MICROBIOLOGICAL EVALUATION OF ACTIVE CHRONIC OTITIS MEDIA AT BASE HOSPITAL SRIKOT, UTTARAKHANDRavindra Singh Bisht¹, Vikas Sikarwar², Sekhar Pal³, Charul Jakhwal⁴**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: AIMS: The purpose of the study was to determine the prevalence of microbiological agents in active COM, in Garhwal hill region and establish antimicrobial susceptibility pattern of these micro- organisms. **MATERIAL AND METHODS:** The study was conducted in Outpatient Department of Otorhinolaryngology of Base Hospital Srikot, Uttarakhand. **STATISTICAL ANALYSIS:** SPSS version-17 was used. **OBSERVATIONS & RESULTS:** The age of patient ranged between age 18 and 80years. Out of 150 cases 54.66% were females and 45.33% males. Peak age of presentation was 18-30 years. Bacteriological and mycological study showed mixed infections. Bacterial isolates were found to be present in 153 cases, out of which aerobic constituted 74.50%, rest were anaerobic (25.49%). Fungus was isolated in 22.72% of cases with bacterial overlapping. Staphylococcus aureus was the commonest aerobic bacteria. Commonest anaerobes Peptostreptococcus and among fungus Candida was found with highest frequency. Staphylococcus aureus showed highest sensitivity to Cephalosporins and least sensitivity to penicillin. Pseudomonas aeruginosa showed highest sensitivity to ciprofloxacin and least sensitivity to erythromycin and penicillin. E. coli showed highest sensitivity to amikacin and cefotaxime. **CONCLUSION:** Younger age group is most commonly affected, implying that early detection and prompt treatment during early stages can prevent major complications. Staphylococcus aureus was the commonest bacteria followed by Pseudomonas aeruginosa. The bacterial growth had a mixed infection pattern and single antibiotic therapy was not sufficient for the proper control of infection. A combination of two or more antibiotics covering both gram positive and gram negative bacteria will have better result than a single antibiotic.

KEYWORDS: Active Chronic Otitis, Acute Suppurative Otitis Media, Ear discharge, bacteriological.

INTRODUCTION: Chronic otitis media (COM), is a permanent perforation of the pars tensa or flaccida resulting from earlier acute otitis media, negative middle ear pressure, or otitis media with effusion. Types of COM:¹

- a) Inactive mucosal COM or dry central perforation.
- b) Active mucosal COM or central perforation with otorrhea.
- c) Inactive squamous epithelial COM (retraction, atelectasis and epidermal involvement).
- d) Active squamous epithelial COM (cholesteatoma).

The overall prevalence of active and inactive COM is reported to be about 4.1%. There is no gender difference in prevalence of COM. It is found to be highest amongst 41-80 years age group.² Higher prevalence is generally seen in lower socioeconomic strata.³ It is more common in economically developing countries.⁴ If left untreated or inadequately healed, it can lead to many complications including conductive and sensorineural hearing loss.⁵

Microbiology of the mucopus removed from the ears with active COM is rarely sterile. Microbiological cultures frequently yield multiple organisms and these vary depending on climate,

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patient population and on the usage of antimicrobials. There is a debate whether the presence of cholesteatoma influences microbiological findings. The bacteria are frequently found in the skin of the external canal, but may proliferate in the presence of trauma, inflammation, lacerations or high humidity.⁶ These bacteria may then gain entry to the middle ear through perforated tympanic membrane.⁷

Depending upon whether the disease process is affecting the pars tensa or the pars flaccida of the tympanic membrane, the disease can be classified into two types: tubotympanic and atticoantral.⁸ Tubotympanic type is associated with central perforation and mucoid or mucopurulent ear discharge and the atticoantral type is associated with attic perforations and foul smelling scanty ear discharge.⁹

The wide spread use of antibiotics has led to the emergence of multiple resistant strains of bacteria which can produce severe, difficult to treat infections. Poor follow-up of patients added upon the indiscriminate, haphazard and half-hearted use of antibiotics have resulted in the emergence of resistant strains.⁸ Thus, proper knowledge regarding the microbial flora involved and their antibiotic susceptibility pattern will be a major lead in combating the disease.

