The investigation of bacteriology of chronic suppurative otitis media in patients attending a tertiary care hospital with special emphasis on seasonal variation

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Abstract:

Background Chronic suppurative otitis media takes a lot of time in the hospital outdoors and a considerable amount of O.T. timings. Chronic suppurative otitis media may be either active chronic otitis media or a sequel of previous otitis media.

Objective (a) To understand the bacteriology of Chronic suppurative otitis media (b) Their susceptibility patterns to commonly used antibiotics in this age of emerging resistance (c) the seasonal variation in the bacteriological pattern (d) For better empirical treatment of C.S.O.M where culture facilities are not available so that both intracranial and extra cranial complications can be avoided.

Materials and Methods The secretions of 160 samples belonging to various age groups and of both sexes of clinically proven chronic suppurative otitis media with definitive exclusion and inclusion criteria were collected and cultured by aerobic and anaerobic methods. Drug sensitivity was done according to standard laboratory protocols. A month wise visit of the patients has been recorded to note any seasonal variations in the isolates.

Results The most common aerobic organism is *Pseudomonas* Spp and most common anaerobes isolated being *Bacteriodes* species. Their susceptibility patterns and seasonal variations have been discussed.

Conclusions It is observed that chronic suppurative otitis media affects mainly younger group of population, mostly (86.8%) below 40 years of age. Majority of them (31.9%) belonged to, 10-19 years of age. The most common isolate being *Pseudomonas* Spp. (64.4%) followed by *Staphylococcus aureus* (33.8%). In the anaerobic group (1.8%) the *Bacteriodes* species is most prevalent. The most effective antibiotic in the aerobic isolates is Amikacin followed by Gentamicin and Cefotaxime where as for anaerobic isolates Cefoperazone sodium has better sensitivity. The isolation rates of both aerobic and anaerobic groups of organisms are more in the month of July to September, which is the monsoon season in this place. Isolation of *Pseudomonas* Spp. in Monsoon and post monsoon season may have been due to filling up of water bodies with rain water and infection with an omnipresent saprophytic organism like *Pseudomonas* Spp.

Keywords Chronic suppurative otitis media • Bacteriology • Aerobes • Anaerobes • Drug susceptibility tests • Monthly variation

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Introduction

Chronic suppurative otitis media is a chronic and long standing infection of the middle ear cleft being presented by aural discharge with variable degree of hearing loss. Some times the course of the disease is so much progressive that it may produce irreversible local destruction of middle ear cleft mucosa and underlying bone. This bony destruction may lead to serious extra and intra cranial complications.

In many cases of chronic suppurative otitis media the antibiotics are prescribed indiscriminately. The consequences are treatment failure, the emergence of resistant strain of organisms, super infection, intracranial and extra cranial complications, and lengthening the treatment costs and sufferings.

The Chronically discharging ears are still now a major health problem in developing country like ours. C.S.O.M has much attention not only because of its high incidence but also because of issues such as bacterial resistance and ototoxicity with both topical and systemic antibiotics.

C.S.O.M. has profound impact on society in terms of resources utilized in treatment (i.e. topical, oral and intravenous antibiotics, multiple office visits and surgery) as well as the direct impact that chronic infection has on hearing. In both children and adults, infections resulting from C.S.O.M. can cause chronic hearing loss which has a negative impact on the development of speech, language and social interaction as well as school or work place performance.

The situation is more critical in some of the rural areas because of lack of hygienic sense and bathing in the dirty tanks. This is more compounded because of the random belief of curative effect of antibiotic drops, sometimes given by lay people.

Previous studies on the microbiology of C.S.O.M. have revealed that the most frequently isolated bacteria were *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus* Spp. and *Klebsiella*¹ although some studies have shown that *S. aureus* was more common especially when cholesteatoma was present^{1,2}.

Regarding management of chronic suppurative otitis media both medical and surgical therapies have same goal that is to achieve a safe ear, eradicate disease, achieve a dry ear free of otorrhoea, avoidance of surgery, stabilize or improve hearing and to prevent future complications.

Keeping in view of the above the first line management of C.S.O.M. is topical antibiotic initiated empirically on the basis of known bacteriological profile⁸. This is more fruitful if it is culture directed.

A drop containing Neomycin/PolymyxinB/hydrocortisone otic suspension is most widely used antibiotic drops in United Kingdom but considering the recent trend of antibiotic resistance pattern this can hardly be suitable⁹.

