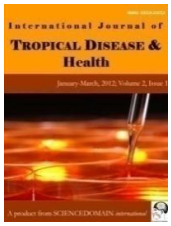

International Journal of TROPICAL DISEASE & Health
5(2): 165-169, 2015, Article no.IJTDH.2015.017
ISSN: 2278–1005

SCIENCEDOMAIN *international*
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Antimicrobial Resistance Profile of Bacterial Isolates in Patients of Chronic Suppurative Otitis Media in a Tertiary Care Hospital in India

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Authors' contributions

This work was carried out in collaboration between all authors. Author RKM did the designing and preparation of manuscript. Author SS did the literature search, analysed data and wrote the first draft of the manuscript. Author GR did the compiling of data and typing of the manuscript. Author RCV did the editing of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2015/13766
Editor(s):
(1) Mochammad Hatta, Department of Molecular Biology & Immunology, Hasanuddin University, Indonesia.
Reviewers:
(1) Anonymous, Federal University Of Sao Paulo, Brazil.
(2) Anonymous, Tehran University of Medical Sciences, Iran.
(3) Anonymous, Sri Venkateshwara ENT Institute, Bangalore Medical College & Research Institute, Bangalore, India.
(4) Fazal I Wahid, Otorhinolaryngology, Head & Neck surgery, Postgraduate Medical Institute (PGMI), Lady reading Hospital (LRH), Peshawar, Pakistan.
Complete Peer review History: http://www.sciencedomain.org/review-history.php?iid=848&id=19&aid=7050

Original Research Article

Received 2nd September 2014
Accepted 11th October 2014
Published 21st November 2014

ABSTRACT

Introduction: CSOM is a massive public health problem with incidence higher in developing countries like India, especially among low socio-economic society because of malnutrition, overcrowding, poor hygiene, inadequate health care, and recurrent upper respiratory tract infections. It is associated with various complications like persistent otorrhoea, hearing impairment, mastoiditis, labyrinthitis, facial nerve paralysis to more serious intracranial abscesses etc. The knowledge of microbiological profile is essential to enable efficacious treatment of this disease & thereby reducing the potential risk of complications.
Methodology: This study was aimed to determine the microbial profile & their antimicrobial resistance pattern using Kirby Bauer disc diffusion method among the patients suffering from CSOM between April 2013 to March 2014. Results: Out of 216 samples processed, isolates were

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seen in 145 (67.1%) cases with male to female ratio of 1.5: 1 and age group affected was 10-20 years. Most common organism isolated was *Pseudomonas* spp. (49%) followed by *S. aureus* (35.9%). *Pseudomonas* spp. showed high degree of resistance to gentamicin (57.7%) and ciprofloxacin (53.5%). Also, *S. aureus* was found resistant to ciprofloxacin (61.5%) and cotrimoxazole (40.4%).

Conclusion: Management of CSOM consists mainly of eradicating infection and closure of tympanic membrane. Periodical monitoring of bacterial isolates and their antibiotic susceptibility pattern is necessary for administering appropriate antibiotics for empirical treatment and also helps in reducing the potentially disabling and fatal complications of CSOM.

Keywords: CSOM; antimicrobial resistance; bacterial profile.

1. INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as discharge from the middle ear through perforated tympanic membrane lasting more than 6-12 weeks [1]. It could be an emanation of inadequately treated acute otitis media or as a result of infection of acute suppurative otitis media (ASOM) with organisms from external auditory canal. Repeated attacks of acute otitis media, overcrowding, malnutrition, respiratory allergies, Eustachian tube dysfunction etc. may predispose development of CSOM [2]. Repeated cycles of inflammation lead to mucosal ulceration and healing with granulation tissue formation which may destroy the surrounding bony margins and ultimately lead to various complications of SOM like persistent otorrhoea, hearing impairment, mastoiditis, labyrinthitis, facial nerve paralysis to more serious intracranial abscesses or thromboses [3]. Craniofacial anomalies like cleft palate, cleft lip, microcephaly augment the risk of CSOM probably through altered Eustachian tube anatomy and function. Organisms most commonly isolated from SOM cases include *Pseudomonas* spp., *Staphylococcus aureus*, *Proteus* spp., *Klebsiella pneumoniae*, and Diphtheroids. 5-10% of infections are polymicrobial. Anaerobes and fungi are isolated from about 25% cases of SOM but these growing along with bacterial pathogens are supposed to produce a more severe infection. The knowledge of organisms causing SOM is essential to enable efficacious treatment of this disease & reduce the potential risks of complications. Microbiological profile and their antibiotic sensitivity pattern alter with time [4]. Hence, the periodic update of prevalence and antibiogram of the etiological agents for CSOM would provide real time science based inputs to manage these cases. The aim of our study was to determine the microbial profile & their antimicrobial resistance pattern among the patients suffering from CSOM who attended ENT Department of our hospital.

2. MATERIALS AND METHODS

A cross sectional prospective study was conducted in the department of Microbiology in which around 216 patients attending ENT OPD between April 2013 to March 2014 with active purulent discharge and perforated tympanic membrane before receiving any antibiotic therapy (topical or systemic) were included. Sterile swabs were used to collect middle ear discharge through the tympanic membrane perforation. All care was taken to avoid surface contamination and the swabs transported to microbiology section for further processing. The patients who had taken antibiotics were excluded from the study. Any repeat isolate from the same patient obtained on more than one occasion was not included in the study. The pus swabs were processed for Gram stain & cultured on Blood agar, MacConkey agar & Sabourauds dextrose agar & incubated at 37°C for 24-48 hours. The organisms isolated were identified by standard microbiological methods & Antimicrobial Sensitivity Testing was done by Modified Kirby Bauer Disc diffusion method based on CLSI guidelines [5]. The same laboratory protocols were followed during the whole period. All dehydrated media, reagents and antibiotic discs were procured from Hi-media Laboratories Pvt. Ltd., Mumbai, India. Data was entered into Microsoft Excel sheet and analysed. The results were expressed as proportions and percentages for each organism isolated in culture.

3. RESULTS

In our study, the patient's age ranged from 1 to 65 years. Out of 216 samples, isolates were seen in 145 (67.1%) cases [bacterial-143 and fungal- 2 cases], mixed growth (contamination) in 17 (7.9%) cases and no growth in 54 (25%) cases. Male to female ratio among isolates was 1.5: 1 and most of the isolates were grown in age group of 10-20 years (40.7%) followed by 20-30

years (20.7%) as shown in Table 1. Most common organism isolated was *Pseudomonas aeruginosa* (49%) followed by *Staphylococcus aureus* (35.9%) as shown in Table 2. *P. aeruginosa* showed high degree of resistance to gentamicin (57.7%) and ciprofloxacin (53.5%). There were two isolates of *Acinetobacter* which were resistant to all the antimicrobials tested except carbapenem (Imipenem). All gram negative