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## The incidence and sensitivity pattern of *Staphylococcus aureus* in CSOM in a tertiary care hospital in South India

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### ABSTRACT

A total of 100 patients suffering from CSOM were randomly selected from department of Otorhinolaryngology, Narayana Hospital, Narayana Medical College, Nellore. The ear discharge was collected and subjected to direct smear, aerobic culture and sensitivity. Direct smear examination and culture was positive in 93% of cases. *Pseudomonas aeruginosa* was the most predominant species in 40% of cases followed by *Staphylococcus aureus* in 31% of cases. *Escherichia coli* was present in 12% of cases and *Proteus* and *Klebsiella* in 5% each. Antibiotic sensitivity for *Staphylococcus aureus* was found to be sensitive to amoxiclav, Cefazolidone, erythromycin, azithromycin, clindamycin, netilmycin and gentamycin. They were resistant to amikacin, magnex and chloromycetin.

**Keywords:** CSOM, *Staphylococcus aureus*, Sensitivity, Amoxiclav

### INTRODUCTION

Chronic suppurative otitis media (CSOM) is characterised by a long standing infection of the middle ear commonly seen among infants and children in whom signs of infection are missing. It is characterised by painless discharge dating from months to years and is the single major cause of deafness in India. It is especially common amongst children of low socio economic strata. [1]

The introduction of antibiotics has reduced the incidence of intracranial complications in otitis media. However the occurrence should not be underestimated due to the high associated morbidity and mortality

In this study, an effort has been made to

- culture and study the aerobic flora involved in causing CSOM
- Identify the most common aerobic bacterial aetiology of CSOM
- Determine the antibiotic sensitivity of the isolated organism.

*Pseudomonas aeruginosa* is the most predominant organism among the cases of CSOM reported by several workers in India and abroad with an incidence ranging from 21% to 52.94%. Gulati et al [2], Brook & Fine gold [3], Ayyagiri et al [4], Lalita, Rekharao and Bhaskaran [5], Maninder pal singh et al [6], A Nandy, PS Mallaya S K Sivaranjan [7], Atluntas A et al [8] and composita [9].

Staphylococcus aureus isolated in 31 cases (31%) is observed as the next predominant organism in this study our findings are similar to those of Fine Gold and Brook (1981) and Moshi et al (Jan 2000) Laxmipathi and Bhaskaran (1965) observed almost similar results with the monomicrobial infection in 46.2% cases.

### MATERIALS AND METHODS

100 patients suffering from CSOM were randomly selected from the department of Otorhinolaryngology, Narayana Hospital, Narayana Medical College, Nellore. The ear discharge was collected under aseptic precautions with the aid of an aural speculum, prior to the instillation of any topical medication. The first swab was used to make a smear on a clean glass slide for direct smear examination by Gram's stain. The second swab was processed for the isolation of aerobic bacteria.

**Direct smear examination:** Gram's stain was performed by Jensen's modification and then screened under oil immersion to note the various morphological types of bacteria, their number, the presence or absence of inflammatory cells and the number of squamous epithelial cells in the sample.

**Aerobic culture:** - The swab on reaching the laboratory was inoculated on the following culture media.

- ✚ Mac conkey agar plate
- ✚ Blood agar plate
- ✚ Chocolate agar plate and
- ✚ Nutrient agar plate to isolate the organisms

The inoculated Blood agar and Mac conkey agar plates were incubated aerobically at 37<sup>0</sup>C for 24 hours.

After overnight incubation at 37degrees C the blood agar and Mac conkey agar plates were examined for evidence of growth. The colony characters were studied; smears were stained by Gram's stain and examined under the 100x objective.

After 48 hours incubation the chocolate agar plate was similarly examined and the colonies further processed. The bacterial species then isolated were identified by morphology, cultural characteristics and bio-chemical reactions according to the standard techniques.[3]

Staphylococci were identified as Staphylococcus aureus and Staphylococcus albus This was done by taking into account colony characteristics (large, circular, smooth, convex, shiny, opaque and easily emulsifiable), pigmentation (white to golden yellow, ), mannitol fermentation and coagulase test. The slide coagulase test was done as per Williams and Harper (1946) method and the tube coagulase test was done as per Gillespie's method.[4]

The Gram negative bacilli were tested for motility by hanging drop and then subjected to other biochemical and sugar fermentation test. The tests were read after incubation at 37<sup>0</sup>c at the end of 24 hours and 48 hours.