OBJECTIVES:

PRIMARY:

- ☐☐ To determine the prevalence of microbiological agents isolated from the active COM cases, in this region.

SECONDARY:

- ☐ To know antimicrobial susceptibility pattern of these micro- organisms.
- ☐ To know distribution of microbial agents associated with different types of COM.

MATERIAL AND METHODS:

Study Type: Cross sectional observational study.

Sample Size: 150

Study Duration: 2 months (May and June 2012).

Study Population: Individuals attending the Outpatient Department of Otorhinolaryngology of Base Hospital Srikot, Uttarakhand, with ear discharge for more than six weeks.

Inclusion Criteria:

- 1) Men and women having both unilateral/bilateral ear discharge for more than six weeks.
- 2) Age group – 18-80years.

Exclusion Criteria:

- 1) Patients with Acute Suppurative Otitis Media (ASOM)
- 2) Patients with complications of ASOM.
- 3) Patients on systemic antimicrobials or on topical antimicrobials for any ear complaint during the time of examination.

This is a hospital based study carried out between May and June 2012 at the Base Hospital Srikot, Uttarakhand, India. 150 individuals with unilateral or bilateral ear discharge for more than six weeks were enrolled in the study. A thorough history, including duration of discharge, type of

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discharge, drug history, other illnesses and complications was taken followed by a detailed ear examination.

Clinical significance was determined based on the presence of other supportive evidences like infection for more than 3 months and the presence of tympanic membrane perforation.

INFORMED CONSENT: All the details including the nature and purpose of the study was explained to the patients in detail. Individuals who voluntarily and knowingly gave written consent on a pre-designed consent form were enrolled.

Statistical Analysis: Was done using Statistical Package for Social Sciences (SPSS) version-17.

OBSERVATIONS & RESULTS: A total of 150 patients with history of ear discharge were included in the study. These were between age 18 and 80years. Culture and sensitivity was done for the ear swabs collected from the active discharging ears in the Outpatient Department of Otorhinolaryngology. There were total 82 females (54.66%) and 68 males (45.33%) with a ratio of 1.20:1. The peak age of presentation was 18- 30 years (48.66%).

Table 1: Age and sex wise distribution of cases: The results of the mycological and the bacteriological study showed the presence of mixed infections of both aerobic and anaerobic bacteria with fungal infections. Bacterial isolates were found to be present in 153 cases, out of which aerobic isolates account to 114 cases (74.50%), the rest being anaerobic bacteria (39 cases) (25.49%). Fungus was isolated in 45 cases (22.72% of all isolates) overlapping with bacterial isolates.

Age groups	males	females	Total
18-30	32(47.05)	41(50)	73
31-45	24(35.29)	27(32.92)	51
46-60	8(11.76)	9(10.97)	17
>60	4(5.88)	5(6.09)	9
Total	68	82	150

Table 1: Age and sex wise distribution of cases

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Table 2: Distribution of bacterial pathogens (aerobic) in Chronic Otitis Media: Bacteriological examination showed *Staphylococcus aureus* with highest frequency (in 60 cases) followed by *Pseudomonas* (28 cases), *Escherichia coli* (*E. coli*) and the rest others, as shown in table 2 and depicted in figure 1.

sl. No.	Aerobic isolates	Number (total=114)	%
1	<i>Staphylococcus aureus</i>	60	52.63%
2	<i>Pseudomonas</i>	28	24.56%
3	<i>Escherichia coli</i>	6	5.26%
4	<i>Streptococcus</i>	3	2.63%
5	<i>Citrobacter koseri</i>	3	2.63%
6	<i>Morgenella</i>	3	2.63%
7	<i>Klebsiella pneumonia</i>	3	2.63%
8	<i>Pneumococcus</i>	3	2.63%
9	<i>Enterobacter</i>	2	1.75%
10	<i>Acinetobacter</i>	2	1.75%
11	<i>Proteus sp.</i>	1	0.87%

