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Bacteriological profile And Their Antimicrobial Susceptibility Patterns In Cases Of Chronic Suppurative Otitis Media In A Tertiary Care Hospital In Uttarakhand

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Abstract
Introduction: *Chronic suppurative otitis media (CSOM) is one of the most commonly encountered diseases in otorhinolaryngology practice.*
Material and method: *A total of 70 samples from 64 clinically diagnosed cases of CSOM were included in the study. The bacterial identification and antibiotic sensitivity of the isolates was carried out by automated method.*
Result: *Out of 70 samples 50% (35/70) showed positive bacterial culture. Among 64 patients, 53.12% (34/64) were males and 46.87% (30/64) were females. The commonest bacteria isolated was Pseudomonas aeruginosa45.71% (16/35) followed by Staphylococcus aureus33.42% (11/35), Proteus mirabilis 14.28% (5/35), Enterobacter cloacae 5.71% (2/35) and Sphingomonaspaucimobilis2.8% (1/35). All Pseudomonas isolates obtained in this study were found to be 100% resistant toamoxicillin/clavulanate, cotrimoxazole, and cefixime and 100% sensitive to meropenem and tigecycline.*
Conclusion: *An appropriate knowledge of antibacterial susceptibility of microorganisms would contribute to a rational antibiotic use and the success of treatment for chronic supportive otitis media.*
Keywords: *Antibiotics, CSOM, Bacterial infection*

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I. Introduction

Chronic Suppurative Otitis Media (CSOM) is defined as persistent disease of middle ear, which is capable of causing severe destruction sequel with the manifestation of deafness, discharge and a permanent perforation (1). The duration of the symptoms to define the disease varies according to various otolaryngologists (2). But according to World Health Organization (WHO) only two weeks of duration is required to define CSOM (3).

CSOM usually develops in the first decade of life but can persist during adulthood. Prevalence of CSOM is more in the developing and underdeveloped countries. According to WHO, the prevalence of CSOM in India is more than 4% and it falls among those countries where urgent attention is needed (3). The incidence of CSOM is increasing in the developing countries because of low socio-economic status, poor nutrition, poor hygienic practices and lack of health education(4)(5). Other risk factors involved in pathogenesis of CSOM are recurrent upper respiratory infections, breast-feeding while lying down, craniofacial malformation and Eustachian tube defect (6).

In CSOM, bacteria can reach the middle ear either from the nasopharynx through the Eustachian tube or from the external ear canal through a non-intact tympanic membrane. The aerobic microorganisms most frequently isolated in CSOM are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus species*, *Klebsiella species*, *Escherichia species*, *Haemophilusinfluenzae*, and *Moraxella catarrhalis*(7) (8). The most frequently isolated anaerobic organisms from CSOM are *Bacteroides species, Peptostreptococcus species* and *Fusobacterium species (*9).

In view of the above background the present study was conducted to access the incidence of aerobic bacterial profile in cases of chronic suppurative otitis media in a tertiary care hospital setting with an objective to identify the bacterialisolates and the antimicrobial sensitivity profile of bacteria responsible for CSOM.

II. Material And Methods

The present study was conducted in the Department of Microbiology and Immunology, Shri Guru Ram Rai Institute of Medical and Health Sciences (SGRRIM&HS) and Microbiology division of Central Laboratory of ShriMahantIndiresh Hospital (SMIH) in collaboration with E.N.T department of ShriMahantIndiresh Hospital, Dehradun for a period of one year from October 2014 to October 2015. A total of 70 samples from 64 clinically diagnosed cases of CSOM of all age groups and both sexes attending outpatient department of ENT as well as those admitted in ENT ward of ShriMahantIndiresh Hospital were included in this study.

Inclusion criteria: Patients who were diagnosed as suffering from CSOM after thorough clinical evaluation by an ENT surgeon, patients of all age groups and both sexes, patients who were not on antibiotic both systemically and topically for minimum of 24 hours prior to sample collection were included in this study.

Exclusion criteria: Patients who were suffering from CSOM and were on systemic antibiotics or who were on topical medication to the ear were excluded from this study.

An informed consent was taken from the patient or from the guardian (in case of minor) in the prescribed format. At the time of sample collection all demographic details and relevant clinical data was collected in the specially designed Case Recording Form for each patient.

