



## RESEARCH ARTICLE

### BACTERIAL FLORA IN CASES OF SUPPURATIVE OTITIS MEDIA

**1\*Dr. Shamendra Kumar Meena and 2Dr. Pawan Kumar Meena**

<sup>1</sup>Department of ENT, Medical Officer M.B.S. hospital Kota, Government Medical College, Kota, India

<sup>2</sup>Department of ENT, Medical Officer District Hospital Baran, India

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#### ABSTRACT

Human negligence is a factor responsible for the development of antibiotic resistance. As soon as symptoms subside many patients stop taking antibiotics before completion of therapy and allow partially resistant microbes to flourish. Such practice should be condemned strongly and people should be educated to avoid the same. The increased rate of isolations of pseudomonas aeruginosa has its own implications as this organism is an important cause of nosocomial infections and has developed resistance to even many potent antibiotics. Pseudomonas infections are mostly seen where there is replaced by its due to constant use of topical antibiotics. The easy availability of the over the counter topical antibiotics drops and their rampant use breeds an environment where organism like pseudomonas can grow and cause serious intra and extra cranial complications.

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## INTRODUCTION

Middle ear infection of varying degree is one of the common infection of general practice particularly in our country. Its importance lies in its chronicity and its dreaded complications. Throughout the centuries chronic infection of middle ear has been one of the greatest problems to otologists. Cullom (1947) Described out that chronic suppurative media has been since the time of Hippocrates and described it as disabling crippling disgusting and death disease. Its chronicity and dreaded complications have been reduced to some extent but it is still a great scourge of worry to otologist. The patients are humiliated and depressed by the foul odour of the discharge. They are deafened by the foul odour of the discharge. They are deafened by the distressing ravage of the disease. They are rendered unfit for society and for occupational employments and are rejected by insurance against disease and disability. The insurance companies with their scientific actuaries found out before the otologists did the crippling death dealing menace of the discharging ear. Chronic suppurative otitis media is one of the most common conditions met with in the ear, nose and throat of outpatient departments all over India. Most of them are a sequelae of acute suppurative otitis media which have not been treated or else treated inadequately. The most dreaded complication is in those children who loose their hearing and this handicap reduces their chances of advancement and also

their utility to state thus resulting in a great national loss. To a person so afflicted such an ear can (or) may be (i) menace to life by extension of the inflammatory process to the labrynth and surrounding structures, (ii) a frequent cause of permanent reduction of hearing (iii) constant source to annoyance and aesthetic embarrassment. It responds poorly to routinely used antibiotics. This is probably due to the fact that many of the cases are due to mixed infection and in majority of cases the organisms responsible are resistant to the commonly used antibiotics. The antibiotic era has directly or indirectly resulted in a new breed of resistant organisms as a result of mutation. It is clear that treatment may become progressively more difficult because of the increased number of resistant organisms found in the hospital. Another factor responsible for chronicity is the peculiar anatomy of the middle ear. The infection remains in the small spaces of middle ear and in the mastoid air cells. The middle ear is also liable to repeated infection from the nasopharynx along the Eustachian tube. It is considered essential to found out if the various organisms isolated from the discharge of chronis suppurative otitis media had any role to play in the prolonged and unsatisfactory course of treatment of the disease. The great frequency of chronic suppurative otitis media and its poor response to the routinely used antibiotics has prompted the undertaking of the present study. Various workers in different parts of the world embarked, upon rationalising the treatment of chronic discharging ears by studying the bacterial flora and their sensitivity but there has been very few from our part in the country. Thus the study is

\*Corresponding author: Dr. Shamendra Kumar Meena,

1Department of ENT, Medical Officer M.B.S. hospital Kota, Government Medical College, Kota, India.

primarily undertaken to determine the (i) kinds of bacterial flora which are prevalent in the middle ear of patient of chronic suppurative otitis media and also to study (ii) the sensitivity of the organisms thus isolated to different antibiotics and chemo-therapeutic agents, in order to prevent recrudescences and relapses which were too frequent and ultimately placed the patient in a state of chronic ill health.

### Aims and objectives

1. To study the bacterial flora in cases of suppurative otitis media.
2. To study the resistance of the organisms thus isolated to commonly used antibiotics.

### Review of literature

For convenience, review of literature can be subdivided into following:

1. Historical Review
2. Gross Anatomy
3. Etiopathology
4. Bacteriology
5. Antibiotic Sensitivity

#### 1. Historical review

Specialty of Otorhinolaryngology has advanced across as Medical Science during the last century only. The earliest mention of the disease of the ear is seen in Atherved (700bc.) ancient remedies which have been in use for otitis since prehistoric period were numerous and varied. The great Hindu surgeon Sushruta and Babylonian Tolmoal has suggested in ancient literature for remedies of "Chronic Discharging Ear". In Morocco rain water was collected on March 25<sup>th</sup> for every disease of ENT. Some other remedies were also used such as juice of plants, urine of bulls, goat gall. Hippocrates (460-357bc) was the first person to examine the tympanic membrane, he was also the first person to describe the otitis media; but thought its origin secondary to the brain abscess. Galen (131-201ad.) believed that otitis was the sequelae of infectious fever and also that it might be associated with serious intracranial complication. Centuries later Morgagni (1682-1772) showed that suppuration in the ear was primary lesion. He also postulated that brain abscess might occur as a complication of otitis media. Duverney (1648- 1730) published a book regarding first manual of diseases of ear. This was the first monograph to be published exclusively on the subject of otology and for this he claimed the title of "Father of Otology".

#### 2. Gross Anatomy

Gibson (1697) first divided the ear into outer and inner ear. Outer ear comprising the external auditory meatus and inner part comprising the middle and inner ears. Antonio Valsalva (1665-1723) who held the chair of anatomy in Bologna in 1697 and published his book "Tractus de aure" Humanae in 1704 divided the ear into three parts.

1. Outer ear
2. Middle ear
3. Inner ear

He applied the name "eustachius" to the pharyngotympanic tube in honour of eustachius. The middle ear is a narrow cleft like space in the temporal bone, it consists of Eustachian tube, the middle ear cavity (Tympanic Cavity), aditus ad antrum, mastoid antrum and pneumatic system of temporal bone (Ballan tyne - 1965). The middle ear cavity lies between the external and internal ear. It has the form of biconcave disc with medial, lateral, anterior and posterior walls, roof and floor.

### Middle ear cavity consists of the following structures

1. Auditory ossicles
  - a. Malleus b. Incus c. Stapes
2. Two muscles
  - a. Tensor tympani b. Stapedius
3. Chorda tympani nerve
4. The tympanic plexus of nerves
5. Air.

### The tympanic mucosa

The mucosa of Tympanic cavity is continues with that of the pharynx, via the Eustachian tube. It is pale, thin and slightly vascular. It has a ciliated columnar epithelium. Except over the posterior part of the medial wall, the posterior wall, often parts of the tympanic membrane & the ossicle, the cells of these surface being flatter and nonciliated. The mastoid antrum and air cells are lined by flat non ciliated epithelium. Tubo tympanic disease has copious discharge he cause of the richness in goblet cells in that area. The Eustachian tube is lined by ciliated epithelium. Which is pseudo stratified columnar in the cartilaginous part, and columnar in the bony part.

