Original Article

Bacteriological study of otitis externa and susceptibility to antimicrobial agents

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Summery

Back ground *Otitis externa (OE) is an inflammation of ear canal between ear drum and the outside of the ear.*

The aims of the study *to isolate and identify the causes of otitis externa, to determine the antimicrobial susceptibility pattern, to detect the seasonal distribution of the OE patient.*

Material and patient *Fifty ear swabs were collected from suspected cases of OE over one year from January to December 2005 in Al-Kindy Hospital. The ratio of male to female was 1.7-1, and the most common ear infection was (40%) of males at age group (10-19) years. Ear swabs were collected and inoculated to blood and maCconkey agar. Morphological identification and biochemical tests for growing bacteria were done. Antimicrobial susceptibility test was carried out.*

Results *This study showed out of 50 ear swabs, 12 swabs (24%) showed no growth while 38 swabs (76%) showed the growth of bacteria, the most common bacteria isolated was Pseudomonas aeruginosa (36%) followed by Proteus mirabilis and Staphylococcus aureus (18%) each and Enterobacter aerogenes (4%). Amikacin was effective antimicrobial agent against P. aeruginosa (61.1%) and Proteus mirabilis (66.6%), while chloramphenicol was effective agent against P. mirabilis (66.6%), S. aureus showed susceptibility to bactrim (septrim), erythromycin, clindamycin (55.5%) each followed by ciprofloxacin (33.3%), while E. aerogenes showed susceptibility to ciprofloxacin (100%). This study showed that P. aeruginosa, E. aerogenes and S. aureus resistant to cefixime, ceftazidime, chloramphenicol. Finally the study showed that 60% of OE was during summer and the least infection was during winter (4%).*

Conclusions *Pseudomonas aeruginosa was the most common bacterial isolates. There is no specific antimicrobial agent against pathogenic bacteria.*

Introduction:

Otitis externa (OE) is an inflammation of the ear canal between the ear drum (tympanum) and the outside of the ear [1]. Otitis externa is more common during the summer swimming season [2].

Otitis exerna most often occurs when too much water gets in the ear such as after swimming or showering. It is easier for germs and fungus to grow when water removes the protective ear wax [1].

Causes of infection [1, 2, 3]:

1. Excessive ear wax can trap organisms in the ear canal and causes OE.
2. High humidity, swimming, perspiration, water contamination bacteria.
3. Injure the skin by putting the finger or some object in the ear, ear plugs, cotton swab, insertion of foreign objects.
4. Acne, psoriasis and other skin conditions that occur in other parts of the body also occur in the ear canal and cause OE.

- Generalized external otitis may be caused by a gram-negative rod such as Escherichia coli, Pseudomonas aeruginosa, or Proteus mirabilis or by Staphylococcus aureus, or rarely by fungus [2].

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Treatment:

Otitis externa can usually be treated very successfully with topical antibiotics; yet physicians in a recent study prescribed systemic antibiotics 65% of the time [1].

Remove infected debris: topical treatment with neomycin and polymyxin B for gram-negative bacteria; 1% hydrocortisone for welling while pills are sometimes necessary to treat otitis externa.

Aims of this study:

1. To isolate and identify the common causes of otitis externa.
2. To determine the antimicrobial susceptibility pattern of the isolated bacteria.
3. To determine the seasonal distribution of the OE patients.

Patients and Methods:

Fifty patients attended to Al-Kindy hospital from January to December 2005. Fifty ear swabs were collected from inflamed or discharged ear by rubbing the ear with sterile disposable swabs.

The swabs were inoculated to blood agar and MacConkey's agar.

Morphological identification and biochemical tests for the growing bacteria were done according to Cruickshank et al [4] and Baron et al[5]:

- Biochemical tests used for identification of gram-negative bacteria including indole, MR, VP, citrate utilization urea and TSI.

- Biochemical tests used for S. aureus identification: catalase, mannitol salt agar and coagulase. Antimicrobial susceptibility test was carried out as described by Kirby-Bauer [5] using different single antimicrobial disc.

