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CHRONIC SUPPURATIVE OTITIS MEDIA INFECTIONS: BACTERIAL PROFILE AND DEMOGRAPHIC FEATURES AMONG PATIENTS ATTENDING TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Chronic suppurative otitis media (CSOM) can cause intracranial and extracranial complications. Reducing its prevalence may have both immediate and long-term health advantages. Understanding the local microbial flora in CSOM is critical before beginning empirical therapy. Our study sought to evaluate the link between bacterial profiles and demographic features in patients admitted to tertiary care institutions with persistent suppurative otitis media infections. **Materials & Methods**: The study was conducted in the Department of Microbiology at the Vijayanagar Institute of Medical Sciences in Ballari. Random selection was used to choose 109 CSOM cases who were admitted to ENT wards and visited outpatient departments. A proforma was used to record each patient's age, sex, address, complete clinical information, and risk factors. Utilizing conventional microbiological techniques, bacterial isolates were obtained. **Result:** The largest percentages of patients (28.4%) were in the 1to 11years age range. Compared to women (36%), men were more impacted (64%). The prevalence of CSOM patients was higher in rural areas (66%) than in urban areas (34%). 86 of the 129 ear samples that tested positive for culture contained 100 bacterial isolates; *Staphylococcus aureus* 36 (36%) was the most frequently isolated pathogen, followed by *Pseudomonas spp*. **Conclusion**, CSOM affects both adults and children. CSOM is commonly dismissed as a minor public health concern. The incidence and morbidity of this disorder can be reduced with the support of health awareness initiatives, improved health education, and easy access to medical facilities.

INTRODUCTION

Chronic Suppurative Otitis Media(CSOM) is an infection of the middle ear that lasts more than 3 months and is accompanied by tympanic membrane perforation[1]. The annual global incidence is estimated at 4.76 per 1000 people per year, totalling 31 million cases, with 22.6% of these cases arising in children under 5 years old[2]. The highest incidence is found in the Western Pacific and South East Asian regions[3]. Infection can spread from the middle ear to vital structures leading to complications. The reported overall extracranial and intracranial complication rate in CSOM varies from 0.7% to 3.2%. It was found to be the single major cause for conductive deafness (66.3%) and is also responsible for 1.5% of speech disorders. Hearing loss and ear diseases in India according to WHO, CSOM accounts about 5.2% .

CSOM has garnered significant focus, not only due to its frequent occurrence and long-lasting nature but also because of concerns like bacterial resistance and ototoxicity associated with both topical and systemic antibiotics. The wide spread use of antibiotics has precipitated the emergence of multiple

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resistant strains of bacteria which can produce both primary and post-operative ear infections. The WHO highlights the need to clearly establish risk factors for the development of CSOM[3]. Determining the risk factors for the development of CSOM will aid in the prevention of the disease and lower the related morbidity and mortality.

MATERIALS AND METHODS

The present study "Chronic Suppurative Otitis Media infections in relation with Bacteriological profile and Their Demographic Features Among Patients Attending Tertiary Care Hospital" was conducted in the tertiary care hospital, Vijayanagar institute of medical sciences, Ballari, from December 2015 to January 2017. 109 cases with CSOM of all age groups and both sexes attending outpatient department and those admitted in ENT wards were selected randomly for the study.

Inclusion criteria: All clinically diagnosed cases of CSOM of all age groups and both sexes attending ENT outpatient department were included.

History taking and examination: A proforma was filled for each patient documenting age, sex, address, detailed clinical information, and predisposing factors.

Collection of sample: In clinically diagnosed cases of CSOM attending ENT outpatient department were selected randomly. Ears were inspected, then cleaned with spirit to remove contaminant[15]. Ear discharges collected by two sterile swabs under all aseptic precautions[6]. Swabs were sent to microbiology laboratory for further processing[15]. One swab for Gram staining and the other one for an aerobic culture[6], plating on Blood agar, Macconkey's agar. All plates were incubated aerobically at 37°C and evaluated at 24 hours to 48 hours. The specific identification of bacterial pathogens was done based on microscopic morphology, staining characteristics, cultural and biochemical properties using standard laboratory procedures.

