CURRENT TRENDS IN MICROBIAL PROFILE AND RESISTANCE PATTERN IN CSOM IN A SEMIURBAN HOSPITAL OF SOUTHERN INDIA

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ABSTRACT

BACKGROUND

Infections of the middle ear space and their sequelae have plagued mankind from the beginning of time. Since there are variations in aetiological agents and their antimicrobial susceptibility patterns regionally. It is pertinent to carry out ongoing studies to observe the profile of aetiological agents and their resistance patterns. This would help clinicians to prescribe appropriate and effective antibiotics and prevent emergence of Multi-Drug Resistant (MDR) bacteria.

AIM

To study the spectrum of aerobic bacterial and fungal aetiological agents among patients clinically diagnosed as CSOM.

METHODS AND MATERIAL

This study was conducted on 105 patients of clinically diagnosed cases of CSOM attending ENT OPD of a semi-urban tertiary care level hospital. After proper sample collection by sterile aural swabs, they were immediately sent to the microbiology laboratory for aerobic bacterial and fungal culture, isolation and identification. Routine antibacterial susceptibility and detection of MRSA and ESBL was carried as per CLSI guidelines.

RESULTS AND CONCLUSION

The commonest age group affected was 10 months - 10 years (30/28.5%), mainly affecting males (59.4%). Patients were mainly from rural background (81.91%) and majority of cases were reported in the months of May to August. Out of 105 patients, Gram negative isolates were 54 (51.4%) and Gram positive isolates were 34 (32.4%), 10 (9.5%) were fungal isolates and remaining 12 (11.4%) showed no growth. P. aeruginosa (34.3%) was the predominant bacterial organism isolated followed by Staphylococcus aureus (28.6%). Out of 30 isolates of S. aureus, 10 (33.3%) were MRSA and out of 18 Gram negative isolates, 6 (33.3%) were ESBL producers. Antibiogram of all isolates revealed that Amikacin was the most sensitive drug amongst all gram positive and gram negative organisms. Imipenem was the most sensitive drug among gram negative isolates, whereas Vancomycin was the most sensitive drug among gram positive isolates.

KEYWORDS

CSOM, MRSA, ESBL.

HOW TO CITE THIS ARTICLE: Bhumbla U, Gupta P, Mathur DR, et al. Current trends in microbial profile and resistance pattern in CSOM in a semiurban hospital of Southern India. J. Evolution Med. Dent. Sci. 2016;5(34):1917-1921,
DOI: 10.14260/jemds/2016/454

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is the most common childhood infections and is the most common cause of hearing impairment in the developing world.[1] CSOM is characterized by drainage from the middle ear for at least two weeks and is associated with a tympanic membrane perforation that is usually painless.[2] The aetiology of CSOM is complex, aerobic bacteria are responsible for 74% cases and the rest are anaerobes, fungi and mixed infections. Indiscriminate use of antibiotics and poor follow-up of patients may result in persistent low-grade infection and development of bacterial resistance leading to intratemporal and intracranial complications.[2,3]

Financial or Other, Competing Interest: None.
Submission 11-03-2016, Peer Review 06-04-2016,
Acceptance 12-04-2016, Published 28-04-2016.
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DOI: 10.14260/jemds/2016/454

Since there are regional variations in aetiological agents and their antimicrobial susceptibility patterns, it is pertinent to carry out prospective studies to observe the profile of aetiological agents and their resistance patterns in order to prescribe appropriate and effective antibiotics and prevent emergence of Multi-Drug Resistant (MDR) bacteria.

AIMS AND OBJECTIVES

1. To study the spectrum of aerobic bacterial and fungal aetiological agents among patients clinically diagnosed to have CSOM attending ENT Outpatient Department (OPD).
2. To study the pattern of antibiotic sensitivity of isolates with special reference to Methicillin Resistant Staphylococcus Aureus (MRSA) and Extended Spectrum of Beta Lactamases (ESBL).

MATERIALS AND METHODS

The study was conducted over a period of 12 months (January to December). The study group comprised of 105 consecutive patients presenting with symptoms of CSOM to the ENT OPD in a semi-urban hospital of Southern India. Patients with symptoms of CSOM were evaluated as per the study protocol.

