

# Prevalence of Micro-Organisms and Current Trends of Antibiotics for Treatment of Chronic Suppurative Otitis Media in Developing Countries

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## INTRODUCTION:

Otitis media is an inflammation of the middle ear & mastoid process, which could be acute purulent otitis media, otitis media with effusion and chronic suppurative otitis media (CSOM) (Berman, 1997). CSOM is a condition of non-healing perforation of the tympanic membrane associated with chronic inflammatory changes of the Mucoperiosteum of the middle ear cleft resulting in mucoid or mucopurulent otorrhea of a period of three months duration (Nwabuisi and Ologe, 2002; Sharma et al., 2004). CSOM is a major problem in developing countries like India. It is more common in children belonging to lower socioeconomic group (Lasisi et al., 2007). It is single most important cause of hearing impairment in our country (Srivastava et al., 2010). The study of microorganisms associated CSOM and their antibiotic sensitivity pattern is most significant for clinician to plan general outline of treatment of chronically discharging ear (Grevall and Ram, 1996). The most common microorganisms found in CSOM are *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus mirabilis*, *Klebsiella* species, *E. coli*, *Aspergillus* spp, and *Candida* Spp, but these organisms vary in various geographical areas (Anwar-us-Salam and Abdulla, 1997). Immediate and effective treatment supported the knowledge of causing microorganisms and their sensitivity ultimately leads to good clinical recovery and provides safety and complications caused by CSOM (Taneja, 1999). Antimicrobial therapy used to eradicate the bacterial agents causing otitis media but most of the microorganisms are acquiring antibiotic resistance. In developing countries, this problem is rapidly increasing due to misuse of antibiotics. The important factors associated with occurrence CSOM found to be a poor hospital hygiene, overcrowding, lack of resources for infection control and lack of personnel trained in controlling infections in hospital (Hart and Kariuki, 1998). *Pseudomonas aeruginosa* is the most predominant organism among the cases of CSOM reported by several workers in India and abroad with an incidence ranging from 21% to 52.14% (Gulati et al., 1969; Ayyagari et al., 1981; Rao and Bhaskaran, 1984). *Pseudomonas aeruginosa* possesses an intrinsic resistance to many antibiotics and has an ability to develop resistance through mutations in different loci or through the horizontal acquisition of resistant genes, which carried on plasmids, transposons or integrons (Bannerman et al., 2007). The changing flora of CSOM and emergence of strains resistant to the commonly employed antibiotics stimulated this study. The present work deals with the bacteriological study of CSOM to identify and categorize various organisms isolated and to evaluate their sensitivity pattern (Agrawal et al., 2013).

**MATERIALS AND METHODS:** The present study carried out after the clearance from the ethical committee in the department of Microbiology at Tertiary care hospital. Total 109 patients presenting with ear discharge for more than 3 months of age group varying from 1-70 years and both sexes were included in the study. Medical history were noted including ear discharge, its duration, hearing

status, previous history of upper respiratory tract infection (URTI), ear surgery and ear trauma, presence of nasal allergy, chronic tonsillitis, tuberculosis etc. Ear discharge collected under aseptic precaution in clinically diagnosed cases of CSOM with sterile cotton wool swabs. Excess discharge was mopped out from external ear canal and it had been cleaned with 70% alcohol first and was allowed to act for 30-40 seconds to attain sterile area (Vartiainen and Vartiainen, 1996; Gopichand et al., 2015). The specimens were cultured on blood agar, MacConkey's agar and chocolate agar for aerobic bacteria and incubated at 37°C overnight (18-24 hours). The reading of the plate, colony identification, Gram Stain, biochemical test was done as per standard microbiological method (Forbes et al., 2002). A plate showing no growth after 48 hours was considered as negative. The antimicrobial susceptibility was performed on Mueller Hinton Agar (MHA) by Kirby Bauer disc diffusion method as per CLSI guidelines (Biemer, 1973; Jorgensen et al., 2007).

**Inclusion criteria:** The patients with active aural discharge for more than 3 months belonging to different age, sex, religion and different classes were included in the study. The samples were further subjected to aerobic culture and Gram stain.

**Exclusion criteria:** Patients with history of using antibiotic either systemic or local in the form of ear drops for last 7 days were excluded in the study.