Table 2: Distribution of bacterial pathogens (aerobic) in Chronic Otitis Media

Figure 1: Distribution of aerobic pathogens

Table 3: Distribution of bacterial pathogens (anaerobic) Chronic Otitis Media: Anaerobes were isolated in only 39 cases amongst which *Peptostreptococcus* was commonest (11 cases) (28.20%) followed by *Clostridium* (25.64%), *Streptococcus* (23.07%), *Provetella* (20.51%), *Peptococcus* (2.56%). (table 3, figure 2)

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Sl. No.	Anaerobic isolates	Number (total=39)	%
1	Peptostreptococcus	11	28.20%
2	Clostridium	10	25.64%
3	Streptococcus	9	23.07%
4	Provetella	8	20.51%
5	Peptococcus	1	2.56%

Table 3: Distribution of bacterial pathogens (anaerobic) Chronic Otitis Media

Figure 2: Distribution of anaerobic pathogens

Table 4: Distribution of fungal pathogens in Chronic Otitis Media: Fungus was isolated in 45 cases amongst which Candida was found in highest frequency (30 cases) accounting to 66.66% followed by Aspergillus and Saprobie fungi. (table-4)

sl. No.	Fungal isolates	Number (total=45)	%
1	Candida	30	66.66%
2	Aspergillus	9	20.00%
3	Saprobie fungi	6	13.33%

Table 4: Distribution of fungal pathogens in Chronic Otitis Media

Table 5: Antibiotic susceptibility pattern of bacterial pathogens of Chronic Otitis Media: Staphylococcus aureus showed highest sensitivity to Cephalosporins (96.00%), followed by amikacin (95.00%), and showed least sensitivity to penicillin (23.33%). Pseudomonas aeruginosa showed highest sensitivity to ciprofloxacin (92.85%), followed by gentamycin (85.71%), and showed least sensitivity to erythromycin and penicillin (0.00%) E.coli showed highest sensitivity to amikacin and

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cefotaxime (83.33%), followed by equal sensitivity to cephalosporins, gentamycin and ciprofloxacin (66.66%). The anaerobic isolates include Peptostreptococcus, Clostridium, Streptococcus, Provetella, Peptococcus. All of them were invariably sensitive to metronidazole.

SL. No.	Bacteria	Amp	Amoxi-clav	Amik	Cefotax	Cefaz	Erythro	Genta	Cipro	Pen
1	Staph no=60	43(71.60%)	50(83.33%)	57(95.00%)	58(96.66%)	58(96.66%)	49(81.66%)	49(81.66%)	54(90.00%)	14(23.33%)
2	Pseudomonas no=28	21(75.00%)	17(60.71%)	21(75.00%)	21(75.00%)	21(75.00%)	0(00.00%)	24(85.71%)	26(92.85%)	0(00.00%)
3	E.coli no=6	0(00.00%)	2(33.33%)	5(83.33%)	5(83.33%)	3(50.00%)	0(00.00%)	4(66.66%)	4(66.66%)	0(00.00%)
4	Strepto no=3	2(66.66%)	3(100.00%)	1(33.33%)	1(33.33%)	2(66.66%)	3(100.00%)	1(33.33%)	3(100.00%)	0(00.00%)
5	Citrobacter koseri no=3	1(33.33%)	0(00.00%)	3(100.00%)	2(66.66%)	2(66.66%)	0(00.00%)	3(100.00%)	3(100.00%)	0(00.00%)
6	Morgenella no=3	1(33.33%)	1(33.33%)	3(100.00%)	3(100.00%)	3(100.00%)	0(00.00%)	3(100.00%)	3(100.00%)	0(00.00%)
7	Klebsiella pneumonia no=3	2(66.66%)	2(66.66%)	3(100.00%)	3(100.00%)	2(66.66%)	0(00.00%)	3(100.00%)	3(100.00%)	0(00.00%)
8	Pneumo no=3	2(66.66%)	3(100.00%)	1(33.33%)	1(33.33%)	3(100.00%)	3(100.00%)	1(33.33%)	3(100.00%)	0(00.00%)
9	Entero no=2	0(00.00%)	0(00.00%)	2(100.00%)	2(100.00%)	2(100.00%)	0(00.00%)	2(100.00%)	2(100.00%)	0(00.00%)
10	Acineto no=2	0(00.00%)	0(00.00%)	2(100.00%)	2(100.00%)	1(50.00%)	0(00.00%)	2(100.00%)	1(50.00%)	0(00.00%)
11	Proteus sp no=1.	1(100.00%)	1(100.00%)	1(100.00%)	1(100.00%)	1(100.00%)	0(00.00%)	1(100.00%)	1(100.00%)	0(00.00%)

