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Original Research Article

Microbiological Profile and Antibiotic Susceptibility Pattern of CSOM Cases in Garhwal (Uttarakhand) Community Presents at Tertiary Care Center, Pauri.

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Abstract

Objectives: This present study was to evaluate the microbiological profile and antibiotic susceptibility pattern of CSOM patients at tertiary care center Pauri, Uttarakhand, India.
Methods: Two swabs were taken in each patient. One swab was used for making smears on clean glass slides for the microscopy using grams' staining. The other swab was used for culture for the isolation of aerobic bacteria and was inoculated onto Blood agar, Chocolate agar and MacConkey's agar. Blood agar and Chocolate agar were incubated at 370C with 3-5% CO2 (in candle extinction jar) and MacConkey's agar was incubated at 370C.The agar plates were examined after 24 and 48 h. The plates showing no growth at 48 h were discarded and labelled as negative. The plates showing bacterial growth were identified by standard techniques based on morphological, cultural and biochemical characteristics. Antibiotic sensibility testing was performed by using Kirby–Bauer disc diffusion method. Interpretation of the sensitivity pattern was done according to CLSI (Clinical Laboratory Standards Institute) guidelines.
Results: Out of 100 CSOM patients, 59(59%) patients were female. Unilateral infection (68.24%) was more common than bilateral (27.34%). 89(89%) cultures were positive for the growth of organism and 11(11%) were sterile cultures. Most common organisms isolated were Staphylococcus aureus 43(41.75%) and Pseudomonas aeruginosa 31(30.09%.
Conclusions: CSOM was more preponderance in female gender. Staphylococcus aureus was the most common organism isolated followed by Pseudomonas aeruginosa. Ofloxacin was the highest antibiotic susceptibility rate. Hence, antibiotic susceptibility pattern of the CSOM causing organisms keeps changing according to time and geographical region. So that, routine antibiotic susceptibility testing should be done at certain interval to guide empirical treatment.
Keywords: CSOM, Microbiological profile, Antibiotic susceptibility

Introduction

Chronic suppurative otitis media (CSOM) is the most common chronic disease seen especially in infants and children causing conductive hearing loss which may lead to delayed development of speech and language in children [1]. The infection may occur during the first 5 years of child s life, with a peak around 2 years [2]. Incidence of CSOM is higher in developing countries especially among low socio-economic society because of malnutrition, overcrowding, poor hygiene, inadequate health care, and recurrent upper respiratory tract infection [3,4]. The feature which is common to all the cases of CSOM is the presence of perforated tympanic membrane. It is classified into two types, tubo tympanic and attico antral basing on the affection of pars tensa or the pars flaccida of the tympanic membrane [5]. The complications associated with CSOM are tympanic membrane perforation, hearing impairment, Middle ear granulation, facial nerve palsy, neck rigidity, death and severe disability occurs due to involvement of Central nervous system [6].

CSOM is an important cause of preventable hearing loss. Inadequate treatment can result in severe, life-threatening adverse effects, such as intracranial and extracranial complications. Because CSOM can cause significant morbidity, the identification of the microorganisms responsible for CSOM can help in the selection of the most appropriate antibiotic for the treatment regimen [7]. Objectives of our study was to evaluate the microbiological profile and antibiotic susceptibility pattern of CSOM patients at tertiary care center Pauri, Uttarakhand, India.

Materials & Methods

This present study was conducted in Department of ENT with the collaboration of Department of Microbiology in VCSG GIMS & R, Pauri, Garhwal, Uttarakhand, India during a period from January 2021 to December 2021. Attendants of entire subject signed an informed consent approved by institutional ethical committee of VCSG GIMS & R was sought.

Methods:

A total of 100 patients with history of ear discharge of more than three-month duration and diagnosed as a case of CSOM with irrespective of gender and demographic distribution were enrolled in study. The patients taking antibiotics currently or taken antibiotics in preceding five days (topical or systemic), having acute suppurative otitis media or otitis externa, recent ear surgery, traumatic perforation or grommet in situ, patients with systemic disease and unwilling/uncooperative patients were excluded from the study.

A detail history of the patients was performed. Systemic and general examination of ear, nose, throat, head and Neck were conducted thoroughly. Swabs were taken on the first day before any local medication was instilled with the patient lying comfortably. The external auditory canal of the discharging ear was cleaned with suction and then by mopping of the cartilaginous and lateral half of the external bony canal with sterile cotton pledged in a probe, after donning sterile gloves. The material for culture were obtained from the affected ears using thin sterile cotton wool swabs with full aseptic precautions without touching the pinna or any other parts of the ear with swabs during insertion into ear or during removal.

