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Otorhinolaryngology

BACTERIOLOGICAL PROFILE IN CHRONIC SUPPURATIVE OTITIS MEDIA IN NORTH KASHMIR

Shafkat Ahmad Lone*	Associate Professor Department of ENT and Head and Neck Surgery Government Medical college Baramulla. *Corresponding Author
Asif Akbar Sofi	Consultant, Department of ENT, District Hospital Handwara.
Mir Waseem.	Registrar Academics GMC Baramulla.

ABSTRACT A prospective study was done to determine the clinic-morphological profile and the antibiogram of patients with chronic suppurative otitis media (CSOM). 110 patients undergoing ENT surgical procedures presenting with tympanic membrane perforation and ear discharge of more than 3 months were studied. Middle ear swabs obtained aseptically were processed for culture and the isolates identified by standard procedures. Antimicrobial susceptibility testing of the bacterial isolates was performed by disc diffusion method. Patients in the age group of less than 10 years were commonly affected (32%). Male: female ratio was 3:2. Majority of the cases had no growth (56%) and 44% had growth. Majority of the organisms were aerobes (94%) while anaerobes were 6%. Among aerobes Staph aureus (45%) was the most common, followed by Psedomonas aeruginosa (19%), Enterobacter(12%), Klebsiella (6%), Proteus(6%) and pronedentia (6%). Only one Clostridium sp. was isolated as anaerobic organism. Majority of the organisms were found sensitive to Tazobactum (100%), Imepenam (100%), Amikacin (100%) and Gentamycin (100%).

KEYWORDS : CSOM, Aerobes, Staph. Aureus, Aminoglycosides.

INTRODUCTION:

Chronic suppurative otitis media (C.S.O.M), chronic tonsillitis and chronic rhinosinusistis are commonest disorders encountered in otorhinolaryngology. These diseases have multiple aetiologies and are well known for their persistence and recurrence in-spite of treatment.

Chronic suppurative otitis media (CSOM) is defined as a perforation of the tympanic membrane, with persistent drainage of pus from the middle ear, lasting at least 6 to 12 weeks [1].The global burden of illness from CSOM is estimated to involve about 65 to 330 million individuals with draining ears, 60% (39 to 200 million) of whom suffer from significant hearing impairment[2].Over 90% of the burden is borne by developing countries in Southeast Asia, the Western Pacific Region, and Africa [2]. Typical pathogens reach the middle ear following insufflations of respiratory pathogens through the eustachian tubes from the nasopharynx and spread from the external ear canal inwards through a non-intact tympanic membrane [3,4].

Studies on microbiologic diagnoses of CSOM differ in regard to patient age, geography, and the presence of complications such as cholesteatomas, and these inconsistencies likely impact some of the variation in reported pathogens. Knowledge of the true frequency of polymicrobial infection, particularly the extent of anaerobic involvement, is limited by differences in collection and culture techniques [5,6].

Aerobes, anaerobes, and fungi are all potential pathogens in CSOM. Understanding of the microbiology of chronic otitis media is important for efficient and effective treatment, prevention of complications and antibiotic resistance. Prevalence of CSOM is more in developing and under developed countries. It is common in infants and children especially in lower socio economic group. The widespread use of antibiotics has precipitated the emergence of multiple resistant strains of bacteria which can produce both primary and postoperative infections [7].

The half-hearted use of antibiotics and poor follow up of patients have resulted in persistent infection. CSOM involves multiple organisms. Infections are however dominated by Pseudomonas areuginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumoniae and E.coli [8, 9].

Methods And Material:

This was a prospective study, which was carried out in the department of ENT Associated hospital GMC Baramulla in collaboration with the department of Microbiology Sheri Kashmir Institute of Medical Sciences (SKIMS) Srinagar and involved 110 patients undergoing ENT surgical procedures from Jan. 2015 to December 2019.

Patients of all age groups diagnosed as chronic suppurative otitis media were included in this study. Patients diagnosed as acute suppurative otitis media or acute on chronic CSOM, patients already on oral or topical antibiotics and those who refused to give consent were excluded from study.

