MED-PHOENIX: JOURNAL OF NATIONAL MEDICAL COLLEGE

ORIGINAL ARTICLE

BACTERIOLOGICAL FLORA OF ACUTE OTITIS EXTERNA

Abha Kiran K.C.,[1]* Bikash Lal Shrestha,[1] Surendra Kumar Madhup,[2] Manish Neupane [3]

[1] Department of ENT-HNS, Kathmandu University School of Medical Sciences, Dhulikhel Hospital, Kavre, Nepal.
[2] Department of Microbiology, Kathmandu University School of Medical Sciences, Dhulikhel Hospital, Kavre, Nepal.
[3] MBBS, Kathmandu University School of Medical Sciences, Dhulikhel Hospital, Kavre, Nepal.

Date of Submission : May 04, 2023
Date of Acceptance : June 30, 2023
Date of Publication : July 28, 2023

Correspondence to:
Abha Kiran K.C., Department of ENT-HNS, Kathmandu University School of Medical Sciences, Dhulikhel Hospital, Kavre, Nepal.
Phone: +977-9841587666
Email: abhakirankc@gmail.com

Citation:
KC AK, Shrestha BL, Madhup SK, Neupane M. Bacteriological Flora of Acute Otitis Externa. Med-phoenix. 2023;8(1):3-6

DOI:https://doi.org/10.3126/medphoenix.v8i1.56841

Conflict of interest: None, ***Funding:*** None

Publisher: *National Medical College Pvt. Ltd.*
MedPhoenix - Journal of National Medical College (JNMC); 2023,8(1), available at www.jnmc.com.np

ISSN:2631-1992 (Online); ISSN:2392-425X (Print)

ABSTRACT

Introduction: *Acute otitis externa refers to inflammation of external auditory meatus skin usually due to infectious etiology. Bacterial etiology of the entity has been established by various studies; however, the predominant causative pathogen has been identified as either Pseudomonas aeruginosa or Staphylococcus aureus. This study aimed to identify the aerobic bacteria responsible for this condition at our centre, and their antimicrobial susceptibility.*

Materials and Methods: *102 patients presenting to our Outpatient Department with acute otitis externa over a period of 1 year (5th April, 2021 - 4th April, 2022) underwent collection of external auditory canal swabs for aerobic bacteriological profile, followed by antimicrobial susceptibility for the recovered isolates.*

Result: *The commonest isolate was Staphylococcus aureus (61.8%), followed by Pseudomonas aeruginosa (21.6%). Methicillin-Resistant Staphylococcus aureus (MRSA) was recorded at an alarming rate of 15.7%.*

Conclusion: *Culture and Sensitivity testing in cases of Acute otitis externa helps to modify the treatment regimen in cases not responding to the usual therapy.*

Keywords: *Acute Otitis Externa, MRSA, Staphylococcus aureus*

INTRODUCTION

Acute otitis externa is an inflammation of the skin and soft tissue of the external auditory canal, often caused by a variety of infectious etiology. It is a common otologic condition, usually presenting with mild symptoms, however, its complications may include necrotizing infection or facial paralysis.[1] Initially described by Mayer in 1844 as a fungal infection, this dictum was considered true till the World War II.[2] Studies during the World War II established the bacteriological etiology of this condition.[3,4,5] The most frequent organism responsible has been either Pseudomonas aeruginosa[4,5] or Staphylococcus aureus[6]. These studies thus show a variation in the bacteriology depending on the geography. The rise of Methicillin Resistant Staphylococcus Aureus (MRSA) as a causative agent has further been worrisome.[7] The practical approach is to treat immediately with antimicrobial agents which are usually effective. Routine microbiological analysis helps to redirect the treatment protocol in clinically unresponsive cases according to the culture and sensitivity studies.

The objective of our study was to determine the aerobic bacteriological profile of acute otitis externa, and to define the antibiotic susceptibility profiles of these isolates.