Two swabs were taken in each patient. One swab was used for making smears on clean glass slides for the microscopy using grams' staining. The smear and swabs were

processed immediately in the department of microbiology. The other swab was used for culture for the isolation of aerobic bacteria and was inoculated onto Blood agar, Chocolate agar and MacConkey's agar. Blood agar and Chocolate agar were incubated at 370C with 3-5% CO2 (in candle extinction jar) and MacConkey's agar was incubated at 370C.The agar plates were examined after 24 and 48 h. The plates showing no growth at 48 h were discarded and labelled as negative. The plates showing bacterial growth were identified by standard techniques based on morphological, cultural and biochemical characteristics [8]. Culture for anaerobic organisms was not performed. The isolated bacteria were tested for susceptibility to Penicillin, Chloramphenicol, Ampicillin, Ceftriaxone, Gentamicin, Ciprofloxacin, Ofloxacin, Tobramycin, Ceftazidime, Amikacin, by using Kirby–Bauer disc diffusion method [28]. Interpretation of the sensitivity pattern was done according to CLSI (Clinical Laboratory Standards Institute) guidelines [9].

Statistical Analysis

Data was analysed by the simple statistical methods with the help of MS-Office software. All data was tabulated and percentages were calculated.

Observations

A total of 100 patients of CSOM were enrolled in this study. Patients ranged in age from 1 years to >60 years. Majorities of patients (58%) were in age group of 11-20 years.

In this present study, most of the 59(59%) patients were female. Unilateral infection (68.24%) was more common than bilateral (27.34%). Among 100 swab cultures, 89(89%) cultures were positive for the growth of organism and 11(11%) were sterile cultures. 87(87%) Gram stain positive was found in swab culture and bacteria was isolated. 3(3%) swabs were sterile and bacteria was seen. 4(4%) swab were gram stain positive, but bacteria was not isolated. 6(6%) were sterile and bacteria was not seen.

Among the swabs with growth, 80% yielded monomicrobial organism, 12% yielded polymicrobial isolation, 13% swabs isolated 2 organisms while 3% swabs yielded 3 organisms.

The antimicrobial sensitivity pattern of the organism isolated were:

Staphylococcus aureus: Highest rate of sensitivity was seen with Ofloxacin (90.75%) followed by Ciprofloxacin (80.11%), Tobramycin (71.23%), Gentamicin (62.14%), and Chloramphenicol (51.67%). Maximum resistance was seen with Penicillin (82.23%).

Pseudomonas aeruginosa: Highest rate of sensitivity was seen with Ofloxacin (89.32%) followed by Tobramycin (81.23%), Ciprofloxacin (72.45%), Gentamicin (63.12%), and ceftriaxone (54.78%). Maximum resistance was seen with Chloramphenicol (55.17%).

Klebsiella pneumonia: All isolate of the Klebsiella pneumoniae were sensitive to ofloxacin (100%). A high rate of sensitivity was seen with Amikacin (92.45%) followed by Ciprofloxacin (65.87%) and Gentamicin (56.43%). A lower rate of sensitivity was with Tobramycin (49.32%) and Chloramphenicol (34.65%). All isolate was resistant with Ampicillin (100%).

Acinetobacter anitratus: All isolate of the Acinetobacter anitratusare sensitive to ofloxacin (100%), Amikacin (100%) and Gentamicin (100%). A high rate of sensitivity was seen with Ciprofloxacin (89.12%) and Tobramycin (78%). A lower rate of sensitivity was with Chloramphenicol (49%). All isolate was resistant with Ampicillin (100%).

Proteus mirabilis:

All isolate of the Proteus mirabalis are sensitive to ofloxacin (100%). A high rate of sensitivity was seen with Amikacin (93.32%) followed by Ciprofloxacin (68.22%) and Gentamicin (57.78%). A lower rate of sensitivity was with Tobramycin (51%) and Chloramphenicol (32.54%). All isolate was resistant with Ampicillin (100%).

Table 1: Showing the correlation of gram stain and culture (n=100).

Gram stain	Culture growth	No. of cases	Percentage
Bacteria seen	Positive	87	87%
Bacteria seen	Sterile	3	3%
Bacteria not seen	Positive	4	4%
Bacteria not seen	Sterile	6	6%

In this present study, gram stain positive was seen in 87(87%) of culture growth.

Table 2: Showing the culture of Swabs

Culture of Swabs	Number of growths	Percentage (%)
Sterile	11	11%
Positive for growth of Organism	89	89%
Total	100	100%

Table 3: Showing the type of isolated organisms

Organisms	Number	Percentage
Staphylococcus aureus	43	41.75%
Proteus mirabilis	6	5.82%
Escherichia coli	5	4.85%
Enterobacter species	2	1.94%
Acinetobacter anitratus	7	6.79%
Streptococcus pyogenes	1	0.9%
Klebsiella pneumoniae	8	7.76%
Pseudomonas aeruginosa	31	30.09%

Discussions

The World Health Organization defines chronic suppurative otitis media (CSOM) as ear discharge through a perforated tympanic membrane present for more than 12 weeks [10]. It is characterized by a chronic inflammation of the middle ear and mastoid cavity, followed by permanent abnormality of the pars tensa or flaccida. Varying degrees of edema; submucosal fibrosis and hypervascularity; and infiltration with lymphocytes, plasma cells, and histiocytes result in the production of pus discharge [11].

