

Clinical and microbiological study of chronic suppurative otitis media at a tertiary hospital

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Abstract

Background: Chronic suppurative otitis media presents with varied clinical features depending on the duration, severity and progression of the disease. The CSOM is a major health problem both in children and adults world-wide, but more so in developing countries. It can cause chronic hearing loss which has a negative impact on the development of speech, language and social interaction as well as school and workplace performance and is responsible for significant morbidity and mortality due to complications. The present work deals with the clinical and microbiological study of CSOM to identify and categorize various organisms isolated and to evaluate their sensitivity pattern. **Material and Methods:** This was a prospective, observational study conducted in the department of ENT, in patients diagnosed clinically with chronic otitis media presenting with unilateral or bilateral Purulent ear discharge of more than 3 months. Ear discharge samples were collected and subjected to culture and sensitivity. **Results:** After applying inclusion and exclusion criteria, total 216 patients were considered for study. Most common age group in present study was 11-20 years (37%) followed by 21-30 years (24%), 31-40 years (13%). Mean age was 25.5± 13.8 years. Tubotympanic type (84%) was far more common type of CSOM than atticointral type (16%). CSOM was common in female sex (56%) as compared to male (44%). Male to female ratio was 0.78:1. Pure growth was noted in 73% samples while mixed growth in 17% and no growth in 10% samples. *Pseudomonas aeruginosa* (45%) was most common organism isolated in ear discharge samples followed by *Staphylococcus aureus* species (36%). Antibiotic sensitive for *pseudomonas aeruginosa* was meropenem (89%) followed by piperacillin and tazobactam (83%) and ciprofloxacin (77%). Sensitivity to other antibiotics was amikacin (72%), ceftazidime (68%), gentamycin (61%), amoxycillin + clavulanic acid (44%). **Conclusion:** The study of microorganisms associated CSOM and their antibiotic sensitivity pattern is most important for clinician to plan general outline of treatment of chronically discharging ear. Early and effective treatment based on the knowledge of causing microorganisms and their sensitivity results in good clinical recovery and prevents damage and complications caused by CSOM.

Key Words: chronic suppurative otitis media, *pseudomonas aeruginosa*, *Staphylococcus aureus*, Tubotympanic

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INTRODUCTION

Chronic suppurative otitis media (CSOM) is chronic inflammatory condition of the middle ear cleft with

permanent perforation, ear discharge and hearing loss. It presents with varied clinical features depending on the duration, severity and progression of the disease. Despite therapeutic interventions, acute otitis media may progress to chronic suppurative otitis media (CSOM) that is characterised by persistent or recurrent discharge through a perforation of the tympanic membrane.¹ Incidence of CSOM varies from 0.5%–2% in developed countries whereas in developing countries it varies from 3%–57%. In India, incidence of CSOM is up to 30% with prevalence rate of 16 and 46 per 1,000 populations respectively in urban and rural areas.² Repeated attacks of acute otitis media, frequent upper respiratory tract infections, respiratory allergies, overcrowding, eustachian tube dysfunction, inadequate antibiotic treatment, poor living

conditions with poor nutrition and hygiene may predispose development of CSOM.³ The CSOM is a major health problem both in children and adults world-wide, but more so in developing countries. It can cause chronic hearing loss which has a negative impact on the development of speech, language and social interaction as well as school and workplace performance and is responsible for significant morbidity and mortality due to complications. The present work deals with the clinical and microbiological study of CSOM to identify and categorize various organisms isolated and to evaluate their sensitivity pattern.

MATERIAL AND METHODS

This was a prospective, observational study conducted in the department of ENT, Department of E.N.T, A.N.M.C.H Gaya from April 2019 to March 2020. Institutional ethical committee approval was taken for present study. Patients who presented to our OPD and IPD with complaints of ear discharge were considered for study.

Inclusion criteria

- Patients diagnosed clinically with Chronic otitis media presenting with unilateral or bilateral Purulent ear discharge of more than 3 months

Exclusion criteria

- Patients with active ear discharge of less than 3 months (ASOM), ear discharge with intact tympanic membrane (Otitis externa),

- patients with serious medical conditions such as immunodeficiency states, malignancy or blood dyscrasia,
- patients with history of using antibiotic either systemic or local in the form of ear drops for last 7 days
- patients with aural discharge due to any cause other than CSOM (foreign body ear, otomycosis, furuncle in the ear, etc.)
- Patients with a history of recent trauma to the ear.