*The vasculature of the tympanic cavity*, six arteries supply the wall and contents of the tympanic cavity.

The anterior tympanic branch of the maxillary artery supplying the tympanic membrane. Stylomastoid branch of the occipital artery & posterior auricular artery supplies the posterior tympanic cavity & mastoid air cells. The petrosal branch of the middle meningeal artery. Superior tympanic branch of the middle meningeal artery. Tympanic branch from the internal carotid artery

*THE VEINS* terminates in the pterygoid venous plexus and the superior petrosal sinus.

*THE LYMPHATICS* drain into the retro-pharyngeal and the pre-auricular lymph node.

*THE NERVES* of the tympanic cavity constitute the tympanic plexus ramifying on the surface of the promontory is formed by; tympanic branch of the glossopharyngeal nerve. The carotico tympanic nerves which arise from the sympathetic plexus around the internal carotid artery. The chorda tympani branch of facial nerve & Facial nerve within falopian canal.

### Tympanic mucosa

The lining of the middle ear space is an extension and modification of the respiratory mucous membrane. The ciliated columnar epithelium lining in the pharyngo- tympanic tube is continued into the tympanic cavity where very soon gradual transition in the type of epithelium takes place. Thus the cilia

are lost and columnar epithelium is succeeded by cuboidal epithelium over promontory and finally a single layer of flattened epithelium lines the mastoid antrum and the mastoid air cells.

#### Classification of Complications of Acute and Chronic otitis media, Lee A, Harker (1990)

Cranial Complications	Intracranial Complications
Coalescent mastoiditis	Meningitis
Chronic mastoiditis	Brain abscess
Masked mastoiditis	Subdural empyema
Postauricular abscess	Epidural abscess
Bezold's abscess	Lateral sinus thrombosis
Temporal abscess	Otitic hydrocephalus
Petrous apicitis	
Labyrinthine fistule	
Facial nerve paralysis	
Acute suppurative labyrinthitis	
Encephalocele and cerebrospinal fluid leakage	

Hall A Colman's (1999) studied intratemporal complications

Acute mastoiditis	Otitic intracranial hypertension
Labyrinthitis	Extradural abscess
Otitic septicaemia	Brain abscess
Intracranial complications	Meningitis
Perisinus abscess	Petrositis
Sigmoid (lateral) sinus thrombosis	

#### Factors that influence the development of complications

Intracranial complications occur as the result of many factors, often acting simultaneously, causing the infection to spread from the ear and into the intracranial cavity. In general, intracranial complications occur when ear infections are either uncontrolled or inadequately controlled. The tendency of middle ear in infection to spread beyond the confines of the middle ear and its adjacent spaces is influenced by a number of factors. Including the virulence of the infecting organism and its sensitivity to antibiotics, host resistance, the adequacy of antibiotic therapy, the anatomic pathways and barriers to spread, and the drainage of the pneumatic spaces, both natural and surgical. The microbiology of middle ear infections remains relatively constant over time. Streptococcus pneumoniae, Haemophilus influenza, and Moraxella catarrhalis cause most acute infections. As new antibiotics are introduced, however, the patterns of antibiotic resistance seem to change and may vary from one location to another. The microbiology of chronic infection is different from the acute process. Organisms such as Pseudomonas from the acute process. Organisms such as Pseudomonas Aeruginosa are much more common. The treatment of a Pseudomonas infection requires a higher dosage of less routinely used antibiotics. The benign type of chronic otorrhea with mucoid discharge coming from a central perforation does not by itself invade bone and cause complications. There is however, nothing to prevent a fresh virulent organism from entering such an ear and causing an acute exacerbation and a complication by the same mechanism as in any case of acute otitis media. Unfortunately, the new organism is likely to display some greater resistance to antibiotics since the patient is likely to have received treatment for the otorrhea. Immunocompromised individuals are at risk of developing not only otitis media but also complications of otitis media. The organisms causing the infection are more likely to be atypical pathogens. Individuals may be taking immunosuppressive

medications, rendering them immune-compromised and susceptible to infection or may have acquired immune deficiency syndrome (AIDS). Intracranial extension of acute otitis media occurs somewhat more often from poorly pneumatized than well pneumatized temporal bones and even ears with a history of previous attacks of otitis media. The likelihood of a complication arising from chronic middle ear infections depends on the pathologic lesion causing the chronic otorrhea. The middle ear cleft has bony barriers that prevent the middle ear infection from extending intracranially. However, these barriers may be eroded by antecedent infections, granulation tissue, or cholesteatoma, thus allowing infection to spread into the cranial passages that allow infections to bypass these natural defenses. The natural drainage of the mastoid cavity (approximately 5 cc in volume) is into a relatively smaller space, the middle ear cavity (capacity approximately 0.9 cc), which then drains through the Eustachian tube. Drainage may be inadequate, allowing infected secretions to accumulate and then erode through the middle ear cleft to extend intracranially.

#### Bacteriology

- Writh (1936) reported that in otitis media there are chiefly staphylococci aureus and albus and pseudo diphtheria bacilli. In suppuration of the recesses with marginal perforation and in desquamative processes usually a flora of proteus mixes with staphylococci.
- Colline and Hughes (1944) studied 26 ears of 23 patients with otitis media, the organism isolated in order of decreasing frequency were B.proteus, coliform bacilli, diphtheroids and staphylococci.
- Collins (1944) said after bacteriological studies of chronic suppurative otitis media that reinfection of a dry open perforation from the outside is a much more important factor.
- Folt and Shel (1947) studied 25 cases and found gram negative bacilli in all these cases of which B.proteus was present in 14 cases and pseudomonas aeruginosa in 11 cases.
- Hayes and Hay (1948) stated that the resistant etiological agent in chronic suppurative otitis media and external otitis was predominantly pseudomonas.
- Farris *et al.* (1949) studied 27 cases out of which seven has mixed infections the organism isolated in order of frequency were Pseudomonas aeruginosa, proteus vulgaris staphylococci (Aureus and Albus) Klebsiella, and streptococcus lactis.
- Harris *et al.* (1949) isolated organisms in the following order of frequency pseudomonas aeruginosa, proteus vulgaris staphylococci (aureus and albus) diphtheroids.
- Sullivan and Smith (1950) found pseudomonas aeruginosa to be the Chief offending organisms tending to chronicity.
- Meurament *et al.* (1951) studied bacterial flora in chronic suppurative otitis media with central perforation. In the total material staphylococcus aureus occurred in 45.7% pseudomonas aeruginosa in 34%, proteus vulgaris in 14.2% and various streptococci in 7.3% of cases.
- Lewis and Gray (1951) stated that commonest organism is the proteus vulgaris closely followed by staphylococci aureus pseudomonas aeruginosa and

coliform. Friedlander's bacillus was isolated in one case.