MATERIALS AND METHODS

All patients presenting to Ear, Nose and Throat Outpatient Department of Dhulikhel Hospital with acute otitis externa from 5th April, 2021 through 4th April, 2022 were included in the study. After clinical examination confirmed the diagnosis, sample for bacteriological study was obtained. The cavum concha and external meatus was cleaned with 70% Isopropanol. With the use of

sterile metallic ear speculum for adequate access into the external auditory canal, a small sterile absorbent cotton swab was placed firmly in contact with the area of maximal involvement avoiding contamination from the surrounding surfaces. In cases with exudation, swab was withdrawn when saturated. In cases with localized inflammatory involvement, swab was rolled over the area and withdrawn. Swab was then placed in sterile stoppered glass tubes and sent to the microbiology laboratory within 15 minutes of collection. Swabs were plated on Blood agar, chocolate agar and MacConkey agar, and incubated aerobically at 37^0 C for 24 hours. The organisms were identified based on culture characteristics and biochemical tests. The cultures were discarded as negative only after 48 hours of incubation. Once the pathogens were isolated, antimicrobial susceptibility was tested using Disc diffusion methods.

The results were recorded in Microsoft Office Excel (Microsoft Corp.; Redmond, WA, USA). During data processing, strict confidentiality was maintained. Ethical approval was obtained on 4th April, 2021 from Institutional Review Committee with protocol number 23/2021.

RESULTS

102 patients were included in our study, 59 males (57.8%) and 43 females (42.2%). Patients were 1 year to 60 years in age (average age=25.4 years), with 46 (45.1%) patients less than 20 years in age. Right ear was involved in 66 (64.7%) patients. All the patients presented with earache, with itching in 61 (59.8%) patients and discharge in 42 (41.2%) patients. 75 (73.5%) patients had undertaken ear picking, by themselves or by their parents in cases of children, preceding the onset of symptomatology. On clinical examination, canal erythema was the predominant finding in 75 (73.5%) patients. Furuncle was noted in 58 patients, with 13 out of 16 cases with MRSA presenting with this finding. The canal pathology has been summarized in Table 1.

Table 1. Examination findings

Findings	Number of patients (%)
Canal erythema	75 (73.5%)
Canal oedema	63 (61.8%)
Discharge	42 (41.2%)
Furuncle	58 (56.9%)
Polyp	13 (12.7%)

The average age of patients with MRSA was 10.5 years (Vs. Methicillin Sensitive Staphylococcus aureus 'MSSA' average age = 33.3 years). The average age of patients with Pseudomonas infection was 26.2 years.

Gram positive Staphylococci was isolated in 63 (61.8%) patients. Staphylococcus aureus was the predominant species recovered (51.96%), followed by Coagulase Negative Staphylococcus (CONS) in 9.8% patients. CONS were considered as normal skin commensals, and antimicrobial sensitivity was not thus done. MRSA was isolated in 15.7% patients. The second commonest isolate was Pseudomonas aeruginosa (21.6%). Other isolates in descending order of frequency included Proteus, Escherichia coli, Citrobacter and Enterobacter. The 'no growth rate' was 4.9%. We had no cases of poly-microbial infection in our study. Table 2 summarizes the isolates recovered.

Table 2. Isolates recovered

Organisms	Number of patients (%)
No growth	5 (4.9%)
Staphylococcus aureus	37 (36.3%)
MRSA	16 (15.7%)
CONS	10 (9.8%)
Pseudomonas aeruginosa	22 (21.6%)
Proteus	5 (4.9%)
Escherichia coli	3 (2.9%)
Citrobacter	3 (2.9%)
Enterobacter	1 (0.98%)

Antibiotic susceptibility was identified for all recovered organisms. Table 3 shows the antimicrobial profile for the isolates.