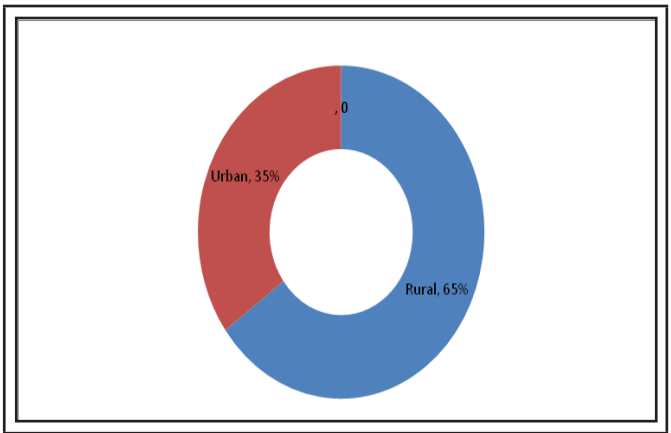
RESULTS

Clinically diagnosed 109 cases of chronic suppurative otitis media attending ENT outpatient department were studied in tertiary care hospital, Vijaynagar institute of Medical sciences, Ballari. Observations made from the study are as follows.

Table 1 Correlation between age and sex study groups

Age (1 year to 66years)	Sex: Male/Female	
	Male (%)	Female (%)
1 to 10 yrs	28.6(%)	11(28.2%)
11 to 20 yrs	27.1(%)	8(20.5%)
21 to 30 yrs	20(%)	7(17.9%)
31 to 40 yrs	7(10%)	3(7.7%)
>41 yrs	10(14.3%)	10(25.6%)

The study group's subjects range in age from one year to sixty seven years. There were 39 female cases and 70 male cases out of 109 totals. The age range of 1–10 years had the highest incidence of CSOM (28.4%).



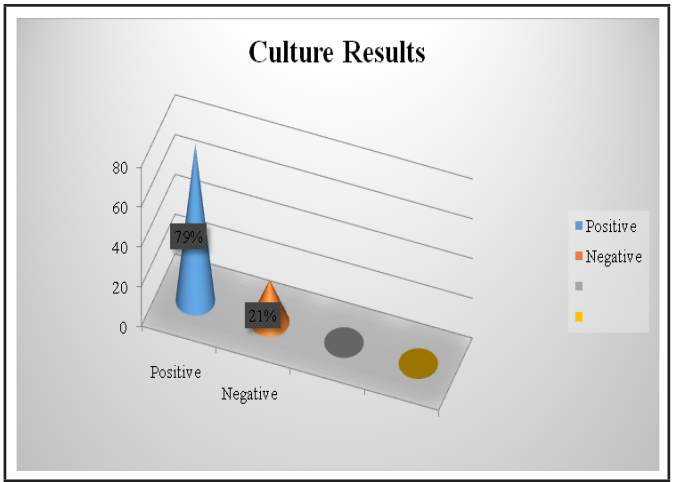
Graph 1 Allocation of patients based on area

38 (35%) of the 109 cases were from cities, while 71 (65%) came from rural areas. The incidence of CSOM was higher in rural than in urban areas.

Table 2 Division of patients based on ear involved (Right/Left/Bilateral)

Ear involved	Frequency	Percentage (%)
Bilateral	20	18
Right	35	32
Left	54	50
Total	109	100

were 35 cases (32%) with a right ear infection, 54 cases (50%) with a left ear infection, and 20 cases (18%) with a bilateral infection.



Graph 2 Culture results

According to the above table, 20 of the 129 samples were deemed contaminated and were not included in the study. Of the 109 samples, 23 (21%) were culture negative and 86 (79%) were culture positive.

