European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 10 Issue 08, 2023

Original Research Article

"A STUDY ON AEROBIC BACTERIOLOGICAL PROFILE AND ANTIBIOGRAM OF CHRONIC SUPPURATIVE OTITIS MEDIA AT A TERTIARY CARE HOSPITAL, WARANGAL"

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ABSTRACT

Introduction: Chronic suppurative otitis media (CSOM) is worldwide in distribution. It is defined as 'chronic or intermittent otorrhea through a persistent non intact tympanic membrane. Its incidence is higher in developing countries, like India. Various studies have shown both gram positive and gram negative organisms as causative agents of CSOM. Untreated CSOM leads to complications such as facial nerve paralysis, lateral sinus thrombosis, labyrinthitis, meningitis and brain abscess.

Aim And Objectives:

Aim of the study is to find out the aerobic bacteriological profile and their antibiotic sensitivity patterns in patients with chronic suppurative otitis media (CSOM) in our geographical area.

Materials And Methods:

This is a prospective cross sectional study done in 150 patients of CSOM presenting with active ear discharge. Sterile swabs were used to collect pus from discharging ear and sent for culture sensitivity.

Results:

Out of 150 samples tested,116 showed pure growth and 12 showed mixed growth and no growth seen in 22 samples. Among them, the most common organisms isolated were Pseudomonas aeruginosa and Staphylococcus aureus respectively. Pseudomonas aeruginosa was found to be more sensitive to Gentamicin followed by Meropenem. Staphylococcus aureus was found to be more sensitive to Linezolid followed by Doxycycline.

Conclusion:

Knowing the etiological agents causing CSOM and their antibiogram pattern is of paramount importance for a particular area. It aids in proper selection of topical/systemic antibiotics, along with keeping ear dry is the effective treatment modality of CSOM to prevent drug resistance, unwanted antibiotic administration and further complications.

Keywords: CSOM, Pseudomonas aeruginosa, Staphylococcus aureus, Antibiogram patter.

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INTRODUCTION:

Chronic suppurative otitis media (CSOM) is worldwide in distribution.[1] It is defined as 'chronic or intermittent otorrhea through a persistent non intact tympanic membrane.[2] Incidence of the disease is higher in developing countries, especially among the low socioeconomic societies because of malnutrition, overcrowding, poor hygiene, inadequate health care and recurrent upper respiratory tract infections.[3] Among the South-East Asian countries, India has highest prevalence rate of 7.8%.[4] CSOM, whether atticoantral or tubotympanic type may be associated with mixed bacterial flora in few patients. Various studies have shown both gram positive and gram negative organisms as causative agents of CSOM.[5-7] Untreated CSOM leads to complications such as facial nerve paralysis, lateral sinus thrombosis, labyrinthitis, meningitis and brain abscess.[8]

The knowledge of the local prevalence of most common aerobic bacterial etiological agents and their antimicrobial susceptibility pattern is essential for efficacious treatment of this disease. So, the present study was undertaken to determine the aerobic bacterial profile, most common bacterial aetiology and their antimicrobial susceptibility pattern in our geographical area causing CSOM.

Materials and Methods:

This is a prospective cross sectional study of 6 months duration, from January 2023 to June 2023. Done on 150 patients of chronic suppurative otitis media presenting with active ear discharge for more than 3 months and willing to give consent for our study. Sterile swabs were used to collect pus from discharging ear and sent for culture sensitivity to Microbiology department MGM Hospital.

All the collected swabs from the patients are subjected to Gram's staining and aerobic bacterial Culture on nutrient agar, blood agar and Macconkeys agar. The inoculated media were incubated at 37^0 for 24 to 48 hours. Organisms isolated were then identified based on their colony morphology, microscopic appearance, culture characteristics and other biochemical reactions were done according to standard operative procedures.[9] Based on the organisms isolated Antibiotic susceptibility testing was performed by Kirby-Bauer"s disc diffusion method as per standard CLSI(Clinical and laboratory standard institute) 2023 guidelines.[10]

The culture media and antimicrobial discs used were obtained from Hi Media Laboratories Private Limited, Mumbai (India).The quality control for antimicrobial susceptibility testing was done with Escherichia coli (ATCC 25922), Staphylococcus aureus (ATCC 25923) and Pseudomonas aeruginosa (ATCC 27853).