Table 3. Antibiotic susceptibility profile for isolates of major bacteria

Organisms	Relative sensitivity	Antibiotics (Number of Isolates)
Staphylococcus aureus	Sensitive	Amoxyclav(37), Ciprofloxacin(36), Cloxacillin(37), Clindamycin(36), Cefuroxime(37), Erythromycin(34)
	Resistant	Penicillin G(37), Erythromycin(3), Ciprofloxacin(1), Clindamycin (1)
MRSA	Sensitive	Cotrimoxazole(16), Linezolid(16), Mupirocin(16), Teicoplanin(16), Vancomycin(16), Clindamycin (3), Erythomycin (3), Gentamycin(14)
	Resistant	Amoxyclav(16), Cefuroxime(16), Ciprofloxacin(16), Clindamycin(13), Cloxacillin(16), Erythromycin(13), Penicillin G(16), Gentamycin (2)
Pseudomonas aeruginosa	Sensitive	Ciprofloxacin(20), Gentamicin (20), Ceftazidime (19), Piperacillin/ Tazobactam(22)
	Resistant	Ampicillin(22), Cloxacillin(22), Amikacin(2), Ceftazidime(3), Ciprofloxacin(2), Gentamycin(2)

DISCUSSION

The average age in our study was 25.4 years. Younger age of incidence has been reported in studies which attribute it to outdoor exposure and active participation in school and college activities.[8,9] Sanchez et al.[10] reported an average age of 30.5 years, whereas Kiakojuri et al.[11] reported middle-aged individuals (35-44 years) to be most often affected. Rowlands et al.[12] concluded otitis externa to be common in all age groups. Practice of ear canal cleansing attempted by parents for their children was the cause for higher prevalence in individuals younger than 20 years in our study. Predominance of males has been reported in earlier studies due to higher prevalence of predisposing factors and better health care access, which is also reflected in our study.[10,11] Higher number of cases with right ear involvement could reflect the fact that right handed people (n=102) reach the right ear for habitual ear picking with resultant finger nail trauma to the canal.

The commonest symptom was earache, which has been reported in earlier studies.[13,14] Furuncle in the ear canal was seen in 56.9% cases in our study, which has not been reported in other studies. Most of these cases were in the younger age group (<20 years), presented to us after failing to resolve with oral antimicrobials, and often needed intravenous therapy due to the involvement of surrounding ear structures.

Polymicrobial isolates were reported in earlier studies, where both fungal and bacterial cultures were undertaken.[4,5,6] These studies also reported polymicrobial infection with two or more bacteria. Luthra et al.[9] Reported polymicrobial culture in only 5 out of 110 ears, with co-existence of two bacteria in only 1 sample. However, our study did not demonstrate any polymicrobial isolates. Mycological culture might have yielded polymicrobial isolates in our study too.

Microbiologic studies of Acute otitis externa usually identified Pseudomonas aeruginosa as the commonest causative pathogen followed by Staphylococcus aureus.[15,16,17,18] The incidence of Pseudomonas has varied from 18.6% to 61% in the aforementioned studies. Similarly, Staphylococcus aureus was isolated in 9% to 30% of cases. The predominance of Staphylococcus aureus as the causative pathogen has been established in other studies.[19,20,21] These may reflect the geographical variation in the etiological agents. Staphylococcus aureus was the commonest causative aerobic bacteria at our center. The role of Staphylococcus as a harmless commensal and a harmful pathogen in humans has been recorded since a long period of time. Increasing rate of Staphylococcal infections in otitis externa may be due to changing population demographics or changes in the strain of Staphylococcus aureus found in the community. Empirical use of antibiotics may have imposed selective pressure that eventually changed the external ear microbial flora.[22]

An alarming rate of MRSA was isolated at our center which has been reflected in the study by Duarte et al.[22] Initially nosocomial in nature, an increase in community-acquired MRSA has surged in otological infections over the years. This may reflect the increasing prevalence of carriage and infection rates of MRSA in the community. MRSA infections presented usually in children, with more severe symptoms than Methicillin-Sensitive Staphylococcus aureus in our study in contrast to the findings by Duarte et al.[22] This may be due to these cases presenting to us after failed antimicrobial therapy from local centres.

Antimicrobial susceptibility of Staphylococcus aureus to Cloxacilin, Pseudomonas aeruginosa to Ciprofloxacin and Ceftazidime, was a reassuring finding. MRSA often responded to Cotrimoxazole, which oviated the need of Intravenous antibiotics with toxicity profiles (Vancomycin, Gentamicin).

CONCLUSION

Causative pathogens for otitis externa are seen to be variable depending on the geographical regions. Routine identification of causative agents prevalent at one's centre and their antimicrobial susceptibility guides the treatment protocol for primary as well as unresponsive cases.