- Friedman (1952) studied 218 cases of otitis media out of which 104 (32.7%) gave positive culture for staphylococcus aureus. The other organism isolated in order of decreasing frequency were B. proteus 87 (27.3%) pseudomonas aeruginosa 51(16%) and coli aerogenes 34 (10.7%).
- Rutter and Ballantya (1952) studied 54 cases of otitis media. Staphylococcus aureus was the commonest organism isolated (35.2%) the other organism in order of decreasing frequency were proteus vulgaris (29.6%) pseudomonas aeruginosa (25.9%), E.coli (16.7%). Haemolytic streptococci (5.6%) and pneumococci (1.9%).
- Lazer *et al.* (1952) isolated diptherioids staphylococcus albus, P.aeruginosa, Proteus vulgaris, strepto coccus, E coli and pneumococcus in order of decreasing frequency.
- James (1953) stated the incidence of staphylococci as 36 percent, E. coli 23 percent, D. bacilli 20 percent B. proteus 14 percent, streptococci 3.0 percent and F. bacillus in 10 percent cases.
- Watkyn Thomas (1953) has described the presence of Freedlander's bacillus and pneumococci in some cases and B. proteus and pseudomonas aeruginosa in others. Fungal infection was found to be rare.
- Das *et al.* (1954) studied 183 ears of 150 patients thirty three cases were bilateral. The most common organism isolated was proteus vulgaris is (45.43%), staphylococcus aureus (12%), staphylococcus albus (7.7%), E. coli (3.2%) they then correlated the bacteriological finding with clinical finding and came to the conclusion that-
  1. The size and site of perforation and duration of discharge did not affect the bacteriology.
  2. Colour of discharge was insignificant, except that frank green colour appeared in the presence of pseudomonas aeruginosa.
  3. Pus was usually thick, scanty, foul smelling, and yellowish, irrespective of the nature of the organism responsible for it.
  4. Reaction was mostly alkaline or amphoteric. Only two in which staphylococcus was grow had acidic reaction.
  5. Granulation and polyp had no effect on the nature of the bacteriology.
- Mayoux and Rebalty (1955) studied bacterial flora in 300 cases of otitis media. The most frequently found organism were micrococcus pyogenes (30%), streptococcus (21%) Proteus (20%) pneumococcus (9%) and pyocyanus (7%).
- Goldstein and Daly (1955) stated that haemolytic staphylococcus aureus, bacillus proteus and pseudomonas aeruginosa were one most commonly encountered pathogens in chronic suppurative otitis media.
- Iomic Karovic (1956) examined 1798 swabs from patints with chronic suppurative otitis media of which B. proteus comprised 30.1 percent and pseudomonal aeruginosa 23.2 percent of total studied.
- Friedmann (1957) studied bacteriology of otitis media in 1700 patients. Mixed growth was obtained in 8.4% of cases, staphylococcus pyogenes was the commonest organism encountered (31.7%). The other organism isolated, in order of decreasing frequency were B. proteus (25.4%) pseudomonas aeruginosa (12.8%) E. coli (8.1%) streptococcus pyogenes (7%) and streptococcus viridians and diplococcus pneumonia combined (4.6%). No growth was obtained in 18.6% of cases.
- Hodgkins (1957) reported 91 cases in which streptococcus pyogenes was commonest (46%).
- Hodgkin (1957) reported 91 cases in which streptococcus pyogenes was the commonest (46%). Ballanger (1957) has reported the presence of staphylococci, pneumococci, streptococci haemolytics and viridians, streptococci haemolytics and staph was most frequent. Friedlanders bacilli and staphylococci were less frequently found.
- Derks *et al.* (1958) found staphylococcus in 72 percent of their cases of chronic otitis.
- Shrinivasan (1958) reported mostly a mixed infection having staphylococcus, proteus vulgaris and b. pyocyanus.
- Stride (1959) found B. pyocyanus and staphylococci in the discharge.
- Akroyd (1959) studied 71 cases and the following organisms were isolated. B. pyocyanus – 36 cases staphylococci – 11 cases E. coli- 4 cases diptheroids – 2 cases and monilia – 6 cases.
- Van dishoek *et al.* (1959) studied bacterial flora in 200 cases of otitis media. The organism isolated were staphylococcus 58% (Coagulase positive), diptherioids 41.5% proteus group 35.5%, pseudomonas aeruginosa 21%, streptococcus viridans 11% pneumococcus 5% Klebsiella 5%.
- Saunders *et al.* (1959) stated that 70% of the patients had mixed bacterial flora. The principal organism isolated were staphylococcus in 53% of cases, pseudomonas aeruginosa in 31.8% bacillus proteus in 30.3% streptococcus viridans in 25.8%.
- Goyal *et al.* (1961) isolated the following organisms in a study of 54 cases. The patients were generally infected with than one organism. Streptococci – 42; staphylococci – 21; coliform bacilli – 44 and Diptheria – 10.
- Heil (1962) found streptococcus viridans most common organism in chronic suppurative otitis media.
- Coats, schenele Miller (1965) mention in their text book in the following order. Haemolytic and non haemolytic streptococci, staphylococci aureus and albus, pneumococcus, streptococcus viridans, E.coli, Friedlanders, bacillus, B.pyocyanus etc.
- Shambaugh (1969) described that common organism found on culture are staphylococcus, pseudomonas, aeruginosa, B. proteus, Colon Bacilli, Diptherioids bacilli.
- Iwazawa (1962) studied 100 patients and found staphylococcus, pseudomonas aeruginosa, B. proteus and streptococcus to be the predominating organisms.
- Palva and mallstrom (1965) studied bacterial flora in 100 cases of otitis media. The predominating organisms were pseudomonas aeruginosa 24% staphylococcus