**RESULTS AND DISCUSSION:** A total of 109 patients having CSOM were studied, different organisms are isolated and their antibiogram was done. The results were correlated with demographic data of the individuals. Chronic suppurative otitis media (CSOM) is a condition of the middle ear characterized by persistent or recurrent discharge through a chronic perforation of the tympanic membrane. Due to the perforated membrane, bacteria can gain entry into the center ear via the outer ear canal. Infection of the center ear mucosa subsequently ends up in ear discharge. Untreated cases of CSOM can result in broad range of complications that leads to spread of bacteria to structures adjacent to the ear or to local damage in the middle ear and such complications are ranges from persistent otorrhea, mastoiditis, labyrinthitis, facial nerve palsy and intracranial abscesses or thromboses. While the incidence of such complications is low, they have to be borne in mind when faced by a patient with active CSOM. Hence, early and effectively treatment required to avoid such complications (Loy et al., 2002). In the present study maximum number of patients 47 (42%) were in the age group of 11- 20 years. Studies conducted by (Poorey, 2002), (Vijaya and Nagarathnamma, 1998) and (Urmil Mohan and Jindal, 1998) have reported maximum number of patients belonging to the second decade. The higher incidence of otitis media in first two decades may be due to abundance of lymphoid tissue in children that may obstruct the eustachian tube and increased risk of respiratory infection in children may result in CSOM. The infection of CSOM was more common in males 71 (65%) than the females 38 (35%). The male predominance may be because of their more exposed way of life (Varshney and Gupta, 1999). The CSOM cases were more

common in rural area 60(55%) as compared to urban area 49(45%) which is in accordance with (Gulati, 1997) and (Urmil Mohan and Jindal, 1998). Incidence of CSOM is high in rural areas because of lack of education, awareness and availability of trained specialists. The CSOM cases were more prevalent during winter season 59(54%) and during early spring 30(28%) which is correlated with Kathleen A. Daly (1991) and Charles D Bluestone (2004). Nwokoye et al., (2012) have reported increased incidence of CSOM in rainy season (May-Oct). Increased incidences in winter season are mainly attributed to repeated upper respiratory tract infection (viral, bacterial) (Paparella et al., 1991). The factor associated with socio-economic status were also evaluated and it was observed that CSOM was more among lower socioeconomic class (59%) followed by middle class (30%) and 11% in upper class individuals. The criteria for socio-economic status was as follows- lower (14000/month) (Paparella et al., 1991). It is presumed that multiple factors such as poor sanitation, unhygienic living conditions, overcrowding, malnutrition, illiteracy and lack of health consciousness in low socioeconomic status may contribute to the increased development of otitis (Hivemath et al., 2001). Polymicrobial infection was 21 (19 per cent) and is consistent with this (Poorey, 2002). However, (Rao and Reddy, 1994) found equal incidence of mixed and pure culture. Use of topical and systemic broad-spectrum antibiotics within the period before consultation was probably liable for the lower incidence of mixed infection (Koppad). Although in the present study patients not taken antibiotics were amongst the exclusion criteria, but as CSOM being chronic disease patients must have been taken topical or systemic antibiotics by local general practitioners and this is often probably liable for lower incidence of mixed infection (Koppad). In the present study *P. aeruginosa* was the predominant organism 62 (53.91%) followed by *Staphylococcus aureus* 33 (28.69%), *Proteus mirabilis* 7 (6.09%), *Klebsiella pneumoniae* 06 (5.23%), *Citrobacter freundii* 5(4.35%) and *Escherichia coli* 2(1.73%). The findings are in accordance with (Shazia parveen and Rao, 2012). The next predominant organism in the present study was *Staphylococcus aureus* 33 (28.69%). This is in accordance with the finding reported by (Hivemath et al., 2001), (Loy et al., 2002). The frequency of *Staphylococcus aureus* in the middle ear infections can be attributed to their ubiquitous nature and high carriage of resistant strains in the external auditory canal and upper respiratory tract (Chole and Sudhoff, 1998). The next most common organism isolated was *Proteus mirabilis* 7(6.09%) that correlates with the findings of (Gul et al., 2006) followed by *Klebsiella pneumoniae* 6 (5.23%), *Citrobacter freundii* 5 (4.35%), and *Escherichia coli* 2 (1.73%). The occurrence of *P. aeruginosa* because the prime offender are often attributed to numerous factors like minimal nutritional requirement and its armamentarium of antibacterial products, pyocyanin and bacteriocin (Mansoor et al., 2009). The Vartiainen and Vartiainen postulated that *Pseudomonas* has the ability to carve out a niche for itself in local infection through the necrotizing activities of its extracellular enzymes. Physical features of the area, weakened epithelium, disrupted circulation and devitalized tissue shield the body from natural host defensive mechanisms and antibiotics (Vartiainen and Vartiainen, 1996). All the isolates were further subjected Antibiotic sensitivity testing, gram negative organisms were 89% sensitive to Imipenem, followed by Piperacillin-Tazobactam (70%), Amikacin (67%), Ciprofloxacin (54%). (Mansoor

et al., 2009) reported similar sensitivity pattern. The *P. aeruginosa* isolates were 100% sensitive to Imipenem which is in accordance with the studies of (Gul et al., 2006). Among gram-positive organism, *Staphylococcus aureus* 27% were resistant to cefoxitin indicating MRSA strains. As the findings of a number of staff were related, one reality became apparent that the CSOM's bacteriology and antibiotic susceptibility trend had evolved from time to time. Sensitivity patterns and drug resistance vary according to the region and may give different picture as the time passes on. A carefully selected local and/or systemic antibiotic guided by culture and sensitivity is an effective treatment modality. This will prevent development of drug resistance and administration of unwanted antibiotics.

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