A baseline data of cases was taken including history, general physical examination, systemic examination, otorhinolaryngology examination, investigations and treatment received.

Collection Of Samples:

Samples were collected intraoperative by ENT surgeon with sterile cotton swab from middle ear or mastoid cavity with the help of microscope.

For Aerobic Culture:

Sample was collected in Ami's transport medium and nutrient broth.

Processing of sample:

1. Direct microscopy

After receiving sample in lab, Gram stain was done from nutrient broth. The smear was examined for the presence of gram positive and gram negative organisms. The size, shape, arrangement of bacteria and presence of spores was noted.

2. Culture of aerobic bacteria:

For isolation of aerobic bacteria, samples were inoculated on Blood agar, Chocolate agar and Mac Conkey's agar (Hi Media Pvt Ltd. Mumbai India) and incubated in aerobic atmosphere at 370C for 24 hours. Chocolate agar was incubated in CO2 jar for 24 hrs to 48 hrs for isolation of Streptococci and Haemophilus. The colonies were examined under magnifying lens and isolates were identified using the standard microbiological procedures like colony morphology, Gram staining and biochemical reactions.

Antibiotic Sensitivity testing—(ABST)

Antibiotic sensitivity was done by Kirby- Bauer disc diffusion method for all isolated bacteria. The isolates were grown in peptone water by incubating it at 37 ° C for 2 to 4 hours or till the turbidity matched that of 0.5 Macfarland standard tube. They were then be lawn cultured onto Mueller Hinton agar plate and antibiotic discs were placed on the surface. The plates were incubated overnight at 37 ° C in the incubator and the zone of inhibition were interpreted according to according to CLSI guidelines.

For Anaerobes:

Samples were collected in freshly prepared Robertson's cooked meat medium and were incubated at 37 ° C for 4 hours. A smear was prepared from RCM and was stained by Gram method to study the morphology and gram character of the organism present. For the anaerobic organisms media usually inoculated were: neomycin blood agar, kanamycin blood agar and brucella blood agar enriched with vitamin K and hemin, and plates were incubated in anaerobic jar at 37ºCfor 48

hours s for isolation of anaerobic bacteria. All colony growths were checked for aero tolerance on chocolate agar. Strict anaerobes were sub cultured and identified further up to genus level based on Gram staining, cultural characteristics and biochemical tests and using special potency antibiotic discs.

RESULTS:

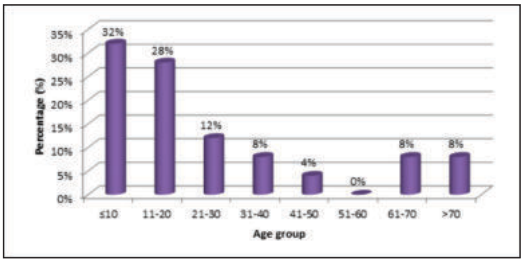

Figure no.1. Age Wise distribution of Patients in CSOM:

Above graph illustrates that Majority of Age group in Ear group that with chronic suppurative otitis media were in < 10 years i.e 8(32%) followed by 11-20 years 7(28%).

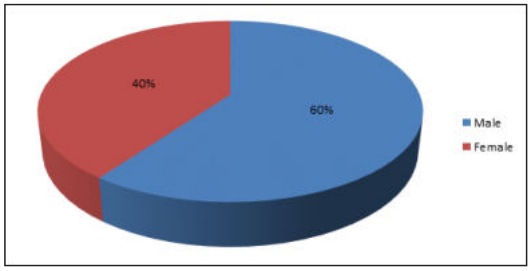

Figure no. 2. Sex Wise distribution of patients in CSOM:

Above graph illustrates that all patients in ear group had ear pain, 23(92 %) had Ear discharge followed by 10(40%) decrease hearing and 05(20%) patients had other complaints.