Table 3 Pattern of organisms isolated

Pattern of Organisms	**No of isolates**
Gram positive cocci	
Staphylococcus aureus	36(36%)

Coagulase negative staphylococci(CONS)	9 (9%)
Streptococcus spp	4 (4%)
Gram negative organisms	
Pseudomonas aeruginosa	34(34%)
E.coli	4(4%)
Citrobacter freundii	4(4%)
Acinetobacter spp.	4(4%)
Klebsiella spp	2(2%)
Proteus Mirabilis	2(2%)

One hundred bacterial isolates were isolated from 86 of the 129 ear samples that demonstrated culture positive. According to the above table, *Staphylococcus aureus* 36 (36%) was the most often isolated bacterium, followed by *Pseudomonas* spp. 34 (34%), and Coagulase-negative Staphylococcus 9 (9%). *Acinetobacter* spp., *E. coli*, and *Citrobacter* spp. are the remaining four (4%).There were two (2% each) *Klebsiella* and *Proteus mirabilis* and one (1% each) *Enterobacter.*

Table 4 Sex wise allocation of cases based on culture results

Sex	Culture	
	Positive	Negative
	Number(%)	Number(%)
Female	27(31%)	12(52%)
Male	59(69%)	11(48%)
Total	86(100%)	23(100%)

Of the 70 (64%) samples taken from male patients, 11 (48%) were culture negative and 59 (69%) were culture positive. Twelve (52%) and 27 (31%) of the 39 (36%) samples that were taken from the female patients were culture negative. Male patients in this study exhibited higher levels of cultural positive than female patients.

Table 5 Age group in connection with culture results

Age group	Culture result		Total Number (%)
	Positive culture Number (%)	Negative culture Number (%)	
1 to 10 years	25 (28%)	6 (30%)	31 (28.44%)
11 to 20 years	24 (27%)	2 (10%)	26 (23.85%)
21 to 30 years	18 (20%)	3 (15%)	21 (19.27%)
31 to40 years	7 (8%)	3 15%)	10 9.17%)
> 41years	15 (17%)	6 (30%)	21 (19.27%)
Total	89 (100%)	20 (100%)	109 (100%)

Bacterial isolation peaked in the 0–20 age group, and as people age, the percentage of bacteria isolated falls. In the age groups of 0–10 and >40, the cultural negative was high.

Table 6 Association of area and culture result

Area	Positive Culture: Number (%)	Negative culture: Number (%)	Total: Number (%)
Urban	33 (38.4%)	0 5 (21.7%)	38 (34%)
Rural	53 (61.6%)	18 (78.3%)	71 (66%)
Total	86 (100%)	23 (100%)	109 (100%)

The above table shows high culture positivity (61.6%) in rural cases than urban cases (38.4%).

Table7 Sex wise prevalence of organisms

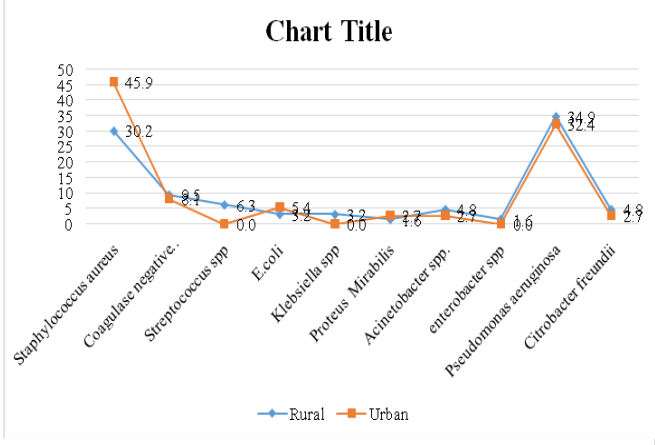
Pattern of Organisms	Sex: Male/Female		Total
	Male: Number (%)	Female: Number (%)	Number (%)
Staphylococcus aureus	26 (36.1%)	10 (35.7%)	36 (36%)
Coagulase negative staphylococci	7 (9.7%)	2 (7.1%)	9 (9%)
Streptococcus spp	4 (5.6%)	0 (0.0%)	4 (4%)
Pseudomonas aeruginosa	26 (36.1%)	8 (28.6%)	34 (34%)
Citrobacter freundii	3 (4.2%)	1 (3.6%)	4 (4%)
E.coli	1 (1.4%)	3 (10.7%)	4 (4%)
Klebsiella spp	1 (1.4%)	1 (3.6%)	2 (2%)
Proteus Mirabilis	1 (1.4%)	1 (3.6%)	2 (2%)
Acinetobacter spp.	3 (4.2%)	1 (3.6%)	4 (4%)
Enterobacter spp	0 (0.0%)	1 (3.6%)	1 (1%)
Total	72 (100%)	28 (100%)	100 (100%)