- aureus 13% E. coli 9% K. pneumoniae 9% staphylococcus albus 8%.
- Tanderson (1965) came to conclusion that organisms vary with geography of place and with change in seasons but still pyogenic staphylococcus and proteus are the commonest.
  - Taune Plava and Mallstrom, (1965) analysed 25 cases of chronic otitis media. The predominating organism was pseudomonas aeruginosa 24 percent, staphylococcus aureus 13 percent E. coli 9.0 percent, K. pneumonia 9.0 percent, staphylococcus albus 8 percent and B. proteus 8 percent.
  - Bhaskaran, c. S. investigated such cases between 1963 in Madras. Total number was 118. The organism isolated mostly was B. coli, B. pyocyaneus, B. proteus and coagulase positive staphylococci.
  - Gulati *et al.* (1969) studied 200 cases of chronic suppurative otitis media in 1967 and 1968. Total number of organism isolated was 240. B. proteus, B. pyocyaneus and B. coli were the predominant organisms. Close to follow are coagulase positive staphylococci. There were no outstanding organisms in multiple infections as observed in the study. Majority of thwm were pure cultures fielding only one organism. Only 25 showed mixed infections.
  - Coffy (1967) carried out the bacteriological observation in the cases of otitis media in the practice of pediatrics. Streptococcus haemolyticus (Group a) was found to be an infrequent invader of middle ear.
  - Arya and Mahapatra (1966) studied 164 cases of otitis media. Common organism isolated were ps. Aeruginosa staphy. Aureus, proteus, E. coli and kib.
  - Bhargava (1966) studied 150 cases patient of chronic suppurative otitis media. The common organism isolated were staphylococcus aureus and albus (31.1%) E. coli (23.2%) and bacillus proteus (19.5%).
  - Gulati, Tandon (1969) have studied 200 cases and various stains were isolated. Pseudomonas pyocynus (26.1%) B. proteus (27.2%) and E. coli (21.7%) was the predominated organism.
  - Wright (1970) studied bacteriology of chronic suppurative otitis media during one month 108 cases and found staphylococcus pyogenes in 50% of cases and in rest of the cases, H. streptococcus, non haemolytic streptococcus, strepto. Pneumonia, E. coli, proteus species.
  - Brydoy and Ellekjeer (1972) stated that tendency to intracranial complication in chronic suppurative otitis media depends primarily on the pathological conditions which is responsible for chronic otorrhea. This may be due to an acute exacerbation with a virulent organism.
  - Dr. Chhagani and Goyal (1976) studied and found the common organism were staphylococcus, B. proteus and pseudomonas pyocyaneus.
  - Tetziaff *et al.* (1977) studied children below 5 years and found common respiratory pathogens coliform organism was found in 18%.
  - Logan turner (1977) bacteriology compared with pyogenic organism found in acute infections. In chronic disease a substantial increase in gram negative organism such as B. proteus pseudomonas pyocynus and E. coli. Invasion of the middle ear by these bacilli occurs by way of the external meatus and perforation in drum head.
  - 1992 in a study at department of medicine faculty of medicine, criogarind hospital Khon Kaen University, Thailand – commonest pathogens in CSOM with intracranial complication were gram negative bacilli, especially proteus and anaerobic organism.
  - M. CC. Nahata and Wintermeyer sm (1994) *et al* – in a study at Ohio State University, Columbus found that commonest pathogen in CSOM were pseudomonas aeruginosa and anaerobes.
  - Santosa and Brook (1995) – In their study of 38 children suffering from CSOM found that predominating organism were peptostreptococcus, staphylococcus aureus, pseudomonas aeruginosa, klebsiella pneumonia and fusobacterium.
  - Yuen and Chav (1995) *et al* in their study over 54 patients of CSOM found that commonest organism was pseudomonas (33%) second commonest organism as staphylococcus aureus (28%) and bacterioes SP only in 3%.
  - Campos and Arios (1995) *et al* – in their study over 251 patients of CSOM found that predominate pathogens were pseudomonas aeruginosa, staphylococcus aureus, and other entrobacterial. 86% of isolates were monomicrobial and 14% were polymicrobial. In polymicrobial predominant microorganisms were also P. aeruginosa, S aureus, corynebacterium SP. and proteus mirabilis. P. aeruginosa was most susceptible to ciprofloxacin but less susceptible to cefotaxime, S. Auerus was highly sensitive to amoxicillin / septran and Rifamycin. 100% Isolates were resistant to penicillin G. and ampicillin.
  - Okeowo pa and olabiya da (1992) *et al* – in the study over 40 patients of CSOM found that pseudomonas aeruginosa and staphylococcus aureus were dominant organism (40% and 35% respectively).
  - In 1992 microbiyol bul ankranumune hatansesi microbiyol found in 134bacteriological culture most frequent bacteria isolated was S. aureus (36.6%) and they are most sensitive to Gentamycin (75.5).
  - Semin pestoir infect (1991) conducted study in school of pharmacy university of minnestoa, reveled that in CSOM pseudomonas and S. aureus are most frequent organism.
  - Pediatrics 1995 July 1996 Department of Pediatrics school of Medicine denwer USA Dr. Berman's in their study the pathogens isolated from ear aspirates in developing countries are similar to those isolated from the developed countries.
  - Study done by Raju Unkrishannan and Nagar 25 cases of tubotympanic type – mixed infection of nine cases (36%) staphylococcus aureus was the commonest single agent (16cases) multi drug resistance was seen in 12 of these isolates (Journal of laryngotology 1990).
  - Study done by S.K. Gupta, S. Mohan, S.C. Tandon *et al* in university of medical sciences B.H.U. India 8 cases of brain abscess secondary to Csom. The most frequent was pseudomonas resistant to most of the antibiotics.
  - Study by I brook in 48 children with CSOM pseudomonas aeruginosa an klebsiella peneomonia.
  - Chow vt *et al* 84 cases of CSOM pseudomonas were predominate organism.
  - L Jonsson *et al* in 47 cases predominant bacteria was pseudomonas.

- Eason *et al* study in *Staphylococcus aureus* and *Pseudomonas* were predominant organism. Gentamycin were effective against them (Nzmed J. 1986 Oct. 22,94)
- Ma Kenna – in 36 cases of CSOM *Pseudomonas* was most predominant infect dis- 1986.
- 1956 Louis J. Goldstein, chloramphenicol is drug of choice in 210 cases. 40% Organism developed resistance it is advisable to reculture after 30 days of therapy.
- Nand and Bhaskar 1971- 300 swab cultures from cases of CSOM 68 (22.6%) mixed and 232 (77.4%) due to one type of organism. *S aureus* was most commonest (40.7%) and most sensitive to chloroamphenicol and mostly resistant to penicillin.
- Fliss and Dayan (1992) *et al*- in their study over children of CSOM. *Pseudomonas* was isolated from 84% enteric gram negative bacilli from 32%, *Staphylococcus aureus* from 20% streptococci from 14% and H. Influenza 15%. Sensitivity of *Pseudomonas* was 100% to mezlocillin and ciprofloxacin and 99% to tobramycin and ceftriaxone.
- Kulkarni and Dharamadhikari (1993) *et al* a bacteriological study of CSOM were carried out. Total 80 cases were studied 69 (86.2%) were positive for aerobes. *Pseudomonas aeruginosa* were predominate organism.
- Study by Mamatha Ballal *et al* a 384 swabs were taken from cases of CSOM monobacterial infection was seen in 227 (68.8%) and poly bacterial 97 (27.3%). *Pseudomonas* organism was commonest 31.9% followed by *Staphylococcus aureus* (30.6%).
- Rudin *et al* (1883) – sampled men from the Swedish national census lists and found an incidence of perforation of 1.7% and other major pathological changes in the tympanic membrane including perforation) of 3.6% otorrhoea for more than 1 month was present in 3.2% CSOM in Israel.
- Fliss *et al* (1990) Calculated an incidence of 39/100000 in southern Israeli children based on 88 with diseases and 76 age matched control. This is 0.04% and in lowest figure in current literature.
- Rao and Reddy 1994 studied 120 cases in which *Staph. aureus* was the predominant pathogen isolated 42.5%, followed by *Ps. aeruginosa* 21.6% and *Proteus* species 18.33% supported by Milton DU *et al* 1989.
- Brook I 1995- Anaerobic organism may also play an important role in chronic otitis media. Vartiainen E, Vartiainen J. 1996 shows *Staph. aureus* was isolated in cholesteatoma ears more frequently than *Ps. aeruginosa*
- Olu Ibekwe A. Zen AL. Shareef 1997 and Dan *et al*.1992 and Varshenoy 1999 shows *Pseudomonas aeruginosa* & *Proteus* sp as predominant organism. Gulati 1997 shows *Ps. aeruginosa* 41.6% *Klebsiella* Sp. 16.6% *Staph. aureus* 16.6% *Esch. Coli* 11.2% as causative organism
- Gupta vineeta, Gupta Abhay 1998-, Karma P & Varshenoy 1999- The aerobe *Staph. aureus* 40.65% and *Pseudo. Aeruginosa* 19.72% as causative organism. Alanazy Fatma *et al*. 1998 shows *Staph. aureus* then *Ps. aeruginosa* as most common organism & is supported by Anefassi *et al* 1989 of zimbabwe and Zakzouk S.M & Mahjoob S. 1980
- Vijaya *et al* 1998 shows *Staph. aureus* 19.90% *Klebsiella* sp. 18.44% *Ps. aeruginosa* 7.28% as most