The study was approved by Institutional Ethical Committee and written informed consent was taken from the patient/guardian.

Inclusion Criteria

All clinically diagnosed new cases of CSOM (Tubotympanic) of all groups and both sexes attending ENT Outpatient Department with history of prolonged otorrhoea (More than 2 weeks' duration) were included in the present study.

Exclusion Criteria

All diagnosed cases of otitis externa, foreign body in the external auditory canal, atticoantral type of CSOM and patients on antibiotics since last one week were excluded from the present study.

Details like age, gender, address, duration of ear discharge, etc. were noted in a case record form. Ear discharge was collected under all aseptic precautions using two sterile cotton swabs and transported to microbiology laboratory without any delay. One of the swabs was used for carrying out aerobic culture on 5% sheep blood agar, MacConkey agar and chocolate agar and incubated at 37^{0}C for 48 hours. Second swab was used for fungal culture and inoculated on two Sabouraud's dextrose agar with Chloramphenicol and incubated at 37^{0}C and 28^{0}C. Organisms isolated were identified using standard laboratory procedures.[3-5]

Antibiotic sensitivity testing was performed on Mueller Hinton Agar according to CLSI guidelines. MRSA was detected using Cefoxitin (30 ug) disc.[6] and ESBL production in Gram negative bacteria was detected by using Potentiated Disc Diffusion Test (PDT).[7,8]

RESULTS

Ear discharge was collected from 105 patients diagnosed to have CSOM, of which 62 (59.1%) were males and 43 (40.9%) were females.

Age ranged from 10 months to 65 years with maximum number of cases seen between the age group of 10 months -10 years (30/28.5%) as shown in Table 1. Cases of CSOM came mainly from rural areas (86/81.91%) as compared to urban areas (19/18.09%) and the peak season of CSOM (53/50.5%) was observed during the month of May-August as shown in graph.

Bacterial/Fungal Isolates

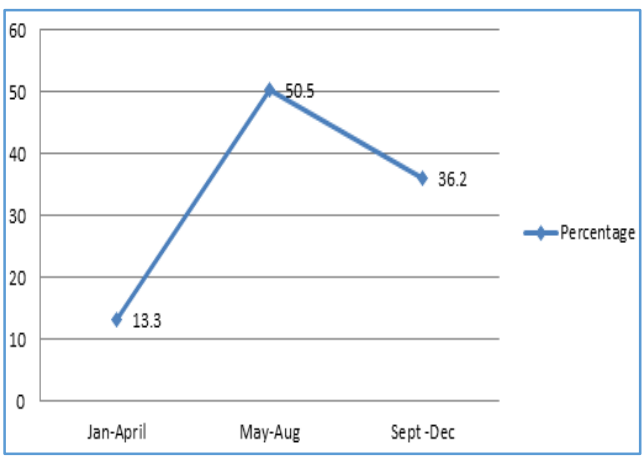
Out of 105 cases, 93 (88.5%) were culture positive for either bacterial/fungal growth. Out of these 93 cases, 83 (79%) showed growth of bacteria and 10 (9.23%) cases showed growth of fungi. No growth was observed in 12 (11.4%) cases. Out of 83 bacterial culture positive cases, 78 were monobacterial and 5 were polybacterial and total bacterial isolates obtained were 88 out of 88 bacterial isolates; P. aeruginosa was the commonest (36/34.3%) followed by S. aureus (30/28.6%). Candida albicans 7 (6.7%) and Aspergillus niger 3 (2.8%) were the only fungi isolated as shown in Table 2.

Antibacterial Susceptibility Profile

Gram positive bacteria showed maximum susceptibility to Vancomycin and Amikacin, whereas gram negative isolates showed maximum susceptibility to Imipenem and Amikacin. P. aeruginosa isolates showed maximum susceptibility to Imipenem and Ceftriaxone; 33.3% of S. aureus isolates were MRSA and 33.3% of Gram negative isolates were ESBL producers as shown in Table 3.