In our present study, majority of the patients (59 %) were females and most of the cases (58%) were in 11-20 years of age who suffered from CSOM and similar findings had been reported by Lou et al [12] and Prakash et al. [13] In contrast, CSOM was more common in male patients in a study by Ahmed et al. [14] In our study, majority (87 %) of the sample showed positive growth and 13% of the sample were sterile. This is accordance with Vijaya et al [15] who found 5.28% sterile samples in their study whereas Fatma et al [16] (16.9%) and Chakraborty et al [17] (12.6%) found higher percentage of culture negative

samples in their studies. Monomicrobial growth was seen in majority (80%) of cases and polymicrobial growth seen in only 12% of cases which is similar to the previous study by Agarwal et al [18]. The predominant organism isolated in our study was Staphylococcus aureus (41.75%) followed by Pseudomonas aeruginosa (30.09%), Acinetobacter anitratus (6.79%), Klebsiella pneumoniae (7.76%), Proteus mirabilis (5.82%). This is in accordance with the previous studies [19,20]. Taneja et al [21] had isolated Staphylococcus aureus as the most common organism in their study, but the percentage of isolation (33.3%) was lesser when compared to our study. Kuchal et al [22] also showed that in his study, S. aureus was the most common isolate followed by Pseudomonas sp. Shyamala et al [23] also has found out that these two were the predominant organisms isolated from the otitis media cases. Many of the previous studies showed Pseudomonas sp. to be the most common bacteria isolated from CSOM cases [24,25]. But Pseudomonas sp. was the second most common organism in our study, isolated from 30.09% cases. This is similar to a study by Sharma et al [26] who reported Pseudomonas in 36% cases. In our study, Staphylococcus aureus and Pseudomonas sp. together account for about 71.84% of cases and this is in consistent with the study by Aslam et al. [27] Among the gram negative pathogens, next to Pseudomonas, Klebsiella pneumoniae (7.76%) was the other common pathogen followed by Acinetobacter (6.79%) and Proteus sp. (5. 82%). This is similar to the study by Loy et al [12].

Antibiotic susceptibility pattern was tested for all the isolated organisms. Most of the isolates were found to be susceptible to Ofloxacin. However, most of the organisms showed resistance to amoxicillin which is similar with Chakraborty et al [14] (95.4%) and Malkappa et al. [24] (90%). Staphylococcus aureus was found to be highly susceptible to ofloxacin (90.75%) followed by Ciprofloxacin (80.11%), Tobramycin (71.23%) and Gentamicin (62.14%). Pseudomonas Sp. was found to be highly sensitive to ofloxacin (89.32%) followed by Tobramycin (81.23%), Ciprofloxacin (72.45%) and Gentamicin (63.12%). The gram-negative isolates were fairly susceptible to ciprofloxacin, third generation cephalosporin and gentamicin. Agarwal et al [18] study shows that Staphylococcus species was high (80-85%) with moxifloxacin, levofloxacin, and doxycycline among the commonly used antibiotics. Pseudomonas aeruginosa was 100% sensitive with colistin, polymyxin B, and carbapenems. Its sensitivity was about 60-70% with the commonly used antibiotics, viz. cephalosporins and fluoroquinolones.

In routine practice, patients with draining ears receive topical antibiotic ear drops, and ear swab culture is performed only in recalcitrant cases. Apart from patient negligence, the widespread and indiscriminate use of antibiotics also precipitates the emergence of multiple resistant strains of bacteria, resulting in treatment failure. Infection with multidrug-resistant pathogens is responsible for the increased duration of treatment and follow-up as well as increased cost of management. The present study was focused on causative agent for CSOM which are usually from community, therefore their susceptibility pattern might be different from hospital antibiogram. Even though the bacterial pathogens were already defined but the different distributions in different age groups and the declining pattern of antibiotic sensitivity were something important that may be considered in the management of the patients.

Conclusions

This present study concluded that CSOM was more preponderance in female gender. Staphylococcus aureus was the most common organism isolated followed by

Pseudomonas aeruginosa. Ofloxacin was the highest antibiotic susceptibility rate. Hence, antibiotic susceptibility pattern of the CSOM causing organisms keeps changing according to time and geographical region. So that, routine antibiotic susceptibility testing should be done at certain interval to guide empirical treatment.

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