common pathogen supported by Jokipii *et al*. 1997, Fliss *et al*. 1992 Ibekwe AO *et al* 1983 & Sugita *et al*. 1981. Vijaya D. 2000, in 360 patients 341 showed positive culture in which *Staph. aureus* 36.2% *Ps. aeruginosa* 19.72% *Klebsiella* 10.55% *Esch. Coli* 0.91%. Chandrasekhar MR *et al*. 2004 showed predominance of *Ps. aeruginosa* 46.76% followed by *Staph. aureus* 17.98%, *Klebsiella* sp. 12.23% & *Citrobacter* species 11.51%

It is a massive health problem and India is one of the countries with highest CSOM prevalence (> 4%) where urgent attention is needed (WHO-2004). It causes conductive and sensorineural hearing loss and has got adverse effect on childhood development. CSOM is mainly classified based on perforation of tympanic membrane into tubotympanic and atticofacial. It is a common cause of hearing impairment and can occasionally lead to fatal intracranial complications. Early and accurate diagnosis of CSOM is life saving. The earlier strains of causative organisms were sensitive to streptomycin, tetracycline and chloramphenicol. Now the trend has changed to aminoglycosides, quinolones and cephalosporins. Though the treatment of CSOM is controversial, and subject to change particularly in developing countries, the antibiogram of these organisms have been reported to vary with time and geographical area, probably due to use and abuse of antibiotics. Hence the need for periodic update of antibiogram for effective chemotherapy and management of CSOM cannot be overemphasized. Therefore, this study is undertaken to know the new trend of prevalence and antibiogram profiles of bacterial agents of CSOM in our community.

- Rao and Reddy in 1994 showed that *Staphylococcus aureus* was the most prevalent organism.
- Poorey and Arati Iyer (2002) undertook a study of bacterial flora in CSOM and its clinical significance in S.S Medical college, Rewa. Out of 100 cases examined they found that *Pseudomonas aeruginosa* (35.2%) was the most common organism isolated followed by *Klebsiella pneumoniae* (25.4%), *Staphylococcus aureus* (14.7%), *Bacillus* species, *Proteus* species (9.8%), *E.coli* (5.88%), *Staphylococcus albus* (4.9%) and *haemolytic streptococci* (3.92%) cases. Amikacin was the most effective antibiotic followed by ciprofloxacin, cefoperazone, gentamicin, cefotaxime and amoxicillin.
- Gh. Etehad, Rejahi S, Nemmati A, Pirzadeh A, Daryani A (2006) undertook a study on microbial and antibiotic susceptibility patterns from patients with chronic suppurative otitis media in Ardebil revealed that most frequently isolated organism was *Staphylococcus aureus* (31.95%), followed by *Pseudomonas aeruginosa* (26.35%), and *Proteus* species (19.67%). Sensitivity results showed majority of the isolates were susceptible to ciprofloxacin (85.7%) and resistant to penicillin (84.97%).
- Maji *et al*. in 2007 showed that *Pseudomonas aeruginosa* to be the most prevalent organism.
- Sanjana, Singh and Reddy (2011) undertook a study on aerobic bacteriology of CSOM in a tertiary care hospital. Out of 214 samples studied, *Pseudomonas aeruginosa* was the most common isolate followed by *Staphylococcus aureus*. Majority of the *Pseudomonas aeruginosa* (93.2%) isolates were sensitive to tobramycin and only 50.8% to ciprofloxacin. 95.2% of

*Staphylococcus aureus* were sensitive to cloxacillin, 83.3% to gentamicin and only 26.1% to ciprofloxacin.

- Shyamala and Sreenivasa Reddy (2012) undertook a study of bacteriological agents of CSOM - aerobic culture and evaluation. Out of 100 samples studied *Pseudomonas aeruginosa* (40%) was the most common isolate followed by *Staphylococcus aureus* (31%), *E.coli* (12%), *Proteus vulgaris* (5%) and *Klebsiella species* (5%). Sensitivity pattern of the isolated aerobes in the decreasing order of frequency is amoxiclav, amikacin, gentamicin, erythromycin, azithromycin, netilmicin, cefoperazone-sulbactam, chloramphenicol and clindamycin.
- Singh, Basu and Venkatesh (2012) undertook a study on aerobic bacteriology of CSOM : Out of 150 patients studied in Rajahmundry, the bacterial isolate contain mainly *Staphylococcus aureus* (36%), *Proteus species* (32%), *Pseudomonas aeruginosa* (24%) and *coagulase negative Staphylococcus* (20%). Among topical antibiotics ciprofloxacin (89%) had highest susceptibility rate followed by gentamicin (76%), and chloramphenicol (59%).

## MATERIALS AND MEHTODS

### Selection of cases

The cases comprising the present study were male and female patients who attended the ear, nose and throat out patients department of Otorhinolaryngology and Head & Neck Surgery N.S.C.B. Medical College and Hospital, Jabalpur with otorrhoea. The patients attending the out patients department were examined clinically and those found to be suffering from suppurative otitis media were placed in to separate groups after detailed otological examination.

- I Group - Cases with acute supurrative otitis media.  
II Group - Cases with chronic supurrative otitis media.

Second group further divided into three sub groups –

- I Group – cases with central perforation  
II Group –cases with attic perforation and marginal perforation

Situated in posterosuperior quadrant

1. II Group – cases with aural polyp and granulation

According to Senturia the acute phase of otitis media is considered to be the initial 3 weeks of inflammation. Chronic phase 3 months following the onset of inflammation and subacute phase is said to be between 3 weeks and 3 months of inflammation.