RESULTS:

A total of 150 patients with CSOM were enrolled in this study. Growth was seen in 128(85.33%) samples and 22(14.66%) samples showed no growth(GRAPH 1). Male to female ratio was 1.35. Among 128 samples, pure growth was seen in 116(90.63%) and mixed growth was seen in 12(9.37%) samples(TABLE 1). The commonest organism isolated was Pseudomonas aeruginosa in total 52(40.6%) samples of which 40(31.2%) samples as pure growth and as a member of mixed flora in 12(9.37%) samples. The second most common organism isolated was Staphylococcus aureus in total 46(35.93%) samples of which 38(29.6%) as pure growth and as a member of mixed flora in 8(6.2%) samples. Other organisms isolated are Escherichia coli, Citrobacter, Acinetobacter, Proteus, Klebsiella, CONS and Enterococcus species.

Pseudomonas aeruginosa was highly sensitive to Gentamicin(92%) and Meropenem(88%) followed by Imipenem(84%) and are least sensitive to Piperacillin/tazobactam and Aztreonam(TABLE 2).

Staphylococcus aureus isolates were found to be more sensitive to Linezolid(82%) and Doxycycline(73%) followed by Erythromycin and least sensitive to Ciprofloxacin and Cepholosporins. 30(65.3%) isolates were found to be Methicillin resistant and other 16(34.7%)isolates were found to be Methicillin sensitive(TABLE 3).

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All the other Gram negative isolates showed maximum sensitivity to Amikacin(90%) followed by Gentamicin(84%) and Meropenem(84%). They were least sensitive to Ciprofloxacin and Levofloxacin(TABLE 4).

GRAPH 1. SHOWING GROWTH PATTERN OF CSOM SAMPLES.

