

Research Article

An analysis of ear discharge and antimicrobial sensitivity used in its treatment

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Received: 27 May 2016

Revised: 10 May 2016

Accepted: 03 June 2016

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ABSTRACT

Background: Ear discharge is one of the cardinal symptoms of ear infection along with progressive deafness, pain, tinnitus and vertigo. Main objectives of the study were to study the various causes of ear discharge, isolate and identify the microorganisms associated with different causes of ear discharge and study the antibiotic sensitivity patterns of the isolated organisms.

Methods: All the patients matching the inclusion criteria were enrolled and sample of ear discharge was collected. This sample was sent to the microbiology laboratory for isolation of microorganism and antimicrobial sensitivity testing.

Results: In present study 115 samples of ear discharge were examined for the presence of microorganisms. Out of 115, 93 (80.86%) samples were positive for growth of microorganisms and 22 (19.13%) samples were sterile. Out of 93 positive samples 61 (65.59%) samples were pure-bacterial growth, 8 (*8.60%) samples showed pure fungal growth and 24 (25.80%) showed mixed growth of both bacteria anti fungi.

Conclusions: Overall bacterial isolates were higher than fungal and pseudomonas appeared to be most common. It was found sensitive to ceftazidime, amikacin, imipenem, colistin and aztreonam.

Keywords: Ear infection, Antimicrobial sensitivity

INTRODUCTION

Ear discharge is any fluid that comes out from the external ear, also known as otorrhea. It could be in the form of blood, wax, pus or mucous fluid.

Ear discharge is one of the cardinal symptoms of ear infection along with progressive deafness, pain, tinnitus and vertigo.

Infection of the ear can be classified depending upon the site: otitis externa (infection of external ear) and otitis media (infection on middle ear).¹

Anatomy of the EAR

As the matter of fact ear performs two sensory function: hearing and maintenance of equilibrium balance of the body. Ear can be divided in to three parts: outer ear, middle ear and inner ear.²

Outer ear

It consists of two parts, pinna and external auditory meatus. The external auditory meatus extends up to the tympanic membrane (ear drum). Pinna and external

auditory meatus possess fine hairs and wax secreting sebaceous glands.

Middle ear

Contains three ossicles, malleus, incus and stapes are attached to one another in a chain-like fashion. Malleus is attached to the tympanic membrane and stapes is attached to the oval window of cochlea. Eustachian tube connects the middle ear cavity with pharynx.

Labyrinth consists of two parts: bony part which is a series of channels and membranous part which is filled with fluid called endolymph. The coiled portion of labyrinth is called cochlea. The organ of corti is a structure located on the basilar membrane containing hair cells which act as an auditory receptors.³

Inner ear

Inner ear contains complex system called vestibular apparatus which is made up of three semi-circular canals and otolith organ containing saccule and utricle. With this brief understanding of the anatomy of the ear, let us now discuss the different infections of the ear and its microbiological nature.

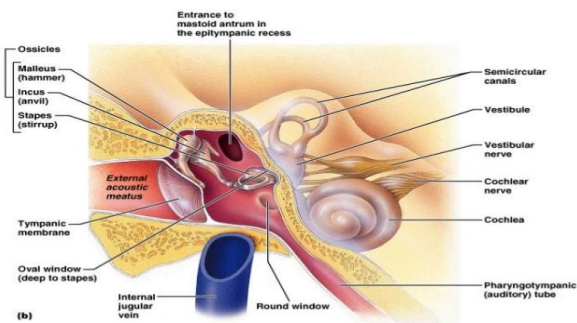


Figure 1 Anatomical representation of ear.

Ear infection in presents with lots of different etiology;

- Recurrent attacks of common cold
- Infections of tonsils and adenoids
- Chronic rhinitis and sinusitis
- Nasal allergy
- Tumors of nasopharynx
- Cleft palate
- Loss of cerumen

Any of the above predisposing factors can lead to invasion of microorganism which may also open the route to middle ear infection.

Ear infection in any form has a varied microbial etiology, which influences the selection of an efficacious antimicrobial agent. According to WHO survey 42 million people worldwide have hearing loss where major cause is

otitis media. Thus management of every case of ear discharge becomes utmost important.⁴

Many studies have been conducted focusing bacterial flora of ear discharge, but very less is known about mycological aspects of this. In recent past importance of knowing this aspect has been increasing because of excessive use of broad spectrum antibiotics, corticosteroids and cytotoxic chemotherapy.²

Hence, this study was undertaken with the objective of identification and isolation of etiological agents in patients coming to ENT OPD with the complain of ear discharge comprising bacteria and fungus so as to study the resistance pattern of microorganisms and provide a guideline for empirical antibiotic therapy.

Main objectives of the study were to study the various causes of ear discharge and to isolate and identify the microorganisms associated with different causes of ear discharge.

METHODS

This study was conducted in OPD patients visiting Department of ENT at L.G. General Hospital and Department of Microbiology; AMC MET Medical College, Maninagar Ahmedabad, Gujarat, India.