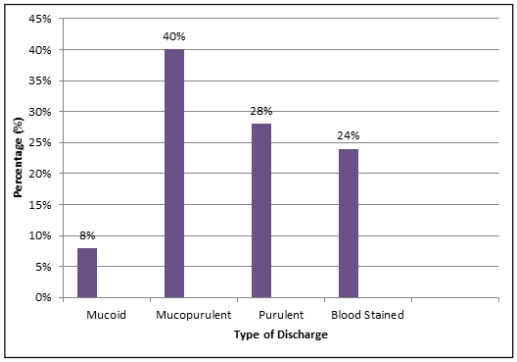

Figure no. 3. Different type of Ear Discharge:

Above graph concludes that most patients come with mucopurulent ear discharge i.e 10 (40%) followed by Purulent discharge 07(28%), blood stained discharge 06(24%).

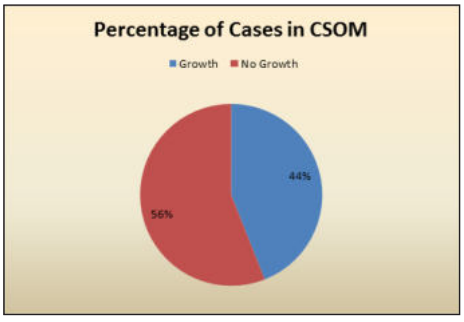

Figure 4: Distribution according to growth in CSOM:
The above graph illustrates the presence of growth in CSOM. It was observed that majority of cases had no growth (56%) and (44%) had growth.

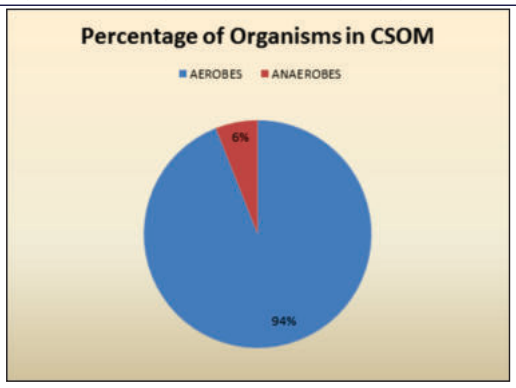

Figure 5: Distribution according to organisms in CSOM

The above chart describes the percentage of organisms in CSOM. It was observed that majority of organisms were aerobes (94%) while anaerobes were (6%).

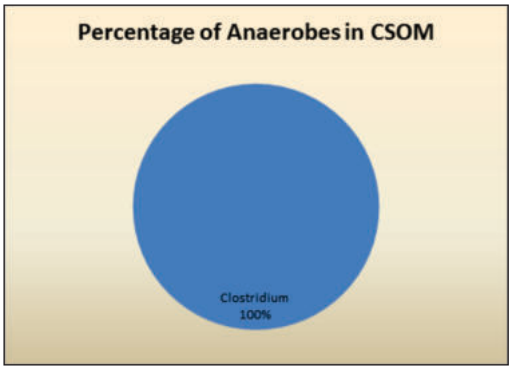

Figure 6: Distribution according to anaerobic organisms in CSOM:

The above figure describes the percentage of anaerobic organisms in CSOM. It was observed that only one clostridium species was isolated as anaerobic organism

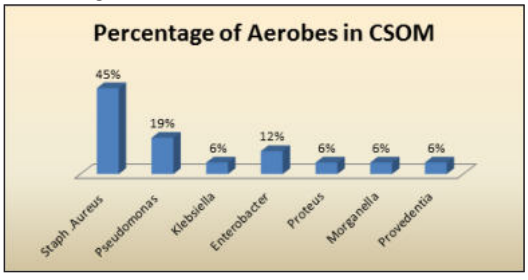

Figure 7: Distribution according to aerobes in CSOM:

The above graph describes the percentage of aerobes in CSOM. It was observed that majority of organisms found was Staph. Aureus (45%) followed by Pseudomonas (19%) The other aerobes include Enterobacter (12%), Klebsiella (6%), Proteus (6%) and Provedentia (6%)