Table 5: Antibiotic susceptibility pattern of bacterial pathogens of Chronic Otitis Media

(Amp- Ampillicin; Amoxi-clav- Amoxicillin-clavulanic acid; Amik- Amikacin; Cefotax- Cefotaxime; Cefaz- Cefazolin; Erythro- Erythromycin; Genta- Gentamycin; Cipro- Ciprofloxacin; Pen-Penicillin; Staph- Staphylococcus aureus; Ps- Pseudomonas; Strepto- Streptococcus; Entero- Enterobacter; Acenito- Acenitobacter)

DISCUSSION: Discharging ear is a common problem faced not only by the ENT surgeon but also by the general practitioner. The disease has irreversible complications and thus an early bacteriological diagnosis and prompt treatment with proper antibiotic coverage is essential in combating the disease.⁸ This study is intended to define the infecting micro-organisms responsible for the disease and to study their antibiotic sensitivity pattern.

The methodology used for testing the antibiotic sensitivity of the isolates was strictly based on the CLSI guidelines. The patients who were on antibiotic treatments were excluded from the study through a thorough and detailed history, so that the isolates procured give the picture of causative organisms of COM. The CLSI guidelines were also used in the study of A.O. Okesola, O.A. Fasina⁶ but antibiotic treatment had not been considered as an exclusion criteria in their study. Maximum numbers of cases were seen in the age group 18-30 years, perhaps because upper respiratory tract infection is more common in younger population, which in turn causes ear infection.

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The finding is comparable to the study of Shazia Parveen. S, Janardhan Rao R¹⁰ and V. K. Poorey and Arati Iyer,⁸ showing younger patients presenting more with the disease. Females dominated the number in this study, comparable to the study conducted in Nepal by Shrestha BL et al,¹⁴ but contradictory findings were seen in the study of V. K. Poorey and Arati Iyer⁸ and Harvinder Kumar, Sonia Seth¹¹ in which males' outnumbered females. The study was conducted on 150 cases from which 198 bacterial and fungal isolates were procured. The bacterial (aerobic and anaerobic) isolates were 153 in total and fungal isolates were 45.

Aerobes constituted 114 (57.57%) of total isolates. Anaerobes present in 39 isolates (19.69%) and fungus in 45 isolates (22.72%). In our study the most common bacteria causing COM is found to be *Staphylococcus aureus* (52.63%). The finding is supported by the study of Shrestha BL et al,¹⁴ while most of the studies show *Pseudomonas aeruginosa* as the most common etiological agent.^{8,7,11}

These micro-organisms lead to infection of the middle ear and pus discharge. The antibiotic sensitivity pattern of *Staphylococcus aureus* in this study revealed maximum sensitivity to cephalosporins (96.00%), followed by amikacin (95.00%), while the studies conducted by Shazia Parveen. S and Janardhan Rao R¹⁰ and Harvinder Kumar, Sonia Seth¹¹ showed amikacin to be the most sensitive antibiotic. Minimum sensitivity against *Staphylococcus aureus* is shown by penicillin, because beta-lactamase enzyme secreted by *Staphylococcus* bacteria. Ciprofloxacin [92.85%] was found to be the most sensitive antibiotic from the antimicrobial profile for *Pseudomonas* which is also comparable with the study by A.O. Okesola & O.A. Fasina⁶ while the study of Mansoor T et al⁷ showed amikacin as the most sensitive antibiotic for *Pseudomonas*. *E. coli* showed maximum sensitivity to amikacin [83.33%] comparable to the study of Shazia Parveen. S and Janardhan Rao R.¹⁰