Method: The external ear was wiped with sterile cotton and then with 70% alcohol and allowed to dry. With the aid of head mirror and lamp as a source of light, sterile ear speculum was introduced into the ear and taking aseptic precautions, the ear discharge was collected using sterile cotton swabs in duplicate prior to instillation of any topical medication.One swab was used for microscopy for Gram staining following standard protocol (10).

The second swab was then inoculated on Blood agar (BA), MacConkey agar (MA) and finally in Brain heart infusion (BHI) broth. Blood agar and MacConkey agar plates were then incubated at 37°C for 16 -18 hours. In case of no growth, plates were re-incubated for 48 hours and subculture was done from BHI broth on BA and MA at 37°C. If growth was observed preliminary tests like colony characteristics, Gram stain, catalase, oxidase, coagulase and motility test were carried out as per standard procedures (11).Final identification of the pathogen and their antimicrobial susceptibility testing was done by automated method (Vitek2 Compact system of bioMèrieux).

The results thus obtained were analyzed using Chisquare test for their statistical significance.

III. Results

In this study males were found to be affected more than females with CSOM i.e, out of the 64 patients studied, 53.12% (34/64) were males and 46.87% (30/64) were females. Statistical analysis revealed that the male preponderance was not significant (p=0.733). Out of 64 patients of CSOM included in this study, 50% (32/64) were from age group 0-10 years followed by 20.31% (13/64) in age group 11-20 years (Table 1). This observation when analyzed was found to be statistically significant (p=0.06).

A total of 70 samples from 64 cases were studied of which 50% (35/70) were positive and 50% (35/70) were negative for aerobic bacterial culture74.28% (26/35) of culture positive cases belonged to low socioeconomic status (Table 2). With p value of 0.00032 this observation was found to be statistically highly significant.

With 45.71% (16/35) *Pseudomonas aeruginosa*was found to be the predominant isolate followed by *Staphylococcus auerus*31.42% (11/35), *Proteus mirabilis* 14.28% (5/35), *Enterobacter cloacae* 5.71% (2/35) and *Sphingomonaspaucimobilis*2.80% (1/35) (Figure 1).

All the 11 isolates of *Staphylococcus auerus* were sensitive to oxacillin, ceftriaxone and linezolid while 81.81% (9/11) were sensitive to amoxicillin/clavulanic acid, teicoplanin, vancomycin, tetracycline and gentamicin. Sensitivity of isolates for amikacin, azithromycin & ciprofloxacin was 54.54% (6/11), 54.54% (6/11) and 45.45% (5/11) respectively. All the isolates studied were found to be resistant to ampicillin (Figure 2).

The antibiotic susceptibility pattern of Gram negative bacterial isolates from CSOM showed 100% sensitivity towards tigecycline&meropenem. While sensitivity to cefepime/sulbactam, cefuroxime, ceftazidime, gentamicin, colistin, cefepime, ciprofloxacin and cotrimoxazole were 83.33% (20/24), 79.16% (19/24), 62.5% (15/24), 58.33% (14/24), 50% (12/24), 45.83% (11/24), 41.66% (10/24) and 20.83% (5/24) respectively. All the isolates studied were found to be resistant to amoxicillin-clavulanic acid (Figure 3).

In the present study an attempt was made to analyse the type of phenotypic resistance of the isolates. Among the *Staphylococcus aureus* strains isolated from cases of CSOM, 27.27% (3/11) were phenotypically found to express macrolide-lincosamide-streptogramin B (MLSB) resistance, only 18.18% (2/11)isolates were found to express both vancomycin resistance i.e., VRSA and MLSB resistance phenotypically.

Of the *Pseudomonas aeruginosa* isolates 50% (8/16) expressed polypeptide resistance, 18.75% (3/16) isolates expressed high level R+R carbapenems (Imper) phenotype, while in 31.26% (5/16) isolates no phenotypic resistance was detected. All *Proteus mirabilis* isolates expressed ESBL (CTX-M like) phenotype. Both the strains of *Enterobacter cloacae* isolates expressed ESBL (CTX-M like) phenotype while, *Sphingomonaspaucimobilis* isolate did not express any resistance phenotypically.