Age (Years)	Male		Female		Total (No. of Cases)
	No. of Cases	% Age	No. of Cases	% Age	
10 months-10	19	30.9	11	25.5	30
11-20	18	28	09	22.9	27
21-30	14	22.5	06	13.9	20
31-40	04	6.4	09	20.9	13
41-50	04	6.4	04	9.3	08
51-60	02	3.2	02	4.6	04
>60	01	1.6	02	4.6	03
Total	**62**	**59.1%**	**43**	**28.5%**	**105**

Table 1: Age and Sex Distribution of CSOM Cases



Graph Showing Seasonal Trend of CSOM

Organisms	Total No. of Cases
Monomicrobial	
Pseudomonas aeruginosa	33
Staphylococcus aureus	28
Proteus mirabilis	06
Klebsiella pneumoniae	05
Streptococcus pyogenes	04
Acinetobacter spp.	02
Candida albicans	07
Aspergillus niger	03
Polymicrobial	
P. aeruginosa + K. pneumoniae	02
P. aeruginosa + S. aureus	01
S. aureus + P. mirabilis	01
K. pneumoniae + P. mirabilis	01
No growth	12

Table 2: Distribution of Bacterial and Fungal Isolates (n=105)

Antibiotics	Gram Positive Isolates n =34	Gram Negative Isolates n =18	Pseudomonas Aeruginosa n =36
Vancomycin (VA)	100%	-	-
Clindamycin (CD)	26.5%	-	-
Linezolid (LZ)	76.5%	-	-
Erythromycin (E)	55.9%	-	-
Ampicillin(AMP)	61.8%	-	-
Amoxyclav (AMC)	52.9%	-	-
Ceftriaxone (CTR)	73.5%	55.6%	72.2%
Cefoxitin (CX)	70.6%	-	-
Cefotaxime(CTX)	-	44.4%	-
Ceftazidime(CAZ)	-	38.9%	61.1%
Gentamicin(GEN)	41.2%	38.9%	33.3%
Amikacin (AK)	82.4%	72.2%	69.4%
Imipenem(IPM)	-	94.4%	86.1%
Piperacillin + Tazobactam(TZP)	-	66.7%	66.7%
Cefpodoxime(CPZ)	-	50%	-
Ciprofloxacin(CIP)	-	33.3%	36.1%
Netilmicin(NET)	-	-	44.4%
MRSA	**33.3%**	-	-
ESBL producers	**-**	**33.3%**	-

Table 3: Antibiotic Sensitivity Pattern of Bacterial Isolates

DISCUSSION

CSOM is one of the most common ear problems encountered in a day-to-day ENT/Paediatric practice and if left untreated may cause hearing loss and other complications like mastoiditis, labyrinthitis, brain abscess, meningitis, lateral sinus thrombophlebitis, etc. The present study was conducted over a period of 12 months to evaluate the type of microorganisms and their antimicrobial susceptibility in cases of CSOM.

In the present study males (59.1%) were affected more than female (40.9%), which is in accordance to other studies.[9-11], but in contrast to findings of some workers.[12-15] where females were more affected than males. Since adult male and female ear has no anatomical differences, either sex can be equally affected.

Prevalence of CSOM was mainly seen in rural areas (81.9%) as compared to the urban areas (18.1%). Mohammad Y et al[16] (84%), Srivastava A et al[17] (80.3%), Aggarwal A et al[10] (56%) and R Shyamala et al[11] (73%), also showed a predominance of cases from rural areas because of low socio-economic status, lack of personal hygiene and poor educational status.

Maximum cases of CSOM were seen between the age group of 10 months – 10 years (30/28.5%) and 11 to 20 years (25.7%), wherein both accounted for 54.2% of the cases. This finding corroborates well with the observations made by other researchers.[11,17-19] Higher prevalence of CSOM in children may be attributed to the fact that they are more prone to Upper Respiratory Tract Infections (URTIs) and due to relatively short Eustachian tube, infected material from the nose, adenoids and sinuses can more readily enter the Eustachian tube and to the middle ear, particularly during coughing, sneezing, vomiting, forced feeding and improper breast and bottle feeding a commonly practiced custom in our country.[20] Furthermore, cold weather predisposes children to URTIs which allows proliferation of pathogens leading to blockage of Eustachian tube.[21]