### History

A detailed history regarding the ear discharge was taken. The patient was enquired about the amount, character, colour and smell, exacerbation and remission of the discharge. An elaborate history presenting complaints and past illness was taken which included history of any eruptive fever, URI influenza, headache, vomiting or tuberculosis, preceding to the discharge from the ear. A personal history of the patient was also taken, so as to know about their personal hygiene. Quite a

good number of patients came out with history of taking bath in cesspools and ponds. Patients were also asked about anybody else suffering from chronic suppurative otitis media, frequent URI allergy and tuberculosis in the family.

### General Physical examination

After noting the history of the patient, a general physical examination was performed. It was done to note about his mental health, general built up, lymphadenopathy and facial expression. Head, neck, chest and abdomen were also examined to exclude any evidence of precipitating or contributory cause for the discharging ear.

### Laboratory examination

#### Bacteriology of the ear discharge

The specimen of the discharge were collected by sterile cotton swab sticks specially prepared and autoclaved by using sterilized ear speculum. All care had been taken to avoid any contamination and then swab was sent for bacteriological examination. The study was done to determine the kind of bacterial flora present in discharging ear of the patient of suppurative otitis media. Sensitivity of the organism to various antibiotics was also noted.

### Culture Studies

The swab thus collected were inoculated on nutrient agar, McConkey media. The inoculated media was incubated at 37°C for 24 hours and was examined for evidence of growth of the organism next day. In all cases a direct smear was prepared and studied after staining with Gram's Technique. Smear were made from colonies and these smears were stained with Gram's technique. To study the morphological characters. If there was no growth in 24 hours the media was reincubated and studied again after another 24 hours. Culture were reported sterile if no growth was obtained up to 48 hours. In case gram negative bacilli were grown a colony from the media was picked up by platinum loop and inoculated in peptone water and incubated for 24 hours at 37°C. From peptone water smears were made and studied after staining with Gram's technique. Hanging drop preparation was made from growth in peptone water to study the motility of organism. The Gram negative bacilli were identified by their morphological character including motility and staining. If the organism grown were gram positive (staphylococci) being morphology and colony characters. Coagulase test for staphylococci was done. If the organism were grown positive cocci (streptococci and pneumococci) being judged by morphology and colony characters. Identification of the organism was done by their colony characteristics in the terms of colour, size, transparency, surface and margin. Further identification was done by staining pattern, motility test and biochemical reactions.

### Antibiotic Sensitivity Test

24 hours agar culture of the organism were obtained and were further inoculated over the nutrient agar plate. The organism thus isolated were also seen for their sensitivity to various type of antibiotics by standard disc method, like as penicillin, ampicilin, tetracycline, chloramphenicol, gentamycin, streptomycin, various cephalosporins like as ceftriaxone,

cefuroxime etc, ciprofloxacin, levofloxacin, clindmycin etc. per disc. The size of disc was 6.25 mm, 1 to 2 cc nutrient broth culture of the organism separated nutrient agar plate and excess of fluid wiped out by pipette than plate was kept for drying in the incubator at 37°C for half an hour. Each antibiotic disc were placed on plate vary carefully with all aseptic precaution and incubated for 24 hours at 37°C. After that it was seen for the zone of inhibition of growth around disc.

### Interpretation of Result

When diameter of zone of inhibition of growth of the test organism was more than 5 mm around the disc it was taken to be sensitive and if it was less than 5 mm it was taken as to be resistant.

## RESULTS

In the present study 110 cases of suppurative otitis media who attended ENT out patients Department of N.S.C.B. Medical College and Hospital, Jabalpur during the period of October 2013 to September 2014 were studied clinically and bacteriologically.

### Organism Isolated

S. No.	Organism Isolated	No. of Cases	Percentage
1.	Pseudomonas aeruginosa	41	37.27%
2.	Staphylococcus aureus	36	32.72%
3.	Escherichia coli	12	10.90%
4.	Klebsiella species	8	7.27%
5.	Proteus species	5	4.54%
6.	Streptococcus pneumoniae	2	1.81%
7.	Acinobactor	1	0.90%
8.	NFG Negative Bacilli	1	0.90%
9.	Sterile	6	5.45%

Out of 110 cases pseudomonas aeruginosa were isolated in 41 (37.27%) cases, Staphylococcus aureus in 36 (32.72%) cases, followed by Escherichia coli in 12 (10.90%) cases, Klebsiella in 8 (7.27%) cases, Proteus in 5 (4.54%) cases, Streptococcus pneumoniae in 2 (1.81%) cases, Acinobactor and Non Fermentating Gram Negative Bacilli in 1 (0.90%) case each and no growth in 6 (5.45%) cases.

### Organism isolated in case of CSOM (n=92)

S. No.	Organism Isolated	No. of Cases	Percentage
1.	Pseudomonas aeruginosa	38	41.30%
2.	Staphylococcus aureus	26	28.26%
3.	Escherichia coli	12	13.04%
4.	Klebsiella species	7	7.60%
5.	Proteus species	4	4.34%
6.	Acinobactor	1	1.09%
7.	Non Fermentating Gram Negative Bacilli	1	1.09%
8.	Sterile	5	5.43%

Out of 92 cases of CSOM pseudomonas aeruginosa were isolated in 38 (41.30%) cases, Staphylococcus aureus in 26 (28.26%) cases, Escherichia coli in 12 (13.04%) cases, Klebsiella species in 7 (7.60%) cases, Proteus species in 4 (4.34%) cases, Acinobactor and Non Fermentating Gram Negative bacilli in 1 (1.09%) case each. No pathogenic organism is seen in 5 (5.43%) cases

### Organism Isolated in case of ASOM (n=18)

S. No.	Organism Isolated	No. of Cases	Percentage
1.	Staphylococcus aureus	10	55.55%
2.	Pseudomonas aeruginosa	3	16.66%
3.	Streptococcus pneumoniae	2	11.11%
4.	Klebsiella species	1	5.55%
5.	Proteus species	1	5.55%
6.	Sterile	1	5.55%

Out of 18 cases of ASOM Staphylococcus aureus were isolated in 10 (55.55%) cases, Pseudomonas aeruginosa isolated in 3(16.66%) cases, Streptococcus pneumoniae isolated in 2 (11.11%) cases, Klebsiella and Proteus species in 1(5.55%) case each and no pathogenic organism was seen in 1 (5.55%) case.

## DISCUSSION

- In the present study 110 cases of suppurative otitis media (Both ASOM and CSOM) studied clinically and bacteriologically.
- Highest incidence was observed in the age group 11-30 yrs (67.27%) in the similar study of out of the 100 cases of CSOM studied the highest incidence 71.0% was observed in the 0-20 yrs of age group. This finding corresponds with the work published by other Authors Gulati *et al*, Barauah *et al*, nandan Singh and Radha Bhaskar, Changani and Goyal, A Nandu, PS Mallaya and K. Sivaranjan.