The sugars were used to study the fermentation reaction with Glucose, lactose, sucrose, maltose and Mannitol.[3] The Bio-chemical test s done were Indole, Methyl red, Voges – Proskaver, citrate (IMVIC) and Urease.[3]

All sugar fermentation and biochemical tests were done from the subcultures made from isolated colonies picked from the primary isolation media. All subcultures were incubated before putting up the sugar and biochemical test. After the subcultures reached MC Farland's Grade 3 turbidity the sugars and biochemical tests were put up and incubated at 37<sup>0</sup>C for 24 hours and 48 hours.

#### **Antibiotic sensitivity tests:**

Antibiotic sensitivity testing was done by Kirby Bauer disk diffusion method.

### RESULTS AND DISCUSSION

One hundred patients attending the ENT Department of Narayana Medical College Hospital, Nellore, with the clinical diagnosis of chronic suppurative otitis media with or without complications were included in the study. The

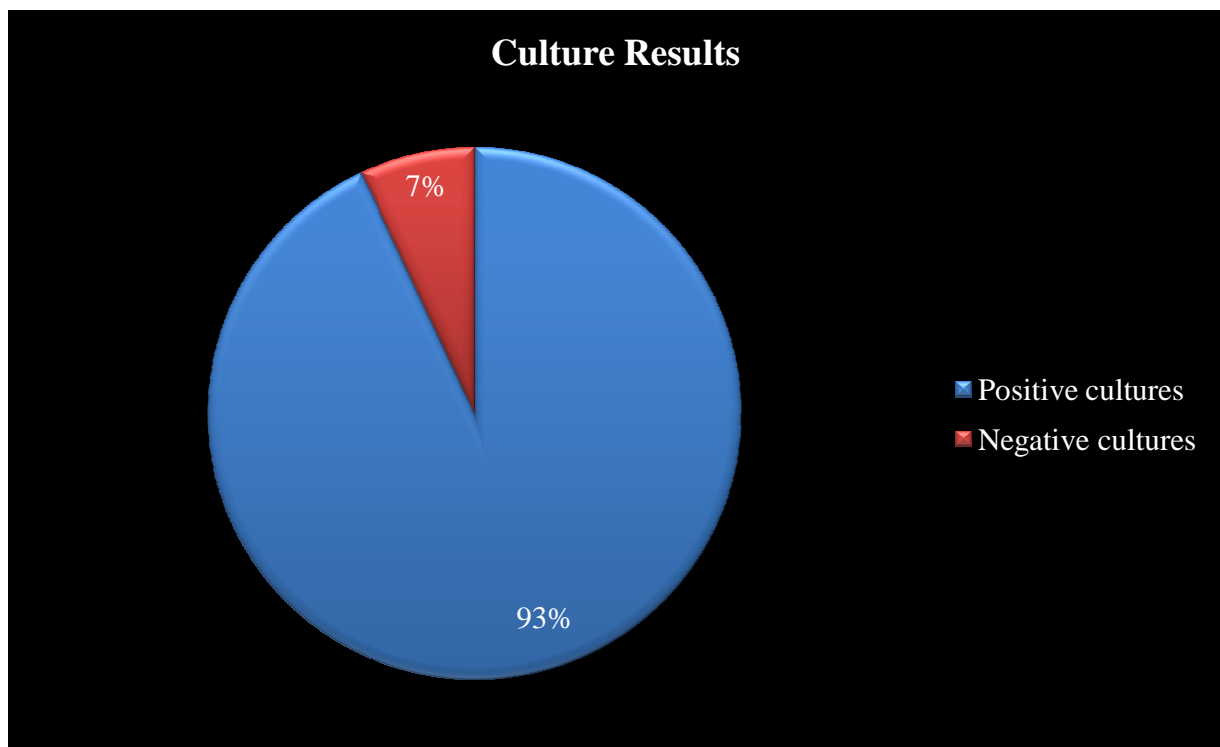
ear discharge was collected and investigated by direct smears and culture methods for isolation of aerobic bacteria and tested for their antibiotic sensitivity.