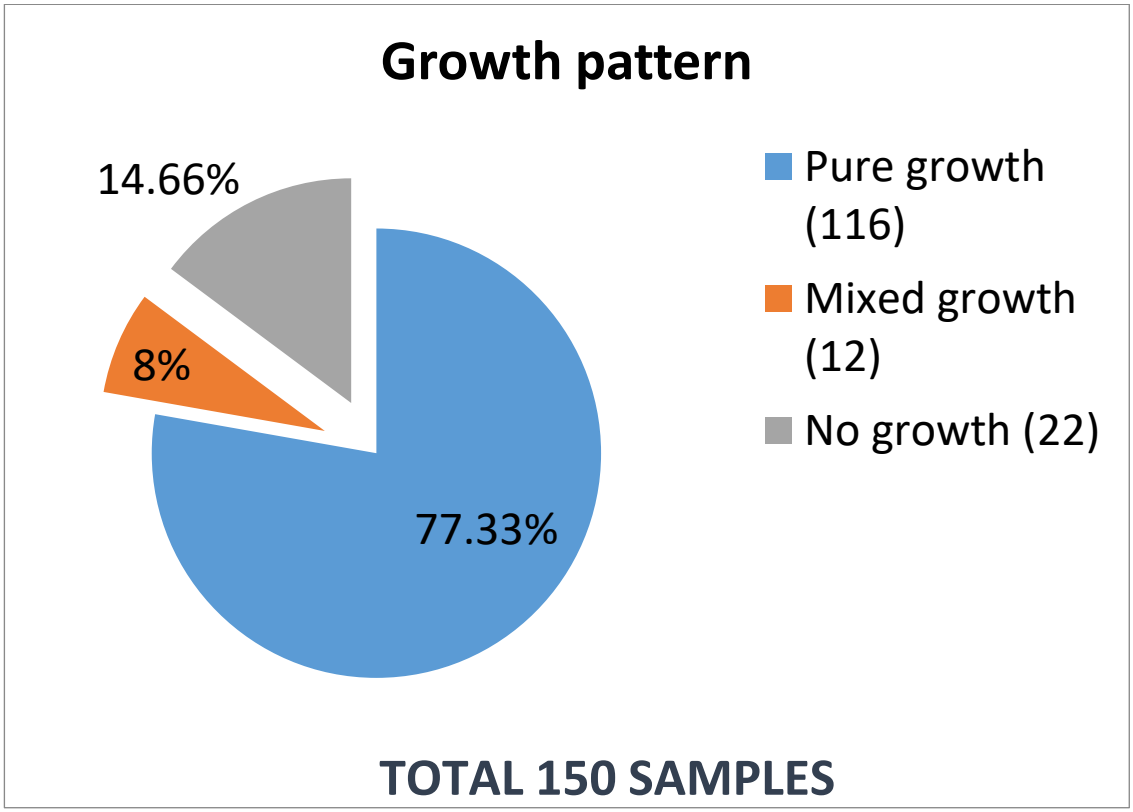

TABLE 1. SHOWING BACTERIOLOGICAL PROFILE OF CSOM.

S.NO	ORGANISM ISOLATED	NO. OF ISOLATES	PERCENTAGE
1)	Pseudomonas aeruginosa	40	31.25%
2)	Staphylococcus aureus	38	29.68%
3)	Escherichia coli	10	7.81%
4)	Citrobacter	6	4.68%
5)	Acinetobacter	6	4.68%
6)	CONS	6	4.68%
7)	Proteus	4	3.12%
8)	Enterococci species	3	2.34%
9)	Klebsiella	3	2.34%
10)	Pseudomonas aeruginosa + Staphylococcus aureus	8	6.25%
11)	Pseudomonas aeruginosa + Escherichia coli	4	3.12%

TABLE 2. SHOWING ANTIBIOGRAM OF PSEUDOMONAS AERUGINOSA.

S.NO	ANTIBIOTICS	SENSITIVE STRAINS	PERCENTAGE
1.	Gentamicin	48	92%
2.	Imipenem	44	84%
3.	Meropenem	46	88%
4.	Levofloxacin	36	69%
5.	Ciprofloxacin	30	57%
6.	Piperacillin-tazobactam	28	53%
7.	Aztreonam	26	50%

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TABLE 3. SHOWING ANTIBIOGRAM OF STAPHYLOCOCCUS AUREUS.

S.NO	ANTIBIOTICS	SENSITIVE STRAINS	PERCENTAGE
1)	Linezolid	38	82%
2)	Doxycycline	34	73%
3)	Tetracycline	32	69%
4)	Erythromycin	28	60%
5)	Cotrimoxazole	26	56%
6)	Gentamicin	24	52%
7)	Ciprofloxacin	18	39%
8)	Cefoxitin	16	34%

TABLE 4. SHOWING ANTIBIOGRAM PATTERN OF OTHER GRAM NEGATIVE BACILLI

S.NO	ANTIBIOTICS	SENSITIVE STRAINS	PERCENTAGE
1.	Amikacin	30	90%
2.	Gentamicin	28	84%
3.	Meropenem	28	84%
4.	Imipenem	26	78%
5.	Piperacillin-tazobactum	24	72%
6.	Ceftriaxone	18	54%
7.	Levofloxacin	16	48%
8.	Ciprofloxacin	14	42%

Discussion

CSOM is one of the major public-health problem, and India is one of the countries with high-prevalence rate.[11] WHO has classified the countries into different groups according to the prevalence of CSOM. Prevalence of CSOM in India according to the WHO reports is 7.8% which puts India amongst the group with the highest prevalence and hence demands immediate attention to deal with a massive public health problem.[12]