- Laxmi Naidu and Arya and Mohapatra reported the highest among the 11-20 yrs age group.
- In the present study out of 110 cases of suppurative otitis media majority of cases belong to the age group 11-20 years (36.36%) followed by 21-30 years age group (30.90%).
- The minimum and maximum age of patients in the study were 5 years and 65 years respectively.
- In our study Suppurative Otitis Media was most prevalent in the age group 11-20 yrs followed by 21-30 years similar result were reported by Mansoor *et al* (2009), Wariso *et al* (2006), and Poorey *et al* (2002).

- Analysis of sex incidence in this present study revealed that ear discharge is more common in males (50.90%) than females (49.09%) male to female ratio was 1.04:1.

- Arya and Mohapatra, Gulati *et al*, Nandan Singh and Radha Bhaskar, P. Jagtap and O. Hardas, Bhavandesi *et al* and NH Mosti *et al* have reported a insignificant male predominance, our findings are in close associations with the above studies.
- CSOM was found to be more common among males this is in agreement with Lakhshmiapati and Bhaskaran (1965), Arya and Mohapatra (1966), Barauoh *et al* (1969), Singh and Bhaskar (1972), Kukreya *et al* (1979), Fule *et al* (1986), Taneja *et al* (1995), and Mishra *et al* (1997).
- In our study males were more commonly affected than females which is in concordance with findings of Ahmad *et al* (1999) in which males were (57.3%) and females were 42.7%.
- The present study suggested the male preponderance which was in correlation with the observation of many authors.<sup>44,67</sup>



4. In our study rural population was 78.18% and urban was (21.18%) and the disease was more prevalent in the low socioeconomic group (76.36%) as compared to other group of the society CSOM is one of the common ear infections which is more reported from rural population and lower socioeconomic status group the various socioeconomic groups were categorized on the basis of the surveys concluded in 1993-94 by the National Council of applied economic research New Delhi.
5. In the present study unilateral ear infection was predominant (76.36%)

Right ear -41.81%

Left ear -34.54%

Bilateral -23.63%

- These findings correspond with Lakshmipathi & Bhaskaran study in 1965 who reported a predominant unilateral presentation 91 out of 118 cases and also in Baruah and Agrawal case study.
6. 65.51% cases of CSOM had central perforation while 20.68% cases had attic & posterosuperior / marginal perforation.
- In 57.27% of cases discharge was profuse and in 42.72% discharge was scanty and in 37.27% of cases discharge was foetid in 62.72% of cases discharge was odourless.
  - In 74.54% of cases discharge was yellowsh/ purulent in colour.
  - In 21.81% cases discharge was mucopurulent, mucoid discharge in 3.63% of cases.
7. Out of 92 cases of CSOM, pseudomonas aeruginosa was the most predominant organism isolated in 38 patients contributing to 41.30%. It is followed by in order of Frequency by Staphylococcus aureus 26 cases (28.26%), Escherechia coli 12 (13.40%), Klebsiella species 7 (7.60%), Proteus species 4 cases (4.34%), Acinobactor and Non Fermentating Gram Negative bacilli each 1 (1.09%) cases.
- The similar findings with pseudomonas aeruginosa as predominant organism was reported by Gulati *et al* in 1969, Sharma *et al* in 2004, AHC Loy *et al* in 2002.
  - Kenna *et al* found pseudomonas was the predominant organism (67%) in the study done by Vikas Khanna *et al* most common bacterial isolates was pseudomonas as (40.57%) followed by staph. Aureus.
  - Second commonest organism isolated in the present study was staphylococcus aureus 36 cases (32.72%) this is comparable with the finding of Friedman (1952), Rotter & Ballentyne (1952), Vandsheek (1957), Sounder's (1959), Shembaugh (1959), Bhargwa (1966), I Wright (1970), Hastanasi (1992), Unikrishnan (1990).
  - Another similar study was done in 2002. By R. Shymala and P. Sreenivasulu Reddy, Andrapradesh India shows that pseudomonas aeruginosa was the most predominant species in 40 cases (40%) followed by staph aureus 31 cases (31%) next E. Coli was present in 12 cases (12%) and proteus and Klebsiella species were seen in 5 cases each (5%).
  - In this study staph aureus was predominant organism in ASOM cases 10 cases out of 18 cases (55.55%) similar

finding was observed with ISCH, K.R. & Adegbite T with 4.62% in 2004.

- Staph aureus was the predominant organism in a few studies like S. AHC Loy *et al* (33.3%) in 2002, Hegde MC *et al* in 2005 (44.2%) Nikokhlagh *et al* (24%) in 2008.
- Staph aureus, isolated in 36 cases (32.72%) as the next predominant organism after P. aeruginosa in a study, our findings are similar to those of fine, gold and brook and Moshiet *et al*, Laxmipathi and Bhaskaran observed almost similar results.
- E. coli was isolated in 12 cases (10.90%) in our study Chatterjee *et al* reported a high incidence (37%) of 101 isolated of E. Coli.
- Proteus species were found in 5 cases of total isolates (4.54%). Some worker like Vaishnav and Chhagavi found proteus to be the leading organism to be isolated from cases of CSOM with 44 isolates. Other worker have reported 5-20% incidence.
- Klebsiella was isolated from 8 cases (7.27%) in the present study. Rekha Rao and Bhaskaran isolated Klebsiella from 16 cases (13%).
- In the present study no pathogenic organism was isolated in 6 cases out of 110 cases (5.45%) the reason might be due to nonbacterial or Anaerobic bacterial aetiology not isolated. By usual Laboratory techniques or may be due to presence of antibacterial enzyme's such as Lysozyme's alone or in combination with immunoglobins in the middle ear fluid that suppressed bacterial growth.
- Over the course of years with liberal use of various antibiotics the bacterial flora in the ear discharge has been showing various types of bacteria and sensitivity.
- In this study pseudomonas aeruginosa was the predominant organism the reason for predominance may be-
  - i. It is normal flora of skin and easily invades the middle ear mucosa through perforation of tympanic membrane.
  - ii. It can thrive even in extreme conditions of environment (Low Oxygen & little nutrition).
  - iii. It has natural resistance to heat and common antibiotics and antiseptics.
  - iv. It produces pyocyanin pigment that inhibits growth of other organism and extotoxin's that produce tissue necrosis.
  - v. It s a common organism for causing Nosocomial infection.
- Sharma *et al* reported that Aural swabs collected from patients of CSOM showed pseudomonas in 36% cases followed by staph aureus in 30% of cases. Similar conclusion was drawn by another study who found pseudomonas as the most common organism in cases of CSOM (indudharan R, Haq JA, Aiyar).
- In a study of 100 cases of CSOM by Harvinder Kumar *et al* similar results were seen in which the causative agent of otitis media is P. aeruginosa (45.5%) followed by staph. Aureus (37.7%), Klebsiella (9.1%), B Haemolytic streptococci (2.9%) and proteus 2%.
  - A study from Pondicherry on CSOM in children shown that pseudomonas aeruginosa being the most predominant isolate constituting about 32% (72