Table 1: Age wise distribution of the cases (N=64)

Age group	Number of cases
0-10 years	32(50)
11-20 years	13(20.31)
21- 30 years	5(7.81)
31-40 years	8(12.5)
41-50 years	3(4.68)
51-60 years	1(1.56)
61-70 years	1(1.56)
71-80 years	1(1.56)
Total	**64(100)**

Figure in parentheses indicates percentage
X2 = 4.54 p = 0.06 significant

Table 2: Distribution of the cases according to their socio economic status (N=64)

Socio economic status	Culture positive	Culture negative	Number of cases
Low	26(78.78)	18(58.06)	44(68.75)
Middle	6(18.18)	9(29.03)	18(28.12)
High	1(3.03)	1(3.22)	2(3.12)
Total	**33(100)**	**31(100)**	**64(100)**

Figure in parentheses indicates percentage
X2=12.90 p=0.00032 highly significant

Figure1: Distribution of bacterial isolates studied in cases of CSOM (N=35)

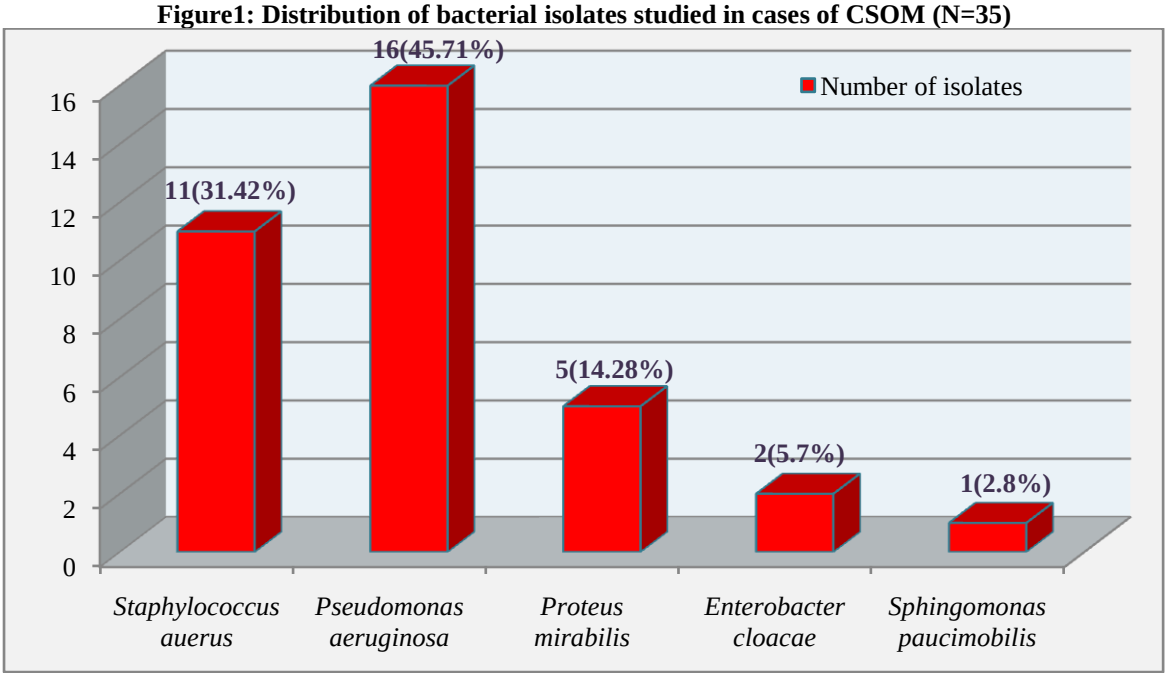


Figure 2:Antibiotic susceptibility pattern of *Staphylococcus aureus*(N=11)