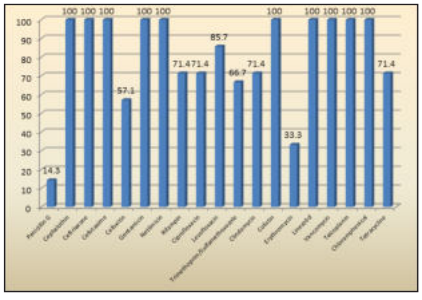

Figure 8: Antibiotic sensitivity of Gram Positive Cocci in CSOM:
The above chart describes the percentage of antibiotic sensitivity of Gram positive cocci in CSOM. It was observed that majority of organisms found sensitive to Cephalothin (100%), Cefotaxime

(100%), Linezolid (100%), Vancomycin (100%) and Chloramphenicol. (100%) The organisms were most resistant to Penicillin G (14.3%) followed by Erythromycin (33.3%)

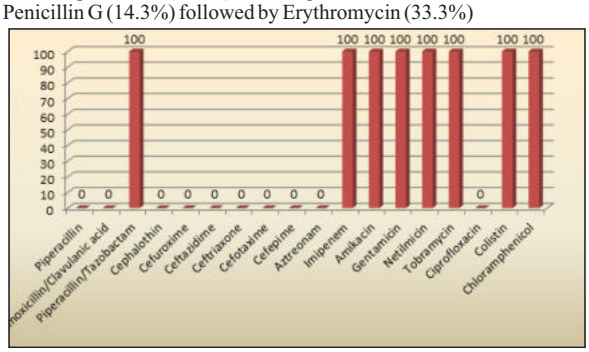

Figure 9: Antibiotic sensitivity of Gram Negative Bacilli in CSOM:

The above graph describes the percentage of antibiotic sensitivity of Gram negative bacilli in CSOM. It was observed that majority of organisms found sensitive to Tazobactam (100%), Imipenem (100%), Amikacin (100%), Gentamycin (100%) and Chloramphenicol. (100%) The organisms were most resistant to Piperacillin (100%) followed by Ceftriaxone (100%)

Bacteriological Profile In Chronic Suppurative Otitis Media.

DISCUSSION

Chronic suppurative otitis media and its complications are among the most common conditions seen by otologists and general practitioners. Chronic suppurative otitis media is a persistent inflammation of the middle ear or mastoid cavity, and is characterized by recurrent or persistent ear discharge through a perforation of the tympanic membrane[10].

Due to the perforated tympanic membrane, bacteria can gain entry into the middle ear via the external ear canal. Infection of the middle ear mucosa subsequently results in ear discharge. The yearly incidence of CSOM in India to be 39 cases per 100,000 persons in children and adolescents aged 15 years and younger. In Britain, 0.9% of children and 0.5% of adults have CSOM. In Israel, only 0.039% of children are affected.[1] Chronic suppurative otitis media is a common and potentially dangerousclinical condition that is difficult to treat because the most common infecting organisms are often resistant to many antibiotics[11] Untreated cases of CSOM can result in a broad range of complications. These may be related to the spread of bacteria to structures adjacent to the ear or to local damage in the middle ear itself. Such complications range from persistent otorrhoea, mastoiditis, labyrinthitis, facial nerve paralysis to more serious intracranial abscesses or thrombosis. [12,13].While the incidence of such complications is low, they need to be borne in mind when faced by a patient with active CSOM. Treatment hence needs to be instituted early and effectively to avoid such complications. The treatment of this condition can be medical; with therapy directed at eradicating pathogenic aerobic and anaerobic organisms[14]. Those cases that are resistant to medical treatment might need surgical intervention.

The present study is a prospective study. In this project efforts were made to isolate both aerobic and anaerobic bacteria from chronic suppurative otitis media and to evaluate sensitivity pattern of aerobic bacteria to the routinely used antibiotics. This study was done over a period of 5 years.

In present study out of 110 patients of CSOM 60% were males and 40% were females, showing male preponderance. Rajat prakash et al [15] in their study of microbiology of CSOM had reported 53% females and 46% males, showing female preponderance. Tanmoy Deb & Debabrata Ray [16] in their study of bacteriological profile of CSOM in Agartala found male preponderance with 51.54% and females with 48.45%. In our study commonest age group for CSOM was up to 10 years (22%) and 21 years to 30 years (22%). Dilshad Arif et al [17] in their study of bacteriological profile of ear infections and its antibiotic pattern in tertiary care hospital reported 21 years to 30 years to be the most common group with 27.5% followed by 31 years to 40 years (21.25%). Rajat prakash et al [15] in their study of microbiology of CSOM in a tertiary care setup of Uttarakand state reported peak incidence of CSOM with age group of 0 to 20 years 51%.