- discharging ear) of the total isolate followed by proteus (20% of isolates) and staph aureus (19% of isolates).
- Monomicrobial growth was seen in 92.72% of cases which is similar to the previous study by Agrawal *et al* in our study six of the sample (5.45%) showed no growth this is in accordance with Vijay *et al* who found 5.28% sterile samples in their study where as Fatma *et al* 16.9% and Chakraborty *et al* 12.6% found higher percentage of culture negative samples in their studies. (Agrawal *et al.*, 2013; Chakraborty *et al.*, 2005; Fatma *et al.*, 1998)
  - More frequent isolation of fecal bacteria like proteus and water bacteria like pseudomonas indicate that individuals are high risk of infection due to poor Hygiene conditions. (Van Hasselt and van Kregten 2002).
8. It is seen that both gram positive and gram negative organism are responsible for infection of middle ear. It is usually seen that gram negative outnumber the gram positive organism in cases of CSOM. The findings of predominant gram negative Bacilli is consistent with many previous investigators Gulati *et al* (1969), Goyal (1976), Rajendra Kumar (1975), Nene *et al* (1979), Fule *et al* (1986), Gulati *et al* (1997), Mishra *et al* (1997).
- Comparing this study with the previous studies there is increase in gram negative organism this is again compatible findings with Logan Turner (1977).
  - Our study shows that gram negative Rods outnumber the gram positive organism in CSOM as reported in some studies.<sup>73,87</sup>
  - Sharma *et al* from Eastern Nepal found a predominance of *P. aeruginosa* (36.4%) followed by staph. Aureus (30.20%) from a total of 322 swab cultures. In this study gram negative organism accounted for 58% of total isolates and gram positive organism constituted 22% isolates.
9. Studies have revealed that quinolone's like ciprofloxacin are safe and effective particularly against *Pseudomonas aeruginosa* and staph aureus. (Agro *et al* 1998, Morden and Berke 2000, Kardal *et al* 2003, Mac Fadyen *et al* 2005, Masausm and Fakir 2010).
- All the strains which are isolated in the present series were tested against various Antibiotics ciprofloxacin (90.24%) was found to be the most effective drug followed by Amikacin (75.6%) and cefepirazole (73.17%), piperacillin+Tazobactam (70.73%) ceftazidime (65.65%) for *Pseudomonas aeruginosa*.
  - Mansoor *et al* showed that Amikacin was active against 96% of the isolated of *Pseudomonas* followed by Ceftazidime (89%) in a study done at Vellore.
  - It is observed that *Pseudomonas* was sensitive to piperacillin in 94% isolates, ceftazidime in 83% and Amikacin in 81% cases.
  - *Pseudomonas aeruginosa* were sensitive to Aminoglycosides i.e. Amikacin and Gentamicin and it is also supported by previous studies in Nepal, India and Mannoor *et al* in 2009.
  - Almost 85% of the organism showed Resistance to amoxicillin which is in accordance with Chakraborty *et al* 95.4% and Malkappa *et al* 90%.
- Ciprofloxacin and Gentamicin thus appears to be the effective first line topical Antibiotics in the Treatment of active CSOM.
  - Unhygienic conditions poverty, illiteracy, overcrowding, lack of health consciousness and malnutrition have also been suggested as reasons for the wide spread prevalence of CSOM which is in accordance with other studies. (Brook, 1980; Erkan Mustafa *et al.*, 1994)

### Summary

- In this study of 110 cases of suppurative otitis media (Both ASOM & CSOM) the majority of the patients belong to age group 11-20 years (36.36%).
- In this case study 86 cases out of 110 cases (78.18%) belonged to the rural area and 24 cases (21.18%) belonged to the urban area.
- In this case study male were 56 (50.90%) and female were 54 (49.09%) thus M:F ratio = 1.04:1.
- In this case study disease is predominantly unilateral in 84 cases (76.36%) and bilateral in 26 cases (23.63%).
- Incidence of safe type of CSOM is much more common 52 cases out of 92 cases of CSOM (56.52%) then unsafe type of CSOM in 40 cases (43.47%).
- 65.51% of CSOM cases had central perforation and 20.68% of cases had attic and posterosuperior/marginal perforation and 13.79% of cases had polyp or granulations.
- Discharge is generally profuse and non foul smelling in safe type of CSOM and scanty, foul smelling in unsafe type of CSOM.
- In this case study of 110 cases *Pseudomonas aeruginosa* was the commonest organism isolated 41(37.27%) cases next common was staphylococcus aureus 36(32.72%) no growth was seen in 6 (5.45%) cases.
- 92.72% of the growths were monobacterial and 1.81% was polybacterial.
- Maximum sensitivity of the *Pseudomonas* were encountered with ciprofloxacin (90.24%) followed by Amikacin (75.60%) then Cefepirazole (73.17%) of cases.
- A large number of bacteria were appearing becoming resistant to various antibiotics because of their indiscriminate use.
- It is suggested that in every case antibiotic must be used only after bacteriological culture and antibiotic sensitivity test.

### Conclusion

- In the Era of Antibiotics the emergence of antibiotic resistance is more common. Irrational use of antibiotics is an important factor for development of antibiotic resistance. Therefore periodical evaluation of bacteriological isolates and their antibiotic susceptibility pattern in local area will be of great help in administering appropriate antibiotics for empirical treatment and also reducing the potentially disabling and fatal complications of CSOM and also decreases the chances of emergence of resistant strains of bacteria.
- Human negligence is a factor responsible for the development of antibiotic resistance. As soon as symptoms subside many patients stop taking antibiotics

before completion of therapy and allow partially resistant microbes to flourish. Such practice should be condemned strongly and people should be educated to avoid the same.

- The fact become obvious is that the bacteriology and antibiotic sensitivity pattern of CSOM has been changing from time to time. Bacterial predominance and their antibiotic sensitivity pattern change over time (YEO *et al.*, 2007).
- Untreated cases of CSOM can result in a broad range of complications like persistent otorrhea through a tympanic perforation with conductive hearing loss, loss of hearing severity, mastoiditis Labyrinthitis, meningitis and facial nerve paralysis. This disease is notorious for causing irreversible destruction of middle ear structures and also very serious intracranial complications hence treatment need to be institutes early and affective to avoid such complications.
- Since India is a developing country and majority are still living under poverty level activities such as swimming, washing cloths etc. in contaminated water supply pouring oil in the ear due traditional beliefs also attribute to ear infections.
- The increased rate of isolations of pseudomonas aeruginosa has its own implications as this organism is an important cause of nosocomial infections and has developed resistance to even many potent antibiotics.
- Pseudomonas infections are mostly seen where there is replaced by its due to constant use of topical antibiotics. The easy availability of the over the counter topical antibiotics drops and their rampant use breeds an environment where organism like pseudomonas can grow and cause serious intra and extra cranial complications.

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