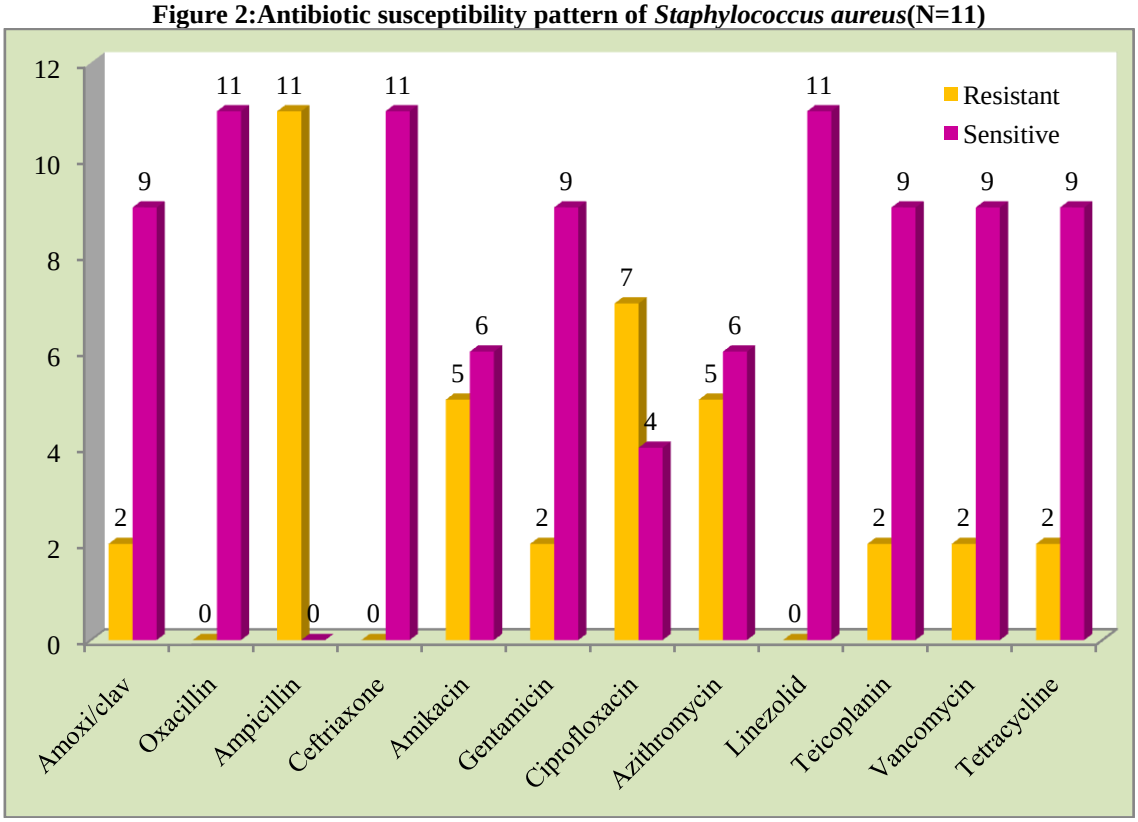
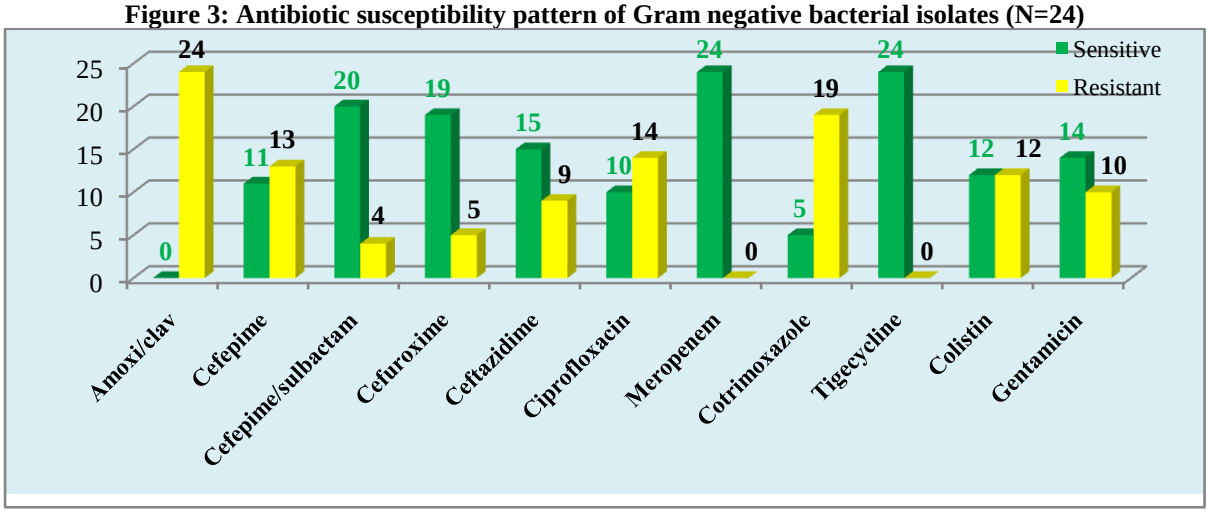