The gram positive organisms (Staphylococcus aureus, Streptococcus pneumoniae) and gram negative organisms (Pseudomonas aeruginosa, Escherichia coli, Proteus species, Klebsiella species) are involved in the pathogenesis of CSOM.[13]

CSOM is an important cause of preventable hearing loss and is of serious concern mainly in paediatric age group because it may show long-term effects on early communication, language development, educational process, auditory processing and physiological and cognitive development.[14]

Pseudomonas is the predominant cause of CSOM in tropical regions, even though it does not inhabit the upper respiratory tract. It's presence in the middle ear cannot be ascribed to an invasion through Eustachian tube (ET) and it should be considered as a secondary invader gaining access to the middle ear through defect in Tympanic Membrane. [15]

Various risk factors have been quoted in the literature for development of CSOM including upper respiratory infections, nasal diseases, inadequate antibiotic treatment and poor hygiene. These factors favors the development of CSOM by weakening the immune system, increasing the inoculum and encourages early infection.[16]

Early microbiological diagnosis ensures prompt and effective treatment to avoid further complications. The mainstay of treatment for uncomplicated CSOM is meticulous aural toilet and instillation of a topical and systemic antimicrobial agent. The therapeutic use of antibiotics is usually started empirically prior to microbiological culture results. Selection of any antibiotic is based on its efficacy, bacterial resistance, safety, toxicity and cost. The knowledge of most

common aerobic bacterial etiological agents and their antimicrobial susceptibility pattern is essential for efficacious treatment of this disease.

Microbiological cultures yield multiple organisms and these vary depending on geographical area, climatic conditions, patient population and whether antibiotics have been recently used or not. Several studies have reported different organisms in different proportions.[17]

In the present study, among the total 128 culture positive cases, 76 males and 52 females were affected with male to female ratio of 1.35:1, which is similar to study done by Prakash R[19] et al., however Teele[18] et al., have found female preponderance.

In the present study Pseudomonas aeruginosa (40.60%) was found to be the most common organism followed by Staphylococcus aureus (35.93%) and Escherichia coli (10.93%). Studies conducted by Afolabi & Vishwanath et al.[20,21] also concluded that pseudomonas aeruginosa was the commonest isolate followed by staphylococcus aureus.[20,21] Whereas study of Prakash et al.[15] showed that staphylococcus aureus was the predominant organism in CSOM.

No growth was observed in 14.66% ear swabs in our present study. This can be due to middle ear infection by anaerobic organisms or due to viral agents or due to fungal causes or due to prior antibiotic usage.

The organisms like Pseudomonas species were considered mostly as secondary invaders from external auditory canal giving access to the middle ear via any defect in the tympanic membrane secondary to an acute episode of otitis media.

The frequency of Staphylococcus aureus in the middle ear infections can be attributed to their ubiquitous nature and high carriage of resistant strains in the external auditory canal and upper respiratory tract. Organisms like E.coli and Klebsiella spp. become opportunistic pathogens in the middle ear when the immune resistance is low.

Pseudomonas aeruginosa was highly sensitive to Gentamicin(92%) where as Staphylococcus aureus isolates were found to be more sensitive to Linezolid(82%) and the other Gram negative isolates showed maximum sensitivity to Amikacin(90%) . Most of the isolates are found to be least sensitive to Ciprofloxacin in our study.

Many studies showed that, the microbiological profile and their antibiogram will vary between different geographical regions and different patient population. So, it urges the need of frequent analysis and to update the microbiological profile and their antibiogram pattern in every geographical region.

Conclusion:

Knowing the etiological agents causing CSOM and their antibiogram pattern is of paramount importance for a particular area. It aids in proper selection of topical/systemic antibiotics, along with keeping ear dry is the effective treatment modality of CSOM to prevent drug resistance, unwanted antibiotic administration and further complications.

ACKNOWLEDGMENTS: None.
FUNDING: No funding sources
CONFLICT OF INTEREST: None
ETHICAL APPROVAL: Approved by institutional ethical committee.

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