases occurred during the summer months and remaining during the rest of the year. Our study table-4: Shows that maximum number of 169(76.1%) cases were acute otitis externa, which had been suffering for less than two months. Rest 53(23.8%) were chronic cases suffering for more than two months. This triad symptoms was more prevalent in different combinations. In addition, discharge, deafness tinnitus etc. were also present in few cases. Khan *et al.* [21] and Khan A.F.M. *et al.* [6] of Bangladesh, Pahwa *et al.* (1983) [18] of Pune, India had similar findings. But Than *et al.* [22] of Myanmar and Paulose and associates from Bahrain added tinnitus with these as a common symptom. Hawke *et al.* [10] of Canada did not mention the sense of blocking as main symptom. Table-5: Symptoms of each affected ear was considered separately. Most of the ears had multiple complains of which commonest was itching in 203 (91.4%) affected ears, followed by earache in 177(79.7%) ears, sense of blocked ear in 132 (59.4%) ears, discharge in 114 (51.3%) ears, deafness in 26 (11.7%) ears and tinnitus in 17 (7.6%) affected ears. Table-6: Out of 202 patients 21(10.3%) had bilateral involvement and 181(89.6%) had unilateral involvement. Of the 202 study population we had included 222 affected ears for study purpose of which 133 (59.9%) were right ears and 88 (40.0%) were left ears. As most of the patients were right handed, chances of manipulation and contamination of right ear by the organisms of anterior nares through fingernail is a more common possibility than left. Anwarullah *et al.* [9] also showed similar finding but Mungliston *et al.* [23] and Clark *et al.* [24] claimed equal incidence of right and left ears from their study. Table-8: Shows that most of the ears were affected by fungal infection accounting 49.0% (109 cases), followed by bacterial infection in 31.9% ears. No growth or contamination is seen in remaining 18.9% cases. This finding is similar to that of Khan AFM *et al.* [6], Khan & Rahman *et al.* [8] and Then *et al.* [22]. Table-7: From the results of microscopic examination and culture of ear swab we detected pure bacterial growth in 48

(21.6%) acute cases and 10 (4.5%) chronic cases, pure fungal growth in 74 (33.3%) acute cases and 22 (9.9%) chronic cases, mixed bacterial and fungal growth in 16 (7.2%) acute cases and 10 (4.5%) chronic cases, no growth or contamination in 32 (14.4%) acute cases and 10 (4.5%) cases. The results of this study are consistent with that of Khan A.F.M. *et al.* [6] of Bangladesh. Bhalla and Sherman *et al.* [25] of U.S.A. showed that 40% of all cases of Otitis externa do not produce a dominant pathogen. It is evident from our study that fungal infection is the single most common cause of otitis externa and it is more common in chronic cases. Singer *et al.* in Florida carried out similar studies in 1952. They recorded 69% of bacterial infections and 31% fungal infections. In 1973, Glasgold *et al.* [26] of New Jersey reported 57.5% of otitis externa cases due to bacterial infection, 14.7% pure fungal and 23.5% mixed in their series. In a study Khan A.F.M. *et al.* [6] of Bangladesh found pure bacteria in 52%, pure fungus in 11%, mixed infection in 31% and no growth in 6% cases. In 1984, Hawke *et al.* [10] of Toronto, Canada carried out a detailed study on clinical and microbiological characters of otitis externa. They also reported the predominance of bacterial infection. They divided their groups into acute and chronic varieties where in acute cases bacteria was seen in 80% and fungus was found in only 7.5% and rest were mixed infection. In chronic cases bacterial infections were found in 51.5% cases, fungal infection in 17.1% cases and 13.1% were mixed infection while 18.11% were found as contamination or no growth. Predominance of fungal otitis externa was reported by Khan *et al.* [21] and Khan A.F.M. *et al.* [6] of Bangladesh and in Myanmar by Than *et al.* [22], in India by Pahwa *et al.* [18] and by Anwarullah *et al.* [9]. These findings are quite significant in relation to the pathophysiology of fungal infection in tropical and subtropical countries. Table-9: Shows that out of 109 cases of otitis externa caused by fungus 79 (72.4%) were due to *Aspergillus niger*, 19 (17.4%) were due to *Aspergillus fumigatus*, 8 (7.3%) were due to *Candida albicans* and 3 (2.7%) were due to *penicillium* strains, From the table it is evident that *Aspergillus* group constitutes about 90% of the total cases. Khan & Rahman *et al.* [8] and Khan A.F.M. *et al.* [6] of Bangladesh, Than of Myanmar [22], Pahwa of Pune [18], India and Anwarullah [9] of India have shown nearly similar incidence of fungal species, Whereas Singer [27] of Florida, America has shown higher incidence of *Candida* among the fungal species. Conley *et al.* [28] pointed out that the external ear canal fulfils many of the requirements for the fungal growth as moisture, warmth and some protein and carbohydrate. This is also a similar finding in our observation. We included 111 healthy individuals (222 ears) as control. It revealed that out of 222 ears were affected by fungal infection accounting 49.0%