Inclusion criteria

All patients were included in the study consecutively after the initial clinical examination of the patients with clinical history as per performa. Study was conducted from 22nd December 2014 to March 2015.

Sample collection

Written informed consent was taken from all the patients before recruiting in the study. Proper examination was done by the clinician of the ENT department to assess the condition of external auditory canal for the presence of congestion, debris, discharge and perforation. After thorough examination discharge material was collected with two clean sterile swab stick. A standard case record form was filled up by the doctor for each enrolled patient. Specimen was sent to microbiology department for further morphological study and antibiotic sensitivity.

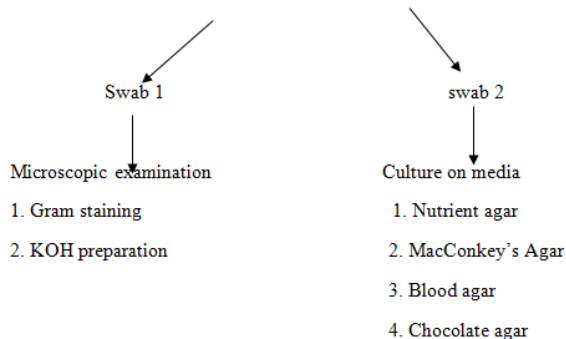
Instruments required are microscope, autoclave, hot air oven, incubator, teasing needles and sterile swab. Various culture media used: sabouraud dextrose agar (SDA), nutrient agar, macconkey's agar, blood agar, chocolate agar, yeast nitrogen based medium (YNB).

Biochemical medium for identification of bacterial growth: triple sugar iron, citrate agar slant, urea slant, phenylalanine slant, tryptophan broth, glucose phosphate broth.

Reagents used were gram staining kit, for fungus: 10% potassium hydroxide, lactophenol cotton blue.

Laboratory investigation of ear discharge

Day 1: Two swabs were collected from patients having ear discharge



Day 2: Process for identification and antibiotic sensitivity test according to gram staining

Identification is done by culture characteristics and Biochemical test:

GPC	LF	LNF
Catalase test	IMViC test	Oxidase test
Coagulase test	TSI agar	TSI agar
		IMViC test
		Urease test
		PPA test

Day 3: Identification and result of antibiotic sensitivity test.

RESULTS

In present study 115 samples of ear discharge were examined for the presence of microorganisms. Out of 115, 93 (80.86%) samples were positive for growth of microorganisms and 22 (19.13%) samples were sterile.

Out of 93% positive samples 61 (65.59%) samples were pure-bacterial growth, 8 (*8.60%) samples showed pure fungal growth and 24 (25.80%) showed mixed growth of both bacteria anti fungi.

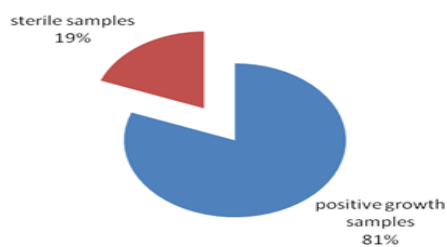


Figure 2: Percentage of samples showing growth of microorganism.

Following table shows most common complains of patients with ear discharge:

Table 1: Complains of patients.

Complains	Number of patient (total=115)	Percentage (%)
Earache	66	57.39%
Earwax	5	4.34%
Tinnitus	53	46.08%
Decreasing hearing	23	20%
Deafness	6	5.21%

The pattern of microbial isolates showed that 41.65% of total isolate were gram positive bacteria, 64.28% were gram negative bacteria and 34.40% were fungal species.

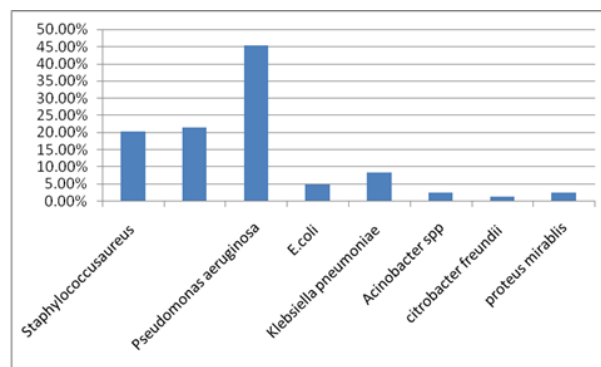


Figure 3: Percentage of microorganisms.

A total of eight different organisms were isolated. The organisms included: *Staphylococcus aureus* 20.23%, *Coagulase negative staphylococci* 21.42%, *Pseudomonas aeruginosa* 45.23%, *E. coli* 4.76%, *Protes Mirabalis* 2.38%, *Klebsiella pneumoniae* 8.33%, *Acinobacter spp.* 2.38% and *Citrobacter freundii* 1.19%.

Table 2: Sensitivity of pseudomonas to antibiotics.