According to the above table, *Staphylococcus auerus* 10 (37%) was the most common organism in females, while *Pseudomonas aueroginosa* and *Staphylococcus auerus* 26 (38%) each had equal incidence in males.

Table 8 Area wise prevalence of organisms

Organisms isolated	Area: Rural/Urban		Total numbers(%)
	Rural: Number(%)	Urban: Number(%)	
Staphylococcus aureus	19 (30.2%)	17 (45.9%)	36 (36%)
Coagulase negative staphylococci	6 (9.5%)	3 (8.1%)	9 (9%)
Streptococcus spp	4 (6.3%)	0 (0.0%)	4 (4%)
Pseudomonas aeruginosa	22 (34.9%)	12 (32.4%)	34 (34%)
Citrobacter freundii	3 (4.8%)	1 (2.7%)	4 (4%)
E.coli	2 (3.2%)	2 (5.4%)	4 (4%)
Klebsiella spp	2 (3.2%)	0 (0.0%)	2 (2%)
Proteus Mirabilis	1 (1.6%)	1 (2.7%)	2 (2%)
Enterobacter spp	1 (1.6%)	0 (0.0%)	1 (1%)
Acinetobacter spp.	3 (4.8%)	1 (2.7%)	4 (4%)
Total	63 (100%)	37 (99.9%)	100 (100%)

Staphylococcus aureus 17 (40.5%) was the most common bacterium recovered from patients in rural areas, whereas *Pseudomonas aeruginosa* 21 (44.8%) was identified from patients in urban areas.



Graph 5 Correlation of area and the infection

According to the above table, *Pseudomonas* species and *Staphylococcus aureus* were the most prevalent bacteria in

Table 9 Age wise prevalence of organisms

Organisms isolated	Age Group					Total
	0-10	11-20	21-30	31-40	>40	
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Staphylococcus aureus	11 (39.3%)	9 (30.0%)	7.0 (41.2%)	3.0 (50.0%)	6.0 (31.6%)	36.0 (36%)
Coagulase negative staphylococci	3 (10.7%)	2 (6.7%)	1.0 (5.9%)	1.0 (16.7%)	2.0 (10.5%)	9.0 (9%)
Streptococcus spp	2 (7.1%)	2 (6.7%)	0.0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	4.0 4%)
Pseudomonas aeruginosa	9 (32.1%)	15 (50.0%)	4.0 (23.5%)	1.0 (16.7%)	5.0 (26.3%)	34.0 (34%)
Citrobacter freundii	0 (0.0%)	0 (0.0%)	2.0 (11.8%)	1.0 (16.7%)	1.0 (5.3%)	4.0 (4%)
E.coli	2 (7.1%)	0 (0.0%)	1.0 (5.9%)	0.0 (0.0%)	1.0 (5.3%)	4.0 (4%)
Proteus Mirabilis	1 (3.6%)	0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (5.3%)	2.0 (2%)
Klebsiella spp	0 (0.0%)	0 (0.0%)	0.0 (0.0%)	0.0 (0.0%)	2.0 (10.5%)	2.0 (2%)
Enterobacter spp	0 (0.0%)	0 (0.0%)	1.0 (5.9%)	0.0 (0.0%)	0.0 (0.0%)	1.0 (1%)
Acinetobacter spp.	0 (0.0%)	2 (6.7%)	1.0 (5.9%)	0.0 (0.0%)	1.0 (5.3%)	4.0 (4%)
Total	28 (99.9%)	30 (100%)	17.0 (100%)	6.0 (100%)	19.0 (100%)	100 (100%)

both adults and children. *Staphylococcus aureus* was the most prevalent pathogen in the adults.

