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Original Research Article

Assessment of Microbiological Diversity in Patients Suffering from Chronic Suppurative Otitis Media (CSOM): An Observational Study

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Conflict of interest: Nil

Abstract

Aims: The aim of this study was to isolate the organisms associated with CSOM.

Materials and Methods: This community based, prospective study was conducted in a Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. A total of 100 patients clinically diagnosed of CSOM were enrolled in the study and the samples were obtained from each patient using sterile cotton swabs and cultured for microbial flora. Drug susceptibility testing for aerobic isolates was conducted using Kirby-Bauer disc diffusion method.

Results: The most common causative organisms isolated were MSSA (86%) and *Pseudomonas aeruginosa* (40%) from aerobic isolates. Anaerobes accounted for clostridium species (20%) and peptococcus species (19%). Fungi accounted for aspergillus and candida species.

Conclusion: Knowing the bacteriological profile of CSOM is essentially important for an efficient treatment, prevention of both complications and development of antibiotic resistance and finally, the reduction of the treatment costs.

Keywords: Bacteriological profile, CSOM, MSSA, Candida

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Introduction

Chronic suppurative otitis media (CSOM) is chronic inflammation of the middle ear and mastoid cavity, which may manifest as recurrent ear discharges or otorrhea via a tympanic hole. Due to starvation, overcrowding, poor hygiene, insufficient health care, and recurring upper respiratory tract infection, the incidence of this illness is greater in developing nations, particularly among low socioeconomic strata. [1] The urban-to-rural ratio of the illness is 1:1, with the greatest frequency in the poorest rural populations. [2,3]

Most of the time, CSOM is divided into two types: tubotympanic and attico-antral. This depends on whether the disease affects the tympanic membrane's pars

tensa or pars flaccida (TM). [2] Tubotympanic is called a safe or benign type because it doesn't cause serious problems. On the other hand, attico-antral is called a dangerous or unsafe type because it can cause serious problems that can sometimes be life-threatening. [4] Infections can spread from the middle ear to the mastoid, facial nerve, labyrinth, lateral sinus, meninges, and brain, causing mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, meningitis, and intracranial abscess. [5,6] Most of the time, hearing loss caused by chronic ear discharge is serious. It is reported in 50% of cases and is usually worse than hearing loss caused by other types of otitis media. [7]

Before antibiotics were invented, there were a lot of problems with CSOM. However, antibiotics gave doctors a tool they could use even if they didn't know the exact cause, and the overuse of antibiotics led to the growth of bacteria that were resistant to multiple drugs, which caused the disease to get worse. [8] Several authors have confirmed and written about how the bacteria in CSOM have changed over the last ten years. [2,8,9]

The best way to treat CSOM isn't clear, especially in developing countries. The prevalence and antibiogram of these organisms have been said to change over time and space, as well as from continent to continent, probably because antibiotics are used without thinking. [8] So, keeping track of the prevalence and antibiogram of the agents that cause CSOM would help with treatment and care of patients.

The objective of this cross-sectional prospective study was to determine the microbial diversity of the patients suffering from CSOM.

Materials and Methods

This community based, prospective study was conducted in a Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India.

Methodology

A total of 100 patients clinically diagnosed of CSOM, who did not received antimicrobial therapy (topical or systemic) for the last 7 days were included in the study. Ear discharge was obtained from the diseased ear of the patient, using three separate pre-sterilized swabs. One of the swabs was used for aerobic culture and was placed on 5% sheep blood agar (BA), MacConkey agar and chocolate agar (CA). The plates were incubated at 37C for 48 h.

Second swab used for anaerobic culture was inoculated in Robertson`s cooked meat (RCM) broth and incubated at 37°C for 72 h. On 3rd day, sub-cultures from RCM were made on 5% BA and Neomycin BA (Neomycin ata working concentration of 70 µg/ml). A metronidazole disc (5 µg) was placed at the junction of secondary and tertiary streaking area, opposite to primary well of inoculation. Dynox anaerobic jar (Dynamicro Pvt. Labs Ltd., Mumbai, India) based on Marshal`s chromous absorption principle [10] was used for anaerobic culture. The jars were closed and incubated at 37°C for 72 h and thereafter, examined for the zone of inhibition around the metronidazole disk. An aertolerance test on CA was set up to rule out facultative anaerobes.

Organisms were identified using standard procedures. [11,12] Antimicrobial sensitivity testing for aerobic isolates was carried out by Kirby Bauer disc diffusion method on Muller Hinton agar. Results were interpreted in accordance with central laboratory standards institute guidelines. [13]

All dehydrated media, reagents and antibiotic discs were procured from Hi-media Laboratories Pvt. Ltd., Mumbai, India.

Statistical analysis

The data was analyzed by using Statistical Package for Social Sciences (SPSS)

version 21 and the prevalence of organisms was determined and expressed in percentage.

Results

Out of total 100 ear swabs processed microbial growth was seen in 90 samples while 10 samples showed no growth.