A written informed consent was obtained from all the patients. The condition of CSOM was diagnosed after eliciting proper history, clinical examination and after obtaining the relevant special investigations (microscopic examination, pure tone audiogram, X-ray mastoids, and HRCT temporal bone, CT scan brain if necessary). Ear discharge samples were collected from the discharging ears using an aural speculum with the use of sterile swab sticks. The specimens so collected were subjected to culture and sensitivity. The organisms isolated were identified by morphological, cultural, and biochemical characteristics. All organisms isolated were identified according to the standard microbiological methods in microbiology laboratory and sensitivity patterns were studied. All details were recorded in a proforma and entered in Microsoft excel sheet. Statistical analysis was done using descriptive statistics.

RESULTS

After applying inclusion and exclusion criteria, total 216 patients were considered for study. Most common age group in present study was 11-20 years (37%) followed by 21-30 years (24%), 31-40 years (13%). Mean age was 25.5± 13.8 years.

Table 1: Age distribution

Age group (years)	No. of patients	Percentage (%)
0-10	21	10%
11-20	80	37%
21-30	52	24%
31-40	29	13%
41-50	16	7%
51-60	9	4%
61-70	5	2%
>70	4	2%

Tubotympanic type (84%) was far more common type of CSOM than atticoantral type (16%). CSOM was common in female sex (56%) as compared to male (44%). Male to female ratio was 0.78:1.

Table 2: Sex distribution in various types of CSOM

Sex	Tubotympanic type (%)	Atticoantral type (%)	Total
Male	81 (38%)	13 (6%)	94 (44%)
Female	100 (46%)	22 (10%)	122 (56%)
Total	181 (84%)	35 (16%)	216

Complicated CSOM (7 %) was less common than uncomplicated CSOM (93%). Complicated CSOM was common in patients with duration of disease more than 3 years.

Table 3: Sex distribution in complicated and uncomplicated CSOM

	Complicated CSOM (%)	Uncomplicated CSOM (%)	Total
male	6 (4 %)	88 (52%)	94 (44%)
Female	9 (3 %)	113 (41%)	122 (56%)
Total	15 (7 %)	201 (93%)	216

Ear discharge was sent for microbiological assay. Pure growth was noted in 73% samples while mixed growth in 17% and no growth in 10% samples.

Table 3: Type of growth obtained from ear discharge

Type of growth	Total isolates	Percentage (%)
Pure growth	158	73%
Mixed growth	37	17%
No growth	21	10%
Total	216	

Pseudomonas aeruginosa (45%) was most common organism isolated in ear discharge samples followed by *Staphylococcus aureus* species (36%). *Staphylococcus aureus* species were further distributed as Methicillin-sensitive *Staphylococcus aureus* (MSSA) (24%), Coagulase-negative *Staphylococcus aureus* (CONS) (7%) and Methicillin-resistant *Staphylococcus aureus* (MRSA) (5%). Other organisms were proteus species (6%), *Escherichia coli* (6%), *Klebsiella* species (5%), *Enterobacter* species (1%) and *Citrobacter* species (1%).

Table 5: Organisms isolated in pure growth culture samples

Organisms	Number of isolates	(%)
<i>Pseudomonas aeruginosa</i>	71	45%
<i>Staphylococcus aureus</i>	57	36%
MSSA: Methicillin-sensitive <i>Staphylococcus aureus</i>	38	24%
CONS Coagulase-negative <i>Staphylococcus aureus</i>	11	7%
MRSA Methicillin-resistant <i>Staphylococcus aureus</i>	8	5%
<i>Proteus</i> species	10	6%
<i>Escherichia coli</i>	9	6%
<i>Klebsiella</i> species	8	5%
<i>Enterobacter</i> species	2	1%
<i>Citrobacter</i> species	1	1%

Antibiotic sensitive for *Pseudomonas aeruginosa* was meropenem (89%) followed by piperacillin and tazobactam (83%) and ciprofloxacin (77%). Sensitivity to other antibiotics was amikacin (72%), ceftazidime (68%), gentamycin (61%), amoxicillin + clavulanic acid (44%).

Table 6: Antibiotic sensitivity pattern for *Pseudomonas aeruginosa*.