In the present study, prevalence of CSOM was mainly seen during the rainy season (50.5%) of May-August in South India and even during September to December (36.2%). Seasonal variations have been reported from both tropical and temperate regions. According to Ibekwe, inactive chronic otitis media becomes active during rainy season in West Africa and similar observation was also made in America and Europe during winter season.[22] In India, the disease is more commonly seen during rainy season.[23-25]

Analysis of the 105 ear swabs collected revealed that monobacterial growth was seen in 74.3%, polybacterial growth was seen in 4.8%, fungal growth was seen only in 9.5% and 11.4% samples showed no growth. Similarly, Poorey V K et al[26] reported pure growth from 82%, mixed growth in 10%, and no growth in 8%. Prakash R et al[17] from Uttarakhand reported monomicrobial aetiology in 51.84%, polymicrobial growth in 33.33% and 8.82% showed no growth. In contrast, some researchers found polymicrobial aetiology more prominent in otitis media.[20,25] Difference in results of various authors could have been due to the differences in the patient population group studied and geographical variations.

In the present study, P. aeruginosa 36 (34.3%) was the predominant organism followed by S. aureus 30 (28.6%). This finding correlates with almost all studies conducted in India and other tropical countries, where either one or the other is the predominant pathogen. In some of the Indian studies, P. aeruginosa followed by S. aureus were the predominant isolates.[9,26,27,28,29,30] whereas in others S. aureus followed by P. aeruginosa was the predominant isolate.[17,21,31] Probably, it could be due to the fact that S. aureus is part of skin flora and can gain entry easily into the middle ear and P. aeruginosa acts as an opportunistic pathogen and gain entry from outside through the perforation in tympanic membrane. Like other studies, our study revealed that both gram-positive and gram-negative organisms were responsible for infection of middle-ear and gram-negative rods outnumbered the gram-positive organisms in causing CSOM.[17]

Fungal infections of the middle-ear are common and the most commonly found fungi in CSOM are Candida species and Aspergillus species. Fungal growth obtained in the current study (9.23%) included Candida albicans 7 (6.6%) and Aspergillus niger 3 (2.8%), which correlated with studies of Arvind N et al[27] (2%), Srivastava A et al[17] (1.9%) and Prakash M et al[29] (1.5%). Fungal infections are promoted due to poor hygienic conditions, environmental factors and previous use of antibiotics.

For better management of CSOM, aetiological identification of infection and conducting drug susceptibility tests are essential in guiding the physician to prescribe effective antimicrobials. From the analysis of the current study and comparison with the findings of other researchers, it is clear that microbial profile and antimicrobial sensitivity pattern of CSOM has been changing over a period of time. Geographical variations and difference in patient population could be the possible factors for variability. Indiscriminate antibiotic usage as well as negligence on part of the patient to continue taking antibiotics beyond the prescribed duration and dose promotes the emergence of antimicrobial resistance. Furthermore, Gentamicin and Ciprofloxacin ear drops are frequently prescribed to patients with CSOM and in our study it was observed that these were the least sensitive antibiotics,

this may have been promoted by injudicious use of broad spectrum antibiotics.

Vancomycin (100%) followed by Amikacin (81.2%) were found to be the most sensitive antibiotics for gram positive isolates, which correlated with other studies.[17,27,32,33]

Imipenem 92.3% followed by Amikacin (61.5%) were the most sensitive drugs for gram negative isolates and this was in concordance with the study of Arvind N et al[27] and Chakraborty B et al.[32]

Imipenem (84.8%) followed by Ceftriaxone were the most sensitive drugs for the P. aeruginosa isolates, which correlated with the study of Arvind N et al[17] and Aggarwal A et al.[16] Other antibiotics like Amikacin, Ceftazidime, Piperacillin and Tazobactam were also sensitive to Pseudomonas, which correlated with the study of Chakraborty B et al, Bansal S et al and Raghavendra SG et al.[32,33,34]

Of 28 S. aureus isolates, 33.3% were MRSA which is similar to prevalence observed by other workers.[21,32,33,34] Of 18 Gram negative isolates, 33.3% were ESBL producers which correlated with the study of Chakraborty B et al[32] (28.6%). Hence, periodic surveillance for microbial aetiology of CSOM and their antibiotic sensitivity pattern in a local area can guide clinicians in prescribing antibiotics for effective treatment of CSOM and thus minimizing its complications.

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