(109 cases), followed by bacterial infection in 31.9% ears. No growth or contamination is seen in remaining 18.9% cases. Among the culture positive ears 13 (38.2%) were due to *Aspergillus*, 9 (26.4%) were due to *Candida*, 6 (17.6%) *Penicillium*, 3 (8.8%) *Mucor* and 3 (8.8%) were due to other fungal strains. In addition *Staphylococcus aureus* and *Streptococcus viridians* can frequently be present without causing any ill effects [29]. It is more likely to be due to a loss of the normal skin protective mechanisms allowing secondary colonization [30]. Table-12: shows the microbiological and culture finding of ear swabs among the healthy population of bacterial isolates of which 10 (16.6%) were *Staphylococcus aureus*, 26 (43.3%) were *Staphylococcus epidermidis*, 8 (13.3%) were *Diphtheroids*, 7 (11.6%) were *E. coll.* 3 (5.0%) were *Proteus* and 6 (10.0%) were *Pseudomonas aeruginosa*. The finding of the distribution of organism in control ears was in accordance with those of Khan AFM *et al.* [6] and Singer David *et al.* [3]. It has been suggested that saturated and unsaturated fatty acids of ear wax have an inhibitory effect on most fungi, [31] yet it may support the growth of *Aspergillus* as identified by Akobjanoff *et al.* [32]. From the observations of the control ears it is again evident that in healthy individual, though few pathogenic bacteria can be seen but presence of fungus is insignificant.

CONCLUSION

From this study it is also evident that although bacteria could be detected from control cases but the isolation of fungus were negligible. Most of the bacteria were normal commensal. Whereas in diseased ear presence of fungus in the ear canal was highly significant, which signifies the prerequisite of an altered aural flora and fauna for the development of fungal infection.

REFERENCE

1. Raza, S. A., Denholm, S. W., & Wong, J. C. (1995). An audit of the management of acute otitis externa in an ENT casualty clinic. *The Journal of Laryngology & Otology*, 109(2), 130-133.
2. Mclaurin, J.W., Simmon, M., Rougem, R. (1964). La: Persistent otitis externa. *The Laryngoscope*, 27; 1699-1707.
3. Singer, D. (1952). Otitis externa. Bacteriological and mycological studies. *Ann Otol Rhinol Laryngol*, 61; 317-333.
4. Ruddy, Bickerton, R.C. (1992). Optimum management of the discharging ear. *Drugs*; 43: 219-235.
5. Von Glasow, R., Sander, R., Bott, A., & Crutzen, P. J. (2002). Modeling halogen chemistry in the marine boundary layer 1. Cloud-free MBL. *Journal of Geophysical Research: Atmospheres*, 107(D17), ACH-9.

