MICROBIOLOGICAL STUDY OF CSOM AT KIMS - AMALAPURAM

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ABSTRACT

BACKGROUND

In India, Chronic Suppurative Otitis Media (CSOM) is a major public-health problem with a high-prevalence rate. Several organisms have been implicated in the causation of CSOM, posing a challenge to the management. This is further complicated by the problem of emerging antibiotic-resistant bacterial strains.

OBJECTIVE

We undertook the present study to identify the causative organisms in CSOM and their susceptibility patterns to antibiotics in a rural teaching hospital in South India.

METHODS

A total number of 100 ear swabs were bacteriologically investigated for the present study. All the swabs collected from patients with clinical diagnosis of CSOM visiting the ENT outpatient department of a rural teaching hospital from December 2014 to May 2015. All these are new patients who did not have recent treatment with antibiotics either locally or systemically. Another group of 30 ear swabs were collected from healthy individuals with no history of ear discharged for control study.

RESULTS

Of the 100 patients, 45 were males. Out of 100 swabs cultured, 95% were culture positive and 5% were culture negative. Of the culture positive cases, 70% were aerobes, 25% were anaerobes and 5% sterile. Further, of the 99% culture positive cases, gram positive isolates were 22(31.42%) and gram negative isolates were 48(68.57%).

The isolated organisms were Pseudomonas aeruginosa (n=26; 37.15%), Staphylococcus aureus (n=15; 21.43%), Klebsiella pneumonia (n=12; 17.15%), Proteus spp. (n=6; 8.57%), Escherichia coli (n=4; 5.72%), Coagulase Negative Staphylococcus (n=5; 7.14%), Streptococcus pyogenes (n=1; 1%), Streptococcus pneumoniae (n=1; 1%), Bacteroides (n=13; 52%), peptostreptococcus (n=11; 44%) and Fusobacterium (n=1; 4%).

When antibiotic susceptibility was assessed, organisms were most susceptible to amikacin, followed by g the Antibiotics tested for sensitivity of the Isolates Amikacin stands first followed by Gentamicin and Ciprofloxacin.

CONCLUSION

CSOM is a serious condition, which is the most common cause of hearing loss, especially in the developing world. In our study, Pseudomonas aeruginosa was the most common causative organism, and amikacin seemed to be the most effective antibiotic with low resistance rates.

KEYWORDS

CSOM, Aerobes, Anaerobes, Culture, Sensitivity, Pseudomonas, Amikacin.

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INTRODUCTION: Chronic Suppurative Otitis Media (CSOM) is the most common childhood infection globally. Additionally, it is the most common cause of hearing impairment, especially in the developing world.[1]

Further, the incidence is higher especially among those belonging to the low socio-economic groups due to factors like malnutrition, overcrowding, lack of hygiene, lack of access to adequate health care facilities and recurrent upper respiratory tract infection.[2] The highest prevalence is among the poorer rural communities.[3] In India, CSOM is a major public-health problem with a high-prevalence rate.

Several organisms have been implicated in the causation of CSOM, posing a challenge to the management. This is further complicated by the problem of emerging antibiotic-resistant bacterial strains, which currently is a significant cause of treatment failure.[4]

There is a need to understand the epidemiology and microbiology of CSOM in order to develop effective strategies for primary prevention and better management of the disease.[4]

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Therefore, we undertook the present study in order to identify the causative organisms in CSOM and their susceptibility patterns to antibiotics in a rural teaching hospital in South India.

METHODS: A total number of 100 ear swabs were bacteriologically investigated for the present study. All the swabs were collected from patients with a clinical diagnosis of CSOM attending the ENT outpatient department in a rural teaching hospital during the period December 2014 - May 2015. The included subjects had not been recently treated with antibiotics either locally or systemically. Further, 30 ear swabs were collected from healthy individuals with no history of ear discharge as controls. They were inoculated on blood agar and chocolate agar plates in duplicate, which were incubated aerobically and anaerobically. The organisms were identified according to standard bacteriological techniques.

RESULTS: A total of 100 ear swabs were cultured, of which in 70 swabs only growth of aerobes was observed and in 25 swabs only anaerobes. Five swabs did not show the growth of any pathogen (Table 1).

	Number	%
Total Swabs	100	-
Only Aerobes	70	70%
Only Anaerobes (Non-Sporing)	25	25%
Mixed growth of Aerobes and Anaerobes Isolated	0	-
No Growth	5	5%
Total number of Strains Isolated	95	-
Total Aerobic Strains Isolated	70	70.9%
Total Anaerobic Strains Isolated	25	29.1%

Table 1: Type of organisms isolated from the ear swabs

As described in Table 2, Pseudomonas aeruginosa was the most common aerobic organism isolated from the swab cultures (n=26; 37.15%), followed by S. aureus (n=15; 21.43%) and K. pneumoniae (n=12; 17.15%).