Table10 Pattern of antibiotic sensitivity

Antibiotic tested	Sensitivity profile: Number of isolates sensitive to the tested antibiotic
Amoxyclav (1 µg)	21(21%)
Gentamicin(10 µg)	47(47%)
Cefotoxime(10µg)	46(46%)
Co trimaxazole(25 µg)	48(48%)
Amikacin(30 µg)	73(73%)
Ciprofloxacin(5 µg)	33(33%)

The above table shows the antibiotic susceptibility pattern of organisms isolated.

DISCUSSION

The current investigation revealed that the highest proportion of patients fell within the age range of 1 to 10 years, accounting for 31 individuals, or 28.4% of the total cohort. Which is correlating with study by A S Adoga et al in a total of 80 patients 24(30%) children were below 10 years of age [15]. Mohammed Jamiu Kazeem, Ruqayyah Aiyeleso et al studied 380 patients with CSOM, maximum number patients were in the age group of 0-10(67.4%)[10]. A cross sectional study by Ashib Parvez et al, majority of the children were in the age group of 8 to 10 years(38.5%) fallowed by 6 to 8 years(36.4%)[11]. In a study by Y.K.Harshika et al, highest incidence in children with age group of 1 to 10 years (20.76%) fallowed by 11 to 20 years (18.4%) age group[12].

Geeta S. H. *et al*. examined 250 CSOM samples; 30.4% of the patients in their study were between the ages of 0 and 10[13]. The current study and this study are related. In the current study, males were more impacted (64%) than females (36%). 204 CSOM samples were examined by Rajat Prakash *et al*. They found that women (53.92%) were more likely than men (46.08%) to be impacted[14].Additionally, a research by A. S. Adoga et al. that included 30 males (37.5%) and 50 females (62.5%) found that females were more impacted than males[15].

When Swarooparaniet al. examined 99 CSOM patients, they found that men were more likely to be impacted (56.6%) than women (43.4%)[6]. Of the 62 patients in a research by Sanjay Kumar *et al*., 38 (61.29%) were men and 24 (38.7%) were women[16].In their study of 120 CSOM patients, Vijay Kumar Poorey et al. found that 68 (56.66%) of them were men and 52 (43.34%) were women[4]. A study by Y.K. Harshika et al. found that men were more likely than women to have CSOM (53.07%)[12]. Additionally, S. Nikakhlagh *et al.*'s study revealed that men were more prevalent (54%) than women (46%) [17].These studies support the current investigation.

According to the current study, the incidence of CSOM cases was higher in rural areas (66%) than in urban areas (34%). According to a study by Ashib Parvez *et al*., 6.1% of the 630 children in the study had CSOM, and 7% of them lived in rural areas. and 1.8% came from cities. It was discovered to be connected with the child's nutritional status and the standard of life index [11]. Additionally, among the 125 patients in a research by Arti Agrawal et al., 70 (56.0%) came from rural areas and 55 (44.0%) from metropolitan areas[18].Our study was associated with this one.

The most prevalent pathogens in both children and adults in the current investigation were Staphylococcus aureus and Pseudomonas species.This finding correlated with Geeta S H et al[13] and Swarooparaniet al[6].