Antibiotic	No. of sensitive strains	Percentage of sensitive strains (%)
Meropenem	63	89%
Piperacillin and Tazobactam	59	83%
Ciprofloxacin	55	77%
Amikacin	51	72%
Ceftazidime	48	68%
Gentamycin	43	61%
Amoxicillin and Clavulanic acid	31	44%

DISCUSSION

Chronic suppurative otitis media is persistent infection and resultant perforation of the tympanic membrane. Chronic suppurative otitis media (CSOM) is a disease associated with the structural change in middle ear and permanent abnormality of pars tensa or pars flaccida mostly as a sequelae of long standing middle ear effusion, inadequately treated acute otitis media or eustachian tube dysfunction and negative middle ear pressure. Chronic suppurative otitis media presents with persistent or

recurrent otorrhea through a perforated tympanic membrane (active), or with a dry but permanent perforation of the tympanic membrane (inactive). Other features include thickened granular mucosa, polyps, and cholesteatoma in the middle ear.⁴ According to a report by WHO, India belongs to the highest (>4%) CSOM prevalent countries.⁵ CSOM is more common in low socio-economic status groups, communities with overcrowding, inadequate housing, poor hygiene, lack of breast feeding, poor nutrition, impaired immunologic status, passive smoking,

frequent upper respiratory tract infection, high rates of nasopharyngeal colonization with potentially pathogenic bacteria and inadequate or unavailable health care. While the incidence of complications is low, untreated cases of CSOM can lead to a wide range of problems such as persistent otorrhea, labyrinthitis, mastoiditis, and paralysis of the facial nerve to more serious complications, Hearing impairment is one of the most common sequelae of CSOM. The resultant hearing loss can have a negative impact on a child's speech development, education and behaviour. Mortality due to complications of CSOM is typically higher than other types of otitis media. Intracranial complications like brain abscess and meningitis are the most common causes of death in CSOM patients.^{6,7} Most common age group in present study was 11-20 years (37%) followed by 21-30 years (24%), this indirectly signals acute exposure during the childhood. Similar age pattern has been reported by Raakhee T *et al.*⁸ and Panchal *et al.*⁹ The high prevalence of otitis media in early age group may be attributed to the fact that they are usually more prone to develop upper respiratory tract infections (URTIs).¹⁰ *Pseudomonas* spp. (45%) was the most common isolate followed by *Staphylococcus aureus* (36%) which is similar to findings as observed by other investigators.^{11,12} *Pseudomonas aeruginosa* is known to cause deep seated and progressive destruction of middle ear and mastoid structures through its toxins and enzymes.⁴ The ability of *P. aeruginosa* to survive in competition with other organisms may be due to minimum nutrition requirement. Ability of *pseudomonas* to use pili to attach to the necrotic or diseased epithelium of the middle ear. After attachment *pseudomonas* produces enzymes like proteases, lipopolysaccharides to elude from normal defence mechanism of body required for fighting infections.¹³ The indiscriminate, haphazard use of antibiotics and poor follow up of the patients have resulted in persistent low grade infectional changes in the microbiology of the disease, the advent of new antimicrobials, anti-inflammatory and anti-histamine agents make an evaluation of bacterial flora of CSOM important. Topical antibiotics are the mainstay of therapy while systemic antibiotics are given in acute exacerbations and in complications due to CSOM.¹⁴ Antibiotic sensitive for *pseudomonas aeruginosa* was meropenem (89%) followed by piperacillin and tazobactam (83%) and ciprofloxacin (77%). Study by Prakash *et al.* showed ciprofloxacin and gentamicin as an effective first line topical antibiotic in the treatment of otorrhea in CSOM.³ The declining sensitivity trend of organisms with commonly used antimicrobial agents may be explained by number of factors including injudicious use, inappropriate doses of antimicrobials and development of enzymatic resistance in microorganisms.

CONCLUSION

The study of microorganisms associated CSOM and their antibiotic sensitivity pattern is most important for clinician to plan general outline of treatment of chronically discharging ear. Early and effective treatment based on the knowledge of causing microorganisms and their sensitivity results in good clinical recovery and prevents damage and complications caused by CSOM. Although the best modality of treatment for COM with or without cholesteatoma is surgery, that is modified radical mastectomy, but the role of antibiotics and knowledge about the bacterial isolates responsible for development of COM will help the treating otolaryngologists for choosing rationale antibiotic prior to, during and immediately after surgery for complete eradication of infection and cure from disease, in the coming future.

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