Figure 3: Antibiotic susceptibility pattern of Gram negative bacterial isolates (N=24)



IV. Discussion

Chronic Suppurative Otitis Media is a major health problem and occurs with a high incidence and prevalence in both developed and developing countries. In India, due to temperate climate with heavy monsoons, CSOM is a major complaint encountered in ENT clinics. In the present study an attempt was made to know thebacteriological profile of CSOM along with their antimicrobial susceptibility patterns from the cases of CSOM in the population attending our hospital.

In present study, males with 53.12% (34/64) were more affected than females 46.87% (30/64), this is in accordance with the other studies Kumar.S.A.Jagdish et al and ArunGhosh et (12) (13).The higher incidence in males was probably due to the fact that males are more involved in outdoor activities making them more prone to develop infection and exposed to moisture.

Dominance of CSOM in the age group of 0-10 years i.e., 50% (32/64) of the cases followed by 20.31% (13/64) cases falling in age group of 11-20 years has also been observed by several workers(14)(15)(16). With p value < 0.001 these observations were found to be statistically significant. The greater susceptibility of young

children to CSOM may be due to short and horizontal course of Eustachian tube and increased frequency of respiratory infections causing AOM due to reduced physiological and immunological defense pathogens.

It was observed that he incidence of CSOM was highestamong individuals belonging to low socioeconomic status with 68.75% (44/64). These observations when analysed statistically were found to be highly significant with a p value 0.00032. Such observations have also been reported from most national and international studies on CSOM (17)(18)(19).Poverty, overcrowding, lack of education, poor hygiene, malnutrition and lack of medical facilities have been suggested as a basis for the widespread prevalence of CSOM in people with low socioeconomic status.

This study showed *Pseudomonas aeruginosa* with 45.71% (16/35) as the commonest bacteria isolated followed by *Staphylococcosaureus* with 31.42 % (11/35) from the cases of CSOM. Studies carried out in the past under similar conditions have also reported *Pseudomonas* and *Staphylococcus aureus* as the dominant pathogen in CSOM (20)(21)(22)(23)(24).

Antimicrobial susceptibility profile of*Staphylococcus aureus* was found to be similar to the observations reported by Orji F.T. et al (25) and Vishwanath S. et al (21). All the Gram negative bacilli were found to be completely sensitive to tigecycline&meropenem. While complete resistance was found against amoxicillin-clavulanic acid.Analysis of the phenotypic resistance of Gram negative bacilli reveals a low level of resistance probably due to the fact that most patients attended the out-patient clinic and were not exposed to highly resistant strains of hospital flora.

Since specimen were processed only for aerobic bacteria in this study therefore it is possible that this may not be a true reflection of polymicrobial etiologies of CSOM as the specimens were not processed for anaerobic pathogens and therefore incidence of anaerobes in CSOM cannot be commented upon.

When results of our study were compared with the findings of other researches, it was clear that bacterial profile and antibiotic susceptibility pattern of CSOM has been changing over a period of time. Geographical variation and difference in patient population studied could also be the possible factor for variability. Moreover in developing country like India, self–treatment, instillation of oil for temporary relief and seeking treatment from the quacks further lead to chronicity of the disease.

V. Conclusion

Chronic Suppurative Otitis Media has become a matter of public health importance in the present days in developing countries like India. It is well known disease of multiple etiologies and its recurrence and persistence.

Irregular, haphazard and indiscriminate use of antibiotics not only precipitates the emergence of multi-resistant bacteria but also suppress normal bacterial flora of ear leading to fungal infection. Therefore it is strongly recommended to use carefully selected local or systemic antibiotics guided by culture and sensitivity, along with the use of frequent ear toilet as an effective treatment modality. This will prevent development of drug resistance and administration of unwanted antibiotics and in return would prevent complications related to CSOM.

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