REFERENCES

1. Ceners for Disease Control and Prevention (CDC). Estimated burden of acute otitis externa-United States, 2003-2007. MMWR Morb Mortal Wkly Rep. 2011;60:605-9.

2. Mcdowell G. The management of otitis externa. Practitioner 1971;207:743-53.

3. Gordon A. Otitis externa. Bull US Army Med Dept 1948;8:245-46.

4. Singer DE, Freeman E, Hoffert WR, Keys RJ, Mitchell RB, Hardy AV. Otitis externa : Bacteriological and mycological studies. Ann Otol Rhinol Laryngol 1952;61:317-30.

5. Syverton JT, Hess WR, Krafchuk J. Otitis externa: Clinical observations and microbiologic flora. Arch Otolaryngol 1946;43:213-25.

6. Dibb WL. Microbial aetiology of otitis externa. Journal of Infection 1991;22:233-9.

7. Walshe P, Rowley H, Timon C. A worrying development

in the microbiology of otitis externa. Clin Otolaryngol 2001;26:218-20.

8. Ghanpur AD, Nayak DR, Chawla K, Shashidhar V, Singh R. Comparison of Microbiological flora in the external auditory canal of normal ear and an ear with acute otitis externa. J Clin and Diagnostic Res 2017;11(9):1-4.

9. Luthra H, Sharma V, Jindal N. Microbiological profile and antibiotic sensitivity of 100 cases of otitis externa. Indian J Otolaryngol Head Neck Surg 2020;74:3616-9.

10. Sanchez AB, Guardiola MIM, Albert JRG, Sanchez JT. Descriptive study of infectious ear disease in relation to summer. Acta Otorrinolaringol Esp 2000;51(1):19-24.

11. Kiakojuri K, Omran SM, Jalili B, Hajiahmadi M, Bagheri M, Shahandashti EF et al. Bacterial otitis externa in patients attending an ENT Clinic in Babol, North of Iran. Jundishapur J Microbiol 2016;9(2):e23093.

12. Rowlands S, Devalia H, Smith C, Hubbard R, Dean A. Otitis externa in UK general practice: a survey using the UK General Practice Research Database. Br J Gen Pract 2001;51(468):533-8.

13. Al-Asaaf SM, Farhan M. Otitis externa in a localized area at the south of Jordan. Saudi Med J 2000;21(10):928-30.

14. Schaefer P, Baugh RF. Acute otitis externa; an update. Am Fam Physician 2012;86(11):1055-61.

15. Clark WB, Brook I, Bianki D, Thompson DH. Microbiology of otitis externa. Otolaryngol Head Neck Surg 1997;116:23-5.

16. Roland PS, Stroman DW. Microbiology of Acute Otitis Externa. The Laryngoscope 2002;112:1166-77.

17. Amigot SL, Gomez CR, Luque AG, Ebner G. Microbiological study of external otitis in Rosario City, Argentina. Mycoses 2003;46:294-7.

18. Ninkovic G, Dullo V, Saunders NC. Microbiology of otitis externa in the secondary care in United Kingdom and antimicrobial sensitivity. Auris Nasus Larynx 2008;35:480-4.

19. Nogueira JCR, Diniz MFFM, Lima EO, Lima ZN. Identification and antimicrobial susceptibility of acute external otitis microorganisms. Rev Bras Otorrinolaringol 2008;74(4):526-30.

20. Enoz M, Sevinc I, Lapena JF. Bacterial and fungal organisms in otitis externa patients without fungal infection risk factors in Erzurum, Turkey. Braz J Otorhinolaryngol 2009;75(5):721-5.

21. Hwang JH, Chu CK, Liu TC. Changes in bacteriology of discharging ears. J Laryngo Oto 2002;116:686-9.

22. Duarte MJ, Kozin ED, Bispo PJM, Mitchell AH, Gilmore MS, Remenschneider AK. Methicillin-resistant Staphylococcus aureus in acute otitis externa. World J Otorhinolaryngol Head Neck Surg 2017;4(4):246-52.