Out of the 100 specimens, 93 (93%) were direct smear positive and culture positive. 7 specimens (7%) were sterile by culture and also did not show any organism on direct smear examination. (**Table 1**)

**Table 1: The Results of Direct smear and culture**

	Specimen	Number	Percentage
1	Smear positive and culture positive	93	93%
2	Smear Negative and culture negative	7	7%

The overall results of bacteriological investigation revealed that out of the 100 cases of otitis media studied, 93 (93%) cases yielded positive cultures and 7(7%) cases yielded no growth on culture. (**Figure 1**)



**Figure 1: Culture Results**

Figure 2 shows the incidence of various aerobes isolated from 100 specimens. *Pseudomonas aeruginosa* was the most predominant species in 40 cases (40%), followed by *Staphylococcus aureus* (31 cases (31%) next *Escherchia coli* was present in 12 cases(12%) and *Proteus sp* and *Klebsiella sp* were seen in 5 cases each (5%).

According to Senturia the acute phase of otitis media is considered to be the initial three weeks of inflammation, chronic phase three months following the onset of inflammation and subacute phase is said to be between three weeks and three months of inflammation.[2]

In this particular study of one hundred cases, all the patients had symptoms lasting more than three months, mainly the symptoms being, ear discharge, pain in the ear and other signs of inflammation like fever. Hence all the cases belong to the group of chronic suppurative otitis media. Out of the 100 cases of CSOM studied the highest incidence 71% was observed in the 0 – 20 age group. This finding corresponds with the work published by other authors Gulati *et al*, Baruah *et al*, Nandan Singh and Radha Bhasker, Changani and Goyal, A Nandy, PS Mallaya and K Sivaranjan.

Nelson's Text book of Pediatrics and NM Moshi et al report a high incidence in the first decade of life, where as Laxmi Naidu and Arya and Mahepatra reported the highest among the 11-20 yr age group.[4]