Organism	Number	Percentage
Pseudomonas aeruginosa	26	37.15%
Staphylococcus aureus	15	21.43%
Klebsiella pneumoniae	12	17.15%
Proteus species	6	8.57%
Escherichia coli	4	5.72%
Coagulase negative staphylococci	5	7.14%
Streptococcus pyogenes	1	1.42%
Streptococcus pneumoniae	1	1.42%
Total	**70**	**100%**

Table 2: Aerobic organisms isolated from ear swab cultures

Of the anaerobic organisms isolated, Bacteroides was the most common (n=13), followed by Peptostreptococcus (n=11) and Fusobacterium (n=1). The susceptibility patterns of these strains to metronidazole are shown in (Table 3).

	No. of Strains	Resistant	Susceptible
Bacteroides	13	0	13
Peptostreptococcus	11	2	9
Fusobacterium	1	0	1
Total	**25**	**2**	**23**

Table 3: Susceptibility pattern of isolated anaerobic organisms to metronidazole

The antibiotic resistance pattern of the aerobic isolates is shown in (Table 4).

Organism (n)	Amikacin	Gentamicin	Ciprofloxacin	Netilmicin	Cefotaxime	Erythromycin	Cotrimoxazole	Ampicillin
Pseudomonas spp. (26)	26	25	18	16	8	2	2	0
Staphylococcus aureus (15)	15	14	12	5	4	6	5	2
Klebsiella (12)	10	9	9	5	1	0	1	0
Proteus (6)	6	6	5	3	2	1	3	0
Escherichia coli (4)	4	3	3	2	0	1	1	0
Streptococcus pyogenes (1)	-	-	0	-	1	1	0	0
Coagulase negative staphylococci (5)	-	-	1	-	1	1	1	1

Table 4: Antibiotic sensitivity pattern of the aerobic isolates

DISCUSSION: The bacteriological study of CSOM revealed isolated of a variety of organisms. Of the 100 ear swabs were cultured, of which in 70 swabs, only growth of aerobes was observed, and in 25 swabs, only anaerobes. Five swabs did not show the growth of any pathogen. Among the control group of 30, 27 swabs showed positive culture and 3 showed no growth.

Different species isolated from aerobic cultures in this study is shown in (Table 3). Pseudomonas aeruginosa 30.4% is the most predominating organism followed by Staphylococcus aureus 21.4%, Klebsiella pneumonia 17%, Proteus species 15.2%, Escherichia coli 7.1%, coagulase negative Staphylococcus 5.3%, Streptococcus pyogenes 2.7% and Streptococcus pneumonia 0.9%. These results are in sync with the statement "the presence of multiple strains of both gram-negative and positive aerobes is the rule rather than an exception" made almost three decades ago (Scott Brown's Otolaryngology 5th ed. 1987).

There have been varied reports on the most common causative organism. Similar to our study findings, few studies report that Pseudomonas is the most commonly isolated pathogen.[2,5-7] In a recent study from North India, Staphylococcus aureus was the predominant pathogen in almost half of the patients.[3] We observed that S. aureus was the second most commonly isolated pathogen. An Egyptian study reports Proteus spp. to be the most frequently implicated organism in CSOM followed by Pseudomonas, in their study. Pseudomonas does not usually inhabit the upper respiratory tract and it probably gains access to the middle ear through a defect in the tympanic membrane.[3]

The sensitive pattern of the organisms isolated aerobically from CSOM cases to various antibiotics tested, reveals that Gram positive organisms were comparatively more sensitive than Gram negative organisms to all the antibiotics tested. When overall resistance pattern is considered Amikacin was found to be a more effective drug with only 2.7% of resistance followed by Gentamicin 7.1%, Ciprofloxacin 22.3%, Netilmicin 50.9%, Cefotaxime 70.5%, Cotrimoxazole 77.7%, Erythromycin 80.4% and Ampicillin 94.6%.

Similar to our study findings, Amikacin was found to be most effective drug, followed by ceftriaxone, gentamicin and ciprofloxacin, in the study by Prakash et al.[3] However, we did not study the susceptibility patterns to ceftriaxone. Other studies have also reported similar observations in the past.[2,7,8]

We also studied the sensitivity patterns of anaerobes to metronidazole, which is the most commonly prescribed antibiotic for this group of organisms. Previously, it was thought that all anaerobes were susceptible to Metronidazole and this was used as one of the identification characteristic of anaerobes. However, in our present study, of the 46 anaerobes isolated, 6(13%) showed resistance to metronidazole. This implies that we should consider other antibiotics also for the management of anaerobic infection, apart from metronidazole.

CONCLUSION: CSOM is a dangerous condition, which can lead to serious and sometimes irreversible complications, especially in the developing world. Identification of the pathogenic organism and antibiotic susceptibility patterns are the cornerstone of effective management. We observed in our study that Pseudomonas is the most common organism and Amikacin seems to be the most effective antibiotic currently with low resistance rates. However, we need larger multicentre studies to confirm the same, since the sample size of our study is small and confined to only one centre.

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