6. Khan, A.F.M. (1997). A comparative bacteriological and mycological study on otitis externa. IPGM&R, Dhaka. July, [Thesis]
7. Yassin, A., Mostafa, M.A., Moawad, M.K. (1964). Fungus infection of the ear. *Journal of Laryngology and Otology*, 78; 591-602.
8. Khan, A. A., & Rahman, K. M. (1977). Fungus infection of ear. *Bangladesh Medical Research Council Bulletin*, 3(1), 28-31.
9. Anwarullah, M., Jayakar, P.A. (1987). Microbiological study of otomycosis. *Journal of Indian Medical Association*, 85(8); 229-232
10. Hawke, M., Wong, J., & Kraijden, S. (1984). Clinical and microbiological features of otitis externa. *The Journal of otolaryngology*, 13(5), 289-295.
11. Mugliston, T., & O'donoghue, G. (1985). Otomycosis—a continuing problem. *The Journal of Laryngology & Otology*, 99(4), 327-333.
12. Walsh, F. (2002). A family resilience framework: Innovative practice applications. *Family relations*, 51(2), 130-137.
13. Bojrab, D. I., Bruderly, T., & Abdulrazzak, Y. (1996). Otitis externa. *Otolaryngologic Clinics of North America*, 29(5), 761-782.
14. Rowland, S., Donkin, P., Smith, E., & Wraige, E. (2001). Aromatic hydrocarbon “humps” in the marine environment: unrecognized toxins?. *Environmental science & technology*, 35(13), 2640-2644.
15. Garrity, J. A., Coleman, A. W., Matteson, E. L., Eggenberger, E. R., & Waitzman, D. M. (2004). Treatment of recalcitrant idiopathic orbital inflammation (chronic orbital myositis) with infliximab. *American journal of ophthalmology*, 138(6), 925-930.
16. Timón, M. L., Ventanas, J., Carrapiso, A. I., Jurado, A., & Garcia, C. (2001). Subcutaneous and intermuscular fat characterisation of dry-cured Iberian hams. *Meat Science*, 58(1), 85-91.
17. Timón, M. L., Ventanas, J., Carrapiso, A. I., Jurado, A., & Garcia, C. (2001). Subcutaneous and intermuscular fat characterisation of dry-cured Iberian hams. *Meat Science*, 58(1), 85-91.
18. Blair, C. (1995). Interactive Atlas of Human Anatomy. *Journal of Osteopathic Medicine*, 95(12), 707-707.
19. Marcy, S.M. (1985). Infections of the external ear. *Paediatric Infectious Disease Journal*, 4; 192-201.
20. Roland, P. S., & Stroman, D. W. (2002). Microbiology of acute otitis externa. *The Laryngoscope*, 112(7), 1166-1177.
21. Khan, A. A., & Rahman, K. M. (1977). Fungus infection of ear. *Bangladesh Medical Research Council Bulletin*, 3(1), 28-31.
22. Than, K. M., Naing, K. S., & Min, M. (1980). Otomycosis in Burma, and its treatment. *The American Journal of Tropical Medicine and Hygiene*, 29(4), 620-623.
23. Mugliston, T., & O'donoghue, G. (1985). Otomycosis—a continuing problem. *The Journal of Laryngology & Otology*, 99(4), 327-333.
24. Clark, W. B., Brook, I., Bianki, D., & Thompson, D. H. (1997). Microbiology of otitis externa. *Otolaryngology—Head and Neck Surgery*, 116(1), 23-25.
25. Bhalla, N., Biggins, S., & Murray, A. W. (2002). Mutation of YCS4, a budding yeast condensin subunit, affects mitotic and nonmitotic chromosome behavior. *Molecular biology of the cell*, 13(2), 632-645.
26. Glasgold, A. I., & Boyd, J. E. (1973). Otitis externa: control of bacterial and mycological infections--a preliminary report. *Eye, Ear, Nose & Throat Monthly*, 52(3), 94-96.
27. Artola, A., & Singer, W. (1987). Long-term potentiation and NMDA receptors in rat visual cortex. *Nature*, 330(6149), 649-652.
28. CONLEY, J. J. (1948). Evaluation of fungous disease of the external auditory canal. *Archives of Otolaryngology*, 47(6), 721-745.
29. Sipilä, P., Jokipii, A. M. M., Jokipii, L., & Karma, P. (1981). Bacteria in the middle ear and ear canal of patients with secretory otitis media and with non-inflamed ears. *Acta oto-laryngologica*, 92(1-6), 123-130.
30. Browning, G. G., Picozzi, G., Sweeney, G., & Calder, I. T. (1983). Role of anaerobes in chronic otitis media. *Clinical Otolaryngology & Allied Sciences*, 8(1), 47-51.
31. Senturia, B.H., Marcus, M.D., Lucente, F.E. (1980). Disease of the external ear. New York; Grune and Stratton, 6-62.1-23.
32. Akobjanoff, L., Carruthers, C., & Senturia, B. H. (1954). The chemistry of cerumen: a preliminary report. *Journal of Investigative Dermatology*, 23(1), 43-50.