Table 1: Age wise distribution of various morphotypes in chronic suppurative otitis media

	Monomicrobial	Polymicrobial	Sterile
0-10	13	15	1
11-20	12	15	3
21-30	12	5	1
31-40	8	1	2
41-50	5	3	0
51-60	0	0	1
>60	0	2	1
Total	50	41	9

Analysis of the total 100 cases revealed that monomicrobial growth was obtained in 50 samples, 41 samples yielded polymicrobial growth, whereas, 9 samples showed no growth.

Table 2: Distribution of various isolates in chronic suppurative otitis media

	N
Aerobic isolates	
MSSA	86
Pseudomonas aeruginosa	40
Klebsiella pneumoniae	20
Escherichia coli	18
Diptheroides	14
Acinetobacter baumanii	15
Anaerobic isolates	
Clostridium species	20
Peptococcus species	19
Peptostreptococcus species	18
Prevotella melaninogenica	11
Fungal isolate	
Aspergillus niger	20
Aspergillus fumigatus	16
Candida albicans	8
Candida species	6

Discussion

CSOM is a big problem for public health, and India is one of the high-prevalence countries that needs help right away. [1] It's a long-lasting disease with a high risk of complications that can't be fixed. CSOM is a major cause of preventable hearing loss, especially in the developing world [5]. It is also a serious concern, especially for children, because it can have long-term effects on early communication, language development, processing sounds, learning, and the body's physical and mental growth. [1] Early microbiological testing allows for quick and effective treatment to avoid these problems.

In this study, 90% of cases of CSOM were found to have a positive culture. This finding fits well with what other researchers have already found. [14-18] Children are more likely to get upper respiratory tract infections, which could explain why they have a high rate of CSOM (URTIs). Also, cold weather makes children more likely to get URTI. [19,20] Poor hygiene and unorthodox methods of treatment, such as putting oil and honey in the middle ear instead of ear drops, can lead to the growth of opportunistic pathogens that can block the eustachian tube (ET). [21]

Analysis of the total 100 cases revealed that monomicrobial growth was obtained in 50 samples, 41 samples yielded polymicrobial growth, whereas, 9 samples showed no growth. Different authors give very different numbers for the same things. Different authors may have gotten different results because they studied different groups of patients or because they lived in different places. In this study, it was found that monomicrobial etiology was more common (51.84%), and other researchers have also found the same thing. [16-18,22] Aslam et al. from Pakistan [23] studied 142 samples and found that 76% were pure, 23.9% were mixed cultures, and only 2.1% were fungi. Poorey and Lyer from India [16] studied 100 samples and found that 82 had pure growth, 10 had mixed growth, and 8 had no growth. A study from Iran [24] found that all 61 samples studied were caused by a single type of microbe. On the other hand, some researchers found that otitis media was more likely to have a multimicrobial cause. [21,25]

In our study, we could isolate Pseudomonas in 40 of cases. Pseudomonas, on the other hand, is the most common cause of CSOM in tropical areas. Since it doesn't usually live in the upper respiratory tract, its presence in the middle ear can't be explained by an invasion through ET. Instead, it should be thought of as a secondary invader that got into the middle ear through a defect in the TM. [8] Other studies from India, Nigeria, and Pakistan, on the other hand, showed that Pseudomonas was the most common microorganism. This could be because microorganisms are different in different parts of the world and because of the effect of climate.

Coliforms including *Klebsiella pneumoniae* and *Escherichia coli* were isolated from 20 and 18 of cases respectively, and these findings were tandem to the reports by Mansoor, *et al*. [18] who reported the same to be 8% and4% whereas Poorey and lyer. [16] reported a high incidence for klebsiella in their study (25.4%). A recent study by Shyamala and Reddy from India [17] showed a little different trend where *E. coli* was reported in 12% and Klebsiella in 5% of cases. [26] More frequent isolation of fecalbacteria like *E. coli*, Klebsiella and water bacteria like Pseudomonas indicates that individuals are at high-risk of infection due to poor hygiene conditions. Our study revealed that both gram-positive and gram negative organisms are responsible for infection of middle ear. It is usually seen that gram negative rods outnumber the gram positive organisms in CSOM as reported by various authors. [2,17,18]

Fungal infections of the middle ear are common as fungi thrive well in moist pus. The most commonly found fungi in CSOM are Candida species and Aspergillus species. In the present study, fungal etiology was found in Candida species 6 sample and *Candida albicans* in 8 sample and Aspergillus species (*Aspergillus niger* 20, *Aspergillus fumigates* 16). In a study from Haryana, India, [2] fungi were found to be the cause of 15% of the cases. Of these cases, 60% were caused by Candida species and 40% by Aspergillus species. In another study from Singapore [14] that looked at 90 people with middle ear infections, fungi

made up 8.8% of the total isolates. Aspergillus species were found in 33.3% of the isolates, and Candida species were found in 22.2%. The environment may have had an effect on the cases of middle ear infection that were studied in this area.

Conclusion:

According to the results of the current research, understanding the etiological agents of CSOM and their antimicrobial susceptibility is crucial for effective treatment, avoiding complications and halting the spread of antibiotic resistance, and cutting down on overall treatment costs.

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