Antibiotic	No.of sensitive iolates	No. of resistant iolates
Ceftazidime	35	3
Colistin	36	2
Minocycline	7	3
Imipenem	35	3
Piperacillin/tazobactum	35	3
Levofloxacin	30	8
Ciprofloxacin	27	11
Aztreonam	35	3
Cefoperazone/sulbactam	36	2
Amikacin	34	4
Cefotaxime	25	13

Out of 8 isolates 46.87% were aspergillus, 40.62% were candida albicans, 6.25% were dermatophytes, 6.25% were other (scopulariopsis and chrysosporium). Among 85 bacterial isolated pseudomonas aeruginosa was most common bacterium isolated followed by staphylococcus aureus.

Table 3: Antibiotic sensitivity for *Staphylococcus aureus*.

Antibiotic	No. of sensitive isolates	No. of resistant isolates
Penicillin G	0	17
Oxacillin	15	5
Erythromycin	12	0
Clindamycin	17	0
Linezolid	17	17
Cotrimoxazole	0	0
Vancomycin	17	9
Ciprofloxacin	8	1
Tetracycline	16	1
Cefotaxime	16	1
Gentamicin	15	2

Klesbsiella was 100% sensitive to ceftazidime, imipenem, tigecycline, levofloxacin, aztreonam. It was mostly resistant to cefuroxime, fluoroquinolone.

DISCUSSION

Any organism can infect the ear if the defence barrier mechanism are breached. It is reported to occur in developing countries due to overcrowding, poor sanitation and poor education.⁵

Present study was carried out in 115 patients. It was intended to cover all the aspects related to ear discharge and microorganism involved in its sensitivity pattern amongst bacteria.⁶ In present study positive growth was found in 80.86% which was similar to the study conducted by Ariyal et al⁷ (82.6%). Incidence of ear discharge as more common in females which was also similar to the above mentioned study. In this study 80.86% samples were positive for the microorganism growth and 19.13% samples were sterile. Total bacterial isolates were 90.32% and total fungal isolates were 30.34%. These results were comparable to the study conducted by Oni AA et al.⁸

Table 4: Comparison of the study.

Observation	Present study	Nageshwari et al ⁹	Arti Agrawal et al ¹⁰
Culture positive cases	80.86%	80.86%	90.4%
Sterile	19.13%	19.33%	9.6%
Common age group	21-30 years	0-30 years	0-20yr
Total bacterial isolates recovered	91.32%	76.39%	97.34%
Total fungal isolates	34.40%	23.60%	2.65%
Most common bacterial isolates	<i>Pseudomonas aeruginosa</i> (45.23%)	<i>Staphylococcus aureus</i> (42.23%)	<i>Staphylococcus aureus</i> (37.6%)
Commonest fungus	<i>Candida albicans</i> (25%)	<i>Aspergillus niger</i> (17.35%)	<i>Candida sp.</i> (1.6%)

CONCLUSION

Otitis media found to be more prevalent during high humidity environment and one of the commonest cause of hearing impairment. Most common complaint of patient having ear discharge were earache, tinnitus and decrease hearing.

In conclusion, overall bacterial isolates were higher than fungal and pseudomonas appeared to be most common. It was found sensitive to ceftazidime, amikacin, imipenem, colistin and aztreonam. Antibiotics and antifungal should only be used after culture sensitivity tests.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kenna M. Etiology and pathogenesis of chronic suppurative otitis media. Arch Otolaryngol Head Neck Surg. 1998;97(2):16-7.
2. Poorey VK, Iyer Arti. Study of bacterial flora in CSOM and its clinical significance. Indian Journal of Otolaryngology and Head and neck surgery. 2002;54:91-5.
3. Blue stone CD, Klein JO. Microbiology. In otitis media in infants and children. 3rd edition. Philadelphia : PAWB . Saunders; 2001:79-1014.
4. Noh KT, Kim CS. The changing pattern of otitis media in Korea. Int J Pediatric Otorhinolaryngology. 1985;9:77-87.
5. Mackie, McCartney. Practical Medical Microbiology- 14th edition, Elsevier publication, India 2008.

6. Arjyal C, Adhikari S, Shrestha J. Bacteriological study of ear discharge in BIR hospital, Journal of Nepal medical association. 2002;41:318-22.
7. Abera B, Kibret M. Bacteriology and Antimicrobial susceptibility of otitis media at Dessie Regional Health Research Laboratory. Ethiopia, *Ethiopian J Health Dev.* 2011;25(2);161-7.
8. Oni AA, Nwaorgu OGB, Bakare RA, Ogunkunle MO, Toki RA. Discharging ears in adult and causative agents and anti-microbial sensitivity pattern” *African J clinical and experimental microbiology.* 2002,3(1):3-5.
9. Nageshwari R, Pallavi S, Savita VJ, Mukesh S. Microbial profile of otorrhea in patients attending OPD in a tertiary care hospital. *JPBMS.* 2012;20(17):1-3.
10. Arti A. Microbial profile of otorrhea in patients attending OPD in a tertiary care hospital. 2014.

Cite this article as: Vaghela MM, Doshi H, Rajput S. An analysis of ear discharge and antimicrobial sensitivity used in its treatment. *Int J Res Med Sci* 2016;4:2656-60.