In present study culture positive cases in CSOM, 47.2%, While Tanmoy Deb and Debabrata et al [16] in 2012, Josiane Faria de Aguiar Nigro et al [18] in 2006, Mohammed S Al Ahmary et al [19] in 2012, reported 54.60% culture positive cases in CSOM. Madhusudhan Malpani et al [20] in 2016, Itzhak Brookt and Edith H. Frazier [21] in 2005, G Raju and Esther Mary Selvam [22] in 2012, reported 88% culture positive cases in CSOM.

In our study percentage of aerobes in CSOM and were 44% whereas anaerobes were 3%, respectively. M. Chirwa et al [23] in their study of microbiology of CSOM in 2015 reported 72.7% aerobes and 33.6% anaerobes whereas Theodore Papastavros, MD et al [24] in 1986 in their study of role of aerobic and anaerobic microorganisms in CSOM reported 84.03% aerobes, 1.68% anaerobes and mixed flora was 14.29%. In our study organisms isolated from CSOM were Staphylococcus aureus (40%), Pseudomonas aeruginosa. (18%), Proteus (18%), Enterobacter spp. (18%), Klebsiella spp. (6%), E.coli (6%), Clostridium spp. (6%). Rajat prakash et al [15] in 2013 also found that most common causative organism isolated was Staphylococcus aureus (48.69%) and Pseudomonas aeruginosa (19.89%) amongst 191 isolates. Anaerobes accounted for 29.41%. The most predominant were clostridium species 18 isolates, Peptococcusspp. and Peptostreptococcus spp 16 isolates each. Madhusudhan Malpani [20] did a study in 2016 on bacteriological profile of CSOM. He found that Pseudomonas aeruginosa (34.20%) and Staphylococcus aureus (32.50%) were predominant isolates. Followed by Klebsiella, Diptheroids, E.coli, Proteus. Loy AH, Tan AL and Lu PK [13] in 2002 did a study on microbiology of chronic suppurative otitis media in Singapore. The most common organism isolated were Staphylococcus aureus (33.3%), Pseudomonas aeruginosa (33.3%),followed by Coagulase negative staphylococcus (21.1%). In our study also Staphylococcus aureus and Pseudomonas aeruginosa were most common organism in CSOM, J. Madana et al [25] in 2011, Pseudomonas aeruginosa being the most predominant isolate constituting about 32% followed by Proteus mirabilis 20% and Staphylococcus aureus 19%. Dilshad Arif et al [17] did a study in 2014 also found that commonest aerobe isolated was Pseudomonas spp. (34.07%) followed by Staphylococcus aureus (17.59%), Proteus spp. (8.79%) and CONS (7.7%). Maha Adel Mahmood[26] in 2015, also reported Pseudomonas aeruginosa 64(57%) followed by Staphylococcus aureus 28(25%), Proteus spp. 8(7%), Enterobacter spp. 8(7%) and Klebsiella spp. 4(3.6%). Mohit Srivastava and Sushant Tyagi [27] in 2015 also reported Pseudomonas aeruginosa was most common bacteria isolated (40.65%), followed by Staphylococcus aureus (14.63%), Klebsiella aerogenes(11.78%) and Proteus Mirabillis (10.56%). Among the anaerobic organisms Peptostreptococcus (5.69%) was the most common followed by Propionibacterium (4.06%) and Bacteroides spp.(3.65%). In comparison to our study anaerobic isolates grown are more in above studies; possible reason may be the different sample collection method, in our study we have collected samples intra operatively. In our study, Pseudomonas aeruginosa was seen 100% sensitive to Piperacillin tazobactum, imepenem, aminoglycosides (amikacin, gentamicin, tobramycin, nitilmicin), ciprofloxacin, cotrimoxazole and colistin. Lower sensitivity of 66.67% was found for piperacillin, amoxycillin – calvulanic acid, cefuroxime and aztreonam. Least sensitivity of 33.33% was seen for ceftazidime, cefipime and ceftriaxone. Similar to our results, Dilshad Arif et al [17] in 2014 reported Pseudomonas spp. 96.8% sensitive to ciprofloxacin and gentamicin. Tanmoy Deb, Debabrata Ray [16] in 2012 also found 15 out of 20 Pseudomonas cases in whom ciprofloxacin was tested was almost 100% effective. Maha Adel Mahmood [26] in 2015 reported 66.6% sensitivity for ceftriaxone. It was seen resistant to cephalothin and cefotaxime. Dilshad Arif et al [17] in 2014 reported 100% sensitivity to ceftazidime and was resistant to cefuroxime and cefotaxime. In our study E.coli was seen 100% sensitive to imepenem, aminoglycosides, ciprofloxacin and colistin. Shamweel Ahmad [28] in 2013 reported 100% resistance for cephalothin, 25% resistance for amoxacillin-clavulinic acid, ceftazidime, cotrimoxazole and piperacillin. He also reported 100% sensitivity for ciprofloxacin and gentamicin. Proteus, Klebshiella and Enterobacter was seen 100% sensitive to all antibiotics.While Maha Adel Mahmood 158 in 2015 reported 100% resistance of Proteus for ampicillin, 75% for amoxacillin, 50% for gentamicin and 37.5% for ceftriaxone. He also reported Enterobacter spp.to be 75% resistance for ampicillin & amoxacillin, 62.5% for gentamicin and 37.5% for ceftriaxone. He also found Klebsiella spp. to be 100% resistance for ampicillin, gentamicin (75%) and ceftriaxone (50%). Rakesh Kumar et al 51 in 2013 also observed Gram negative bacteria showing maximum sensitivity to piperacillin / tazobactam followed by amikacin and cefoperazone /