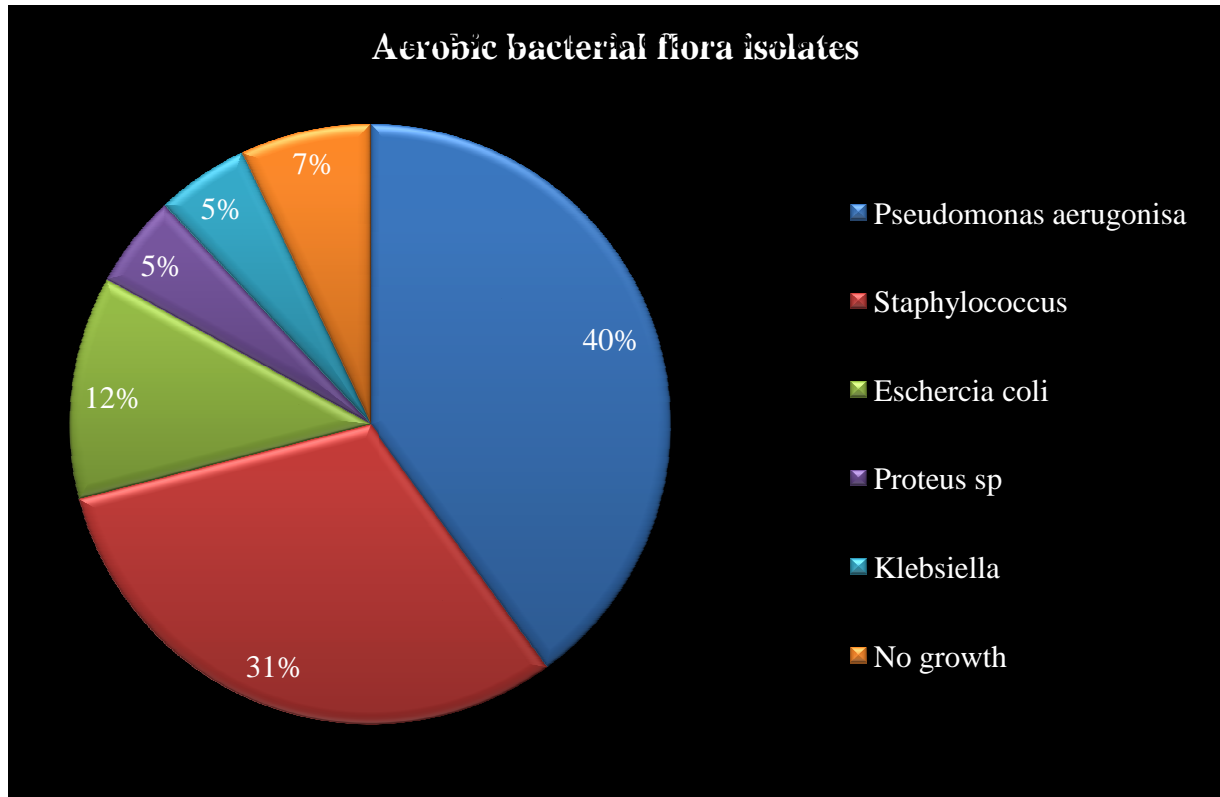


Figure 2: Aerobic bacterial flora isolates

The bacteriologic study of otitis media revealed the isolation of a variety of organisms. Pseudomonas aeruginosa is the most prominent organism being isolated in 40 (40%) of the cases.

It is followed in order of predominance by Staphylococcus aureus in 31 (31%) cases. This is followed by E.coli in 12 (12%) cases. Proteus mirabilis in 5 cases (5%) Klebsiella pneumoniae in 5 cases (5%).

Staphylococcus aureus isolated in 31 cases (31%) is observed as the next predominant organism in this study our findings are similar to those of Fine Gold and Brook and Moshi et al Laxmipathi and Bhaskaran observed almost similar results with the monomicrobial infection in 46.2% cases.[4]

Whereas, Friedman, Mann et al, Baruah et al, Ramarao and Jayakar and Karov et al reported the most predominant organism in CSOM as being staphylococcus aureus.[6]

A look into the monomicrobial and polymicrobial infection in cases of otitis media shows that in this study monomicrobial etiology was found to be common. Usha Hardass and Chatterjee et al have reported monomicrobial etiology to be more common than the polymicrobial in the causation of otitis media. Other workers who have reported predominated polymicrobial etiology in otitis media are, Ayyagiri et al, Rekha Rao S Bhaskaran and Maninder Pal Singh et al. As regards the antibiotic sensitivity, in the present study Amoxiclav has proved to be the most effective drug for aerobes (59 strains) closely followed by Amikacin (55 strains), followed by Gentamycin (40 strains) and 38 strains sensitive to Erythromycin. Different workers showed different sensitivity patterns to Gentamicin.

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**CONCLUSION**

1. One hundred patients with the clinical diagnosis of chronic suppurative otitis media attending the outpatient department of Narayana Hospital, attached to Narayana Medical College, Nellore formed the study group. They were investigated by direct smears and culture methods for the isolation of aerobic bacteria.
2. Majority of the cases were of the age 0-20 yrs(71%). The over all incidence was found to be higher in males (57%) as compared to females(43%)
3. Direct examination revealed the presence of bacteria in 93% of cases The overall rate of culture positives was 93% and 7% of cases were culture negative.
4. Majority of cases were unilateral in nature.
5. Monomicrobial aetiology was found to be the common among the study group.
6. Among the aerobes, *Pseudomonas aeruginosa* was the most common isolate (40%), the other organisms in the order of decreasing frequency were,
  - a. *Staphylococcus aureus* -31%
  - b. *Escherichia coli* - 12%
  - c. *Proteus vulgaris* - 5%
  - d. *Klebsiella* - 5%
- e. Monomicrobial infection was found to be common in this study.
7. Antibiotic sensitivity for *Staphylococcus aureus* was found to be sensitive to amoxiclav, Cefazolidone, erythromycin, azithromycin, clindamycin, netilmycin and gentamycin. They were resistant to amikacin, magnex and chloromycetin.

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