Amongst the anaerobes isolated the most common organism found is *Peptostreptococcus* (28.20%) followed by *Clostridium* (25.64%), *Streptococcus* (23.07%), *Prevotella* (20.51%), *Peptococcus* (2.56%), while the most frequently isolated anaerobic organisms in the study conducted by Monique Verhoeff et al was *Bacteroides* sp. (1—91%).¹⁵

Our study showed all of the anaerobes sensitive to metronidazole. Fungus was isolated from 22.72% of all isolates out of which *Candida* was found in highest frequency (66.66%), followed by *Aspergillus* Sp. (20.00%), in agreement with the study of Harvinder Kumar, Sonia Seth¹⁰ which showed *Candida* (60%) to be the most common fungal agent followed by *Aspergillus* (40%), whereas disagreeing were the results of the study conducted by Khanna V et al showed *Aspergillus flavus* to be the most common fungal agent causing COM.¹¹ In view of the polymicrobial aetiology of COM, prompt appropriate antimicrobial therapy can effectively reverse the disease process and prevent the long term sequelae.

As 33 cases (22%) presented with common presentation of both tubotympanic and atticotympanic types of COM, the objective of finding out the distribution of microbial agents associated with different types of COM was not met. Out of these 23 cases presented with a marginal perforation in tympanic membrane with profuse mucoid discharge and 10 cases presented with a central perforation but with scanty purulent discharge. Thus, the delineation of these cases as a single type was not possible clinically and so this objective was dropped.

The major limitation in the study was the time allotted. Study could have been extended to include two seasons of summers (dry) and monsoon (warm and humid) and how the bacterial

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composition changed according to them could have been studied. Moreover, the study could have included more number of subjects and the microbial agents causing complication of COM could also have been studied.

CONCLUSION: The study suggests COM to be a disease of younger age group being most common in 18-30 years, implying that early detection and prompt treatment during early stages can prevent major complications of the disease. The study also suggests that the most common etiological agent for Chronic Otitis Media was *Staphylococcus aureus* (52.63%) followed by *Pseudomonas aeruginosa* (24.56%). The bacterial growth pattern showed that most of the specimens were combination of different types of bacteria. The study also suggested that single antibiotic therapy was not sufficient for the proper control of infecting organisms. Here we concluded that a group of two antibiotics covering both gram positive and gram negative bacteria will have better result than a single antibiotic.

The result of isolate culture point towards a polymicrobial aetiology thus appropriate antimicrobial therapy can effectively reverse the disease process and prevent the long term sequelae.

SUMMARY: Chronic otitis media (COM) is one of the commonest illnesses in ENT practice which requires medical attention, more in children of poor socio-economic status and having in past inadequate treatment and negligent medical care. The present study was a cross sectional observational study conducted over a period of 2 months, involving 150 individuals complaining of unilateral or bilateral ear discharge for more than six weeks at the Outpatient Department of Otorhinolaryngology of Base Hospital Srikot, Uttarakhand.

The study aimed at finding the prevalence of isolates and their antimicrobial susceptibility pattern in active COM, in the general population of this region. After procuring a written consent on a pre-designed consent form a thorough history was taken followed by a detailed ear examination. The samples were collected in form of ear swabs, three from each patient. These were then tested for their culture and antibiotic sensitivity pattern.

The presence of mixed infections of both aerobic and anaerobic bacteria with fungal infections was seen. Aerobes constituted 114(57.57%) of total isolates while anaerobes were present in 39 isolates (19.69%) and fungus in 45 isolates (22.72%). The most common bacteria causing COM was found to be *Staphylococcus aureus* which showed highest sensitivity to Cephalosporins (96.00%) followed by amikacin(95.00%).

Peptostreptococcus (28.20%) was the most common organism found amongst the anaerobes and *Candida* was the fungi found in highest frequency (66.66%). In view of the polymicrobial etiology of COM, prompt appropriate antimicrobial therapy can effectively reverse the disease process and prevent the long term sequelae.

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