Results:

This study showed that the infected males were 32 (64%) and females were 18 (36%). The ratio of male to female was 1.7:1;

The highest age number of patients 23 (40%) were in both sexes the age group of 10-19 years; Table (1)

Out of 50 ear swabs collected, 12 swabs (24%) showed no growth while 38 swabs (76%) showed the growth of bacteria.

Table (1): Distribution of 50 suspected patients According to age and sex

Age	Males		Females		Total	
	No.	%	No.	%	No.	%
10-19	20	40	3	6	23	46
20-29	7	14	6	12	13	26
30-39	2	4	4	8	6	12
40-49	2	4	3	6	5	10
Above 50	1	2	2	4	3	6
Total	32	64	18	36	50	100

Table (2) shows the distribution of bacterial isolates from the ear swabs. The most common bacteria isolates was Pseudomonas aeruginosa (36%).followed by Proteus mirabilis and Staphylococcus aureus (18%) each and Enterobacter aerogenes(4%).The incidence of gram-negative bacteria 29(78.3%) was much highr than gram-positive bacteria 9(23.7%)

Table (2) Distribution of bacterial isolates from the ear swabs

Bacteria	No.	%
Pseudomonas aeruginosa	**18**	**36**
Proteus mirabilis	**9**	**18**
Staphylococcus aureus	**9**	**18**
Enterobacter aerogenes	**2**	**4**
Total	**38**	**76**
No bacterial growth	**12**	**24**
Total	**50**	**100**

Table (3) shows antimicrobial susceptibility patterns against infected bacteria. Amikacin was effective agent against P. aeruginosa (61.11%) and Proteus mirabilis (66.6%). This result disagree with Battikhi et al (6)who found that P. aeruginosa showed best susceptibility to ciprofloxacin, while Proteus mirabilis showed the best susceptibility to amikacin (100%).

Chloramphenicol was effective agent against Proteus mirabilis (66.6%).

Staphylococcus aureus showed susceptibility to bactrim (septrim), erythromycin, clindamycin (55.5%) each, followed by ciprofloxacin (33.3%).

Ciprofloxacin was effective agent against Enterobacter aerogenes (100%).

In this study, showed that P. aeruginosa, E. erogenes and S. aureus resistant to cefixime, ceftazidime, chloramphenicol.

Table (3): Antimicrobial susceptibility patterns against infected bacteria

Antimicrobial agent	P. aeruginosa		Proteus mirabilis		Enterobacter aerogenes		Staphylococcus aureus	
	No.	%	No.	%	No.	%	No.	%
Amikacin	11	61.11	6	66.6	0	0	NT **	
Tobramycin	10	55.5	2	22.2	0	0	NT	
Ceftriaxone	5	27.7	2	22.2	1	50	NT	
Chloramphenicol	0	0	6	66.6	0	0	0	0
Ciprofloxacin	4	22.2	5	55.5	2	100	3	33.3
Cefixime	0	0	4	44.4	0	0	0	0
Ceftazidime	0	0	4	44.4	0	0	0	0
Bactrim	NT		NT		NT		5	55.5
Erythromycin	NT		NT		NT		5	55.5
Clindamycin	NT		NT		NT		5	55.5

**** No. Sensitive isolates***

***** NT = Not tested***

Table (4) shows the seasonal distribution of OE. The study showed that 60% of infections was during summer over the period from June, 1st – 31st, Aug. And the least infection was during winter (4%) from Dec. 1st, Feb., 28th, 2005.

This result in agreement with Berkow et al [2] & Burton [3] who found that otitis externa is more common during the summer swimming season.

Table (4): Seasonal distribution of patients with OE

Season	No. Of cases	%
Winter 1/12 - 28/2	2	4
Spring 1/3 – 31/5	6	12
Summer 1/6 – 31/8	30	60
Autumn 1/9 – 30/11	12	24
Total	50	100

Discussion:

The number of males patients were 32 and female were 18 this result is in agreement with Battikhi [7], who found that males were 100 and females 80.

The highest age number of patients 23 (40%) were in both sexes the age group of 10-19 years this age group represent the age of activity and motility Out of 50 ear swabs collected 12 swabs (24%) revealed no growth of bacteria This maybe due to patients were under the antimicrobial treatment or fungal infection; this result is in agreement with Arshad et al [8] who found that 16 samples showed no growth, 108 specimens yield growth of bacteria.