sulbactum. Staphylococcus aureus strains were resistant to penicillin.28.5% MRSA were found, which were 100% sensitivity to vancomycin, teicoplanin, chloramphenicol, gentamycin, netilmicin and 71.4% were sensitive to eryhtromycin, clindamycin and cotrimoxazole. Sensitivity of 57.14% was seen for quinolones. Rakesh kumar et al [29] in 2013 reported Staphylococcus aureus showing 100% sensitivity to vancomycin followed by clindamycin (70%), and erythromycin (45%) and ofloxacin (30%) which is quiet similar to our study. Maha Adel Mahmood [26] in 2015 reported Staphylococcus aureus to have 71.4% resistant to ampicillin, amoxacillin (60.7%), gentamicin (42.9%) and ceftriaxone (32.1%).

Aerobes, anaerobes, and fungi are all potential pathogens in CSOM. Understanding of the microbiology of chronic otitis media is important for efficient and effective treatment, prevention of complications and antibiotic resistance. The most common pathogen isolated around the world in chronic otitis media is Pseudomonas aeruginosa and Staphylococcus aureus. [4,5] Occasionally, otitis media may be caused by fungi (Aspergillus or Candida) or by other viral pathogens. We have also observed that Staphylococci and pseudomonas were common isolates in CSOM cases. Many of the infections were mono-microbial. Though in our study isolation of MRSA was less, development of drug resistance is common in S. aureus. we have isolated only one ESBL E Coli strain from CSOM. Pseudomonas aeruginosa next common isolate is also known for intrinsic and acquired drug resistance. Therefore, evaluation of microbiological pattern and their antibiotic sensitivity pattern in local area become helpful in prescribing empirical antibiotics for successful treatment of otitis media and thus minimizing its complications and emergence of resistant strains.

CONCLUSION

Chronic suppurative otitis media (C.S.O.M), is a common disorder encountered in otorhinolaryngology. This disease has multiple aetiologies and is well known for its persistence and recurrence in-spite of treatment. Evaluation of microbiological pattern and their antibiotic sensitivity pattern in local area become helpful in prescribing empirical antibiotics for successful treatment of chronic suppurative otitis media and thus minimizing its complications and emergence of resistant strains.

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