Materials and Methods

The 160 patients attending the OtoRhinoLaryngology O.P.D of Burdwan Medical College with active discharge through ear, were referred to the Dept. of Microbiology from January 2005 to December 2005

Exclusion criteria Patients with the history of using antibiotic drops for the last ten days, HIV, cancer and diabetic patients were excluded from the study.

Inclusion criteria The patients with active aural discharge belonging to different age, sex, religion and different classes were included in the study.

Pus samples were collected from the discharging ears using an aural speculum with the use of sterile sticks. The samples were immediately cultured in Blood Agar, Macconkey's Media, and Robertsons Cooked Meat media. (Supplied from Himedia Laboratories Pvt. Limited Mumbai) for aerobic and anaerobic cultures. The culture plates were incubated at 37 degree centigrade for 24 to 48 hours. The isolates were identified according to N.C.C.L. standards. An Antibigram was done by disc diffusion technique of Kirby Bauer. The intermediate zone of susceptibility was not taken into consideration

Results

Microbiology of 160 samples has been studied in patients with chronic suppurative otitis media. A search was made for organisms, their susceptibility patterns to different antibiotics,

Demographic data Most of the patients with chronic suppurative otitis media belonged to younger age group between 10-19 years of age. (31.9%) Majority of the patients were below 40 years (86.8%) out of which 76.3% were below 30 years of age.

Sex ratio of the cases F: M was 1:1.3 and sex differential is not significant. ($p > 0.05$). 58 (36.3%) patients were the Muslims in the studied group against 102 (63.7%) the Hindus.

Table 1 Age Distribution of Patients

Age (Years)	No.	%Distribution
Below 10 years	39	24.4
10-19 years	51	31.9
20-29	32	20.0
30-39	17	10.6
40-49	8	5
50-59	13	8.1
Male 89	Female 71	

Organisms isolated Among 160 cases, 103 (64.3%) had *Pseudomonas* Spp. of infection while 53 (33.1%) cases had *Staphylococcus aureus* infection and only one cases had *E.Coli* infection (0.6%). 3 cases had *Bacteroides* species (1.8%)

Antimicrobial susceptibility test

The most effective antibiotic is Amikacin followed by Gentamicin and Cefotaxime in both isolates namely *Pseudomonas* Spp and *Staphylococcus aureus* The sensitivity rates for Amikacin, Gentamicin and Cefotaxime

are 100,86, 85.4 in *Pseudomonas* and 100,87.5,80.3 percent for *Staphylococcus aureus* respectively. Sensitivity rates for a commonly used antibiotic like Ciprofloxacin is 46.6% for *pseudomonas* and 64.3% for *Staphylococcus aureus* only.

Table 2 Percentage susceptibility patterns of isolates:

ANTIMICROBIALS	PSEUDOMONAS SPECIES	STAPHYLOCOCCUS AUREUS
AMPICILLIN	0%	7.1%
AMIKACIN	100%	100%
CLOXACILLIN	2.9 %	51.8%
CEFOTAXIME	85.4%	80.3%
CEPHALEXIN	2%	12.5%
CIPROFLOXACIN	46.6%	64.3%
CEFUROXIME	9.6 %	7.1%
CHLORAMPHENICAL	2%	7%
GATIFLOXACIN	47.6%	69.6%
GENTAMICIN	86.0%	87.5%
LEVOFLOXACIN	29.4%	41.1%
NORFLOXACIN	31.1%	41.1%
NETILMICIN	55.3%	57.1%
TOBRAMYCIN	43.7%	17.8%
O-FLOXACIN	2.9%	<1%

The most effective antibiotic is Amikacin followed by Gentamicin and Cefotaxime in both isolates namely *Pseudomonas* Spp and *Staphylococcus aureus*. The sensitivity rates for Amikacin, Gentamicin and Cefotaxime are 100,86, 85.4 in *Pseudomonas* and 100,87.5,80.3 percent

Table 3 Month wise distribution of isolates

Month	<i>Pseudomonas</i> SPP.	<i>Spathaureus</i>	<i>Bacteriodes</i>
January	3	6	2
February	6	5	0
March	8	1	0
April	7	1	0
May	7	6	0
June	4	2	0
July	13	2	0
August	19	12	0
September	22	4	0
October	3	8	0
November	5	2	1
December	6	4	0
All	103	53	3

for *Staphylococcus aureus* respectively. Sensitivity rates for a commonly used antibiotic like Ciprofloxacin is 46.6% for *pseudomonas* and 64.3% for *Staphylococcus aureus* only.