Pseudomonas acruginas was the most common bacteual bolates This result is in agreement with Battikhi [7] who found that P. aeruginosa was the most frequently isolated pathogen (41.7%) and in agreement with Hajjartabar [9] who found that P. aeruginosa was isolated from the ear swabs of (79.3%) of cases. Proteus mirabilis and Staphylococcus aureus (18%) each and Enterobacter aerogenes(4%) This result is in agreement with Burton[3] and Berkow[2] who found the common cause of OE were P. aeruginosa, Proteus mirabilis and Staphylococcus aureus. Battihi et al [9] found that the causative agent of OE were P. aeruginosa, S. aureus, Proteus mirabilis and Enetrobacter aerogenes.

Arshad et al [8] found that S. aureus and P. aeruginsa was 38% each.

In this study, no specimen revealed multiple organisms. This result is in agreement with Arshad et al [8].

Amikacin was effective agent against P. aeruginosa (61.11%) and Proteus mirabilis (66.6%). This result disagree with Battikhi et al [7]who found that P. aeruginosa showed best susceptibility to ciprofloxacin, while Proteus mirabilis showed the best susceptibility to amikacin (100%). Ciprofloxacin was effective agent against Enterobacter aerogenes (100%). Arshad et al [8] found that (92%) of organisms were susceptible to ciprofloxacin, while majority of organisms were resistant to erythromycin. Battikhi et al [7] found that S. aureus showed the best susceptibility to amikacin and ciprofloxacin (96.5%) each.

While Proteus mirabilis showed the best susceptibility (100%) to amikacin, ciprofloxacin. In this study, showed that P. aeruginosa, E. erogenes and S. aureus resistant to cefixime, ceftazidime, chloramphenicol. Cross et al [10] reported that incidence of amikacin resistance rasied with increase admistration of this antimicrobial against gram-nagative bacteria. The study showed that 60% of infections was during summer over the period from June, 1st – 31st, Aug. And the least infection was during winter (4%) from Dec. 1st, Feb., 28th, 2005.

This result in agreement with Berkow et al [2] & Burton [3] who found that otitis externa is more common during the summer swimming season.

Conclusions:

1. Pseudomonas aeruginosa was the most common bacterial isolates.
2. There is no specific antimicrobial agent against pathogenic bacteria.

References:

1. ***Sander W. Robert. Otitis externa: Infection of the ear canal. Practical therapeutics, vol. 63; No. 5, 2001.***
2. ***Berkow Robert, Talbott John H. The Merck manual of diagnosis and therapy, Merck Sharp and Dohme Research Lab., Rahway, N.J 1977.***
3. ***Burton, Gwendolyn RW. Microbiology for health sciences. J.B Lippincott Company, Philadelphia, 1988.***
4. ***Cruickshank R., Duguid J.P, Marmion B.P, Swain R.H.A, Medical Microbiology, Churchill Livingstone, Edinburgh, London and New York, 1975.***
5. ***Baron, E. J; Peterson L.R and finegolld S.M. "Baily and Scott's Diagrnostic microbiology 9 th edition (1994).***
6. ***Bauer Q.W, Kirby W.M.M, Sherris J.C and Turck M. "Antibiotic susceptibility test by a standardized single disc method". Am. J. Clin. Pathol., 45; 493-96, 1966.***
7. ***Battikhi M.N; Ammar S.I. "Otitis externa infection in Jordan. Clinical and microbiological features". Saudi Med. J., 25(9): 1199-203, 2004.***
8. ***Arshad M, Khan N.U, Ali N, Afridi N.M. "Sensitivity and spectrum of bacterial isolates in infectious otitis externa". J. Coll- Physicians-Surg-Pak., 14(3): 146-9, 2004.***
9. ***Hajjartabar M. "Poor-quality water in swimming pools associated with a substantial risk of otitis externa due to Pseudomonas aeruginosa". Water-Sci-Technol., 50(1): 63-7, 2004.***
10. ***Cross A.S; Opal M.S; Dennis J."Progressive increase in antibiotic resistance of gram-negative bacterial isolates ". J. Arch. Intern. Med.143: 2075-80, 1983.***