Unilateral infection was more prevalent in this study (82%) than bilateral infection (18%). Adoga et al., examined 80 CSOM patients and discovered bilateral CSOM in 6 cases and unilateral CSOM in 74 cases[9]. In a study of 380 patients, Mohammed Jamiu Kazeem, Ruqayyah Aiyeleso, et al. found that 3.4% of cases had unilateral CSOM and 96.6% had unilateral[10]. 120 of the 127 ear swabs in a research by Vijay Kumar Poorey et al. were bilateral, and seven of them were bilateral[4]. In 2009, Swarooparaniet al. conducted a study on 80 CSOM patients, reporting 76.8% unilateral and 23% bilateral[6]. Additionally, Sanjay Kumar et al. examined 62 individuals; of these, 54 (87.09%) had unilateral disease and 8 (12.09%) had bilateral disease[16].These results are in line with current.

23 (21%) of the specimens in the current investigation tested negative for the culture, while 86 (79%) tested positive. The other studies likewise have different cultural outcomes. 116 (91.34%) of the 127 ear swabs that were taken for the study by Vijay Kumar Poorey et al. produced microbial growth. This finding may be explained by the efficacy of the previous antibiotic treatment, inadequate methods for collecting ear swabs, and sending swabs for cultures when the diagnosis is unclear[4]. In a study by Sateesh Kumar Malkappa *et al*., 130 samples were included. of which 126 samples (96.92%) tested positive for culture[8].130 instances were examined by Y.K. Harshika et al. Of the 130 instances, 14 (10.7%) had no growth or skin contaminants, and 116 (89.5%) were culture positive[12]. 186 CSOM patients were investigated by Rajat Prakash et al. They found that 18 (8.82%)% of the cases in their study had negative cultures[14].This study is consistent with ours.

Out of 86 culture-positive cases, 100 bacterial isolates were obtained. *Staphylococcus aureus* 36 (36%) was the most frequently isolated organism, followed by *Pseudomonas* spp. 34 (34%), and Coagulase-negative *Staphylococcus* 9 (9%). The remaining four percent each are *Streptococcus* spp., *Acinetobacter* spp., *Citrobacter* spp., and *E. coli*. *Enterobacter* spp. were identified from one sample (1%), whereas *Klebsiella* spp. and *Proteus vulgaris* 2 (2% each) were isolated.

Pseudomonas spp. was the most common gram-negative bacillus recovered in the investigation by Mohammed Jamiu Kazeem et al[10]. According to research by Kenna *et al*.[19], Fliss et al.[20], Papastavros *et al*.[21], Arguedas as al[22] and Brook *et al*[23], *Pseudomonas* spp. was the most common bacteria recovered from the patients with CSOM.

32.4% of the *Staphylococcus aureus* in the S. Nikhakhalagh et al. investigation were followed by *Pseudomonas aeroginosa* (21.6%)[17].S. aureus 47 (37.6%) was the most common organism in a research by Arti Agrawal *et al*., followed by *P. aerogionosa* 41 (32.8%), *Klebsiella pnemoniae* 5 (4%), *E. coli* 4 (3.2%), *Streptococcus pneumoniae* 2 (1.6%), and *Proteus mirabilis* 1 (0.8%)[18]. Our research findings are consistent with those of the aforementioned studies. Vijay Kumar Poorey et al. examined 120 cases, 116 of which were culture-positive. They discovered that *P. aerogenosa* spp. (37.21%) was the most common bacterium, followed by *Staphylococcus* spp. (24.81%)[4]. *Proteus mirabilis* and *citrobacter* spp. 8 (5.75%) each, *E. coli* (3.59%), *Enterobacter* spp. 3 (2.15%), *Acinetobacter spp*. CONS2 (1.43%) each, *Staphylococcus aureus* 30 (21.58%), *Klebsiella* spp. 13 (9.35%), and *P.aeroginosa46* (30.09%) were the most frequently isolated aerobic organisms in a study by Y K. Harshika *et al*[12].

CONCLUSION

In our nation's rural areas, the prevalence of CSOM is still significant and typically found in younger age groups. Complication rates can be decreased by early detection of CSOM and proper treatment. Controlling infection presents the most treatment challenge because of its recurrent nature and the emergence of resistant pathogenic organisms. Before beginning empirical therapy, it is crucial to understand the local microbial flora in CSOM.

Statements and Declarations

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