Fig. 1

Discussion

The major organisms isolated in acute otitis media are *H influenzae*, *Streptococcus pneumoniae*, and *Moraxella catarrhalis* and along with these organisms in addition *Staphylococcus aureus*, *E.coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and anaerobic bacteria can all be present in chronic otitis media¹¹.

The present study was done from 1st January 2005 to December 2005 in a tertiary care hospital in rural set up to look for the objectives.

160 samples of aural discharge taken from clinically proven chronic suppurative otitis media cases have been studied bacteriologically. The isolates were basically of two types belonging to either *Pseudomonas* species or *Staphylococcus aureus*. Only 3 (1.7%) cases had the anaerobes and one case belonged to *E.Coli* (0.6%). It was observed that the chronic suppurative otitis media is a disease of younger group. The patients belonged mostly to 10-40 age groups. No significant difference could be observed between males and females. So there is hardly any sex variation.

The commonest pathogen is *Pseudomonas* species consisting of 63.8% of cases followed by *Staphylococcus aureus* consisting of 33.8 % and anaerobes were present only in 1.7% samples.

Regarding their susceptibility pattern there is a great change from a previous situation as reported by Altuntas et al. Altuntas et al⁽²⁾ in 1996 reported that only 6.2% of *Pseudomonas*, 2.9% of *Proteus* isolates, 10% of *Staphylococcus aureus*, and 8.3% of *E.coli* were resistant to Ciprofloxacin where as in the present study the sensitivity

rates for Amikacin, Gentamicin and Cefotaxime are, 100,86,85.4 for *Pseudomonas* and 100,87.5,80.3% for *Staphylococcus* respectively. Sensitivity rates for Ciprofloxacin is 46.6% and 64.3% for the two important isolates *Pseudomonas* and *Staphylococcus aureus* respectively.

In the Aminoglycosides group of antibiotics Amikacin is the only antibiotic for which there is 100% susceptibility for both the important isolates. Where as Sensitivity rates for Gentamicin 86%, 87.5%, for Netilmicin 55.3% and 57.1%. for Tobramycin 43.7% and 17.8 % for the two important isolates *Pseudomonas* and *Staphylococcus aureus* respectively. The present study also points to the fact that there is wide spread resistance among *Pseudomonas* isolates against commonly used Aminoglycosides namely Gentamicin, Netilmicin, Tobramycin which is same as in literature. Fortunately the resistance against Amikacin has not developed in this part of country which is evident from our findings.

The most effective antibiotic is Amikacin for aerobes where as Cefoperazone sodium is effective to a certain degree in anaerobic population. One impediment in this connection is that Amikacin ototopical drops are not available.

The second groups of antibiotics are fluroquinolones like Ciprofloxacin, Gatifloxacin Levofloxacin and Norfloxacin of which ciprofloxacin sensitivity has reduced in recent past in comparison to previous findings² Ofloxacin has not been recommended to be given for children as recommended from F.D.A³.

The bacteriological profile is to some extent dependent on the seasonal variations. In Table 3, a month wise data have been arranged according to the number of isolations. This projects that there is considerable aggregation of case in the months of July to September.

52.4% cases of *Pseudomonas* cases and 44.6% of cases belonging to *Staphylococcus aureus* have occurred during monsoon and in post monsoon periods. This needs further study to delineate the relationship of humidity, temperature and effect of bacteriological load in the cases of chronic suppurative otitis media.

Pseudomonas according to their habitat is a saprophytic organism and it is often omnipresent including distilled water and antibiotics solution. The bacteriological load is more increased when there is sudden appearance of rain water in ponds and because of the habit of pond bathing still prevalent in this part of country there may be increment in the cases with chronic suppurative otitis media (Table 3).

Another aspect of this study is isolation of an opportunistic pathogen like *Pseudomonas* Spp. recurrently from different group of patients.

Pseudomonas infections are mostly seen in the places where there is either breach in the continuity of skin as in burn cases or where the normal flora is replaced by constant use of various types of topical antibiotics especially in the places where normal defenses are jeopardized⁴. This study points out to a very basic question regarding the random use of topical antibiotics often as OTC formulations and ushering in a more serious type of organism like *Pseudomonas* which can create both intra and extra cranial complications due to its toxins¹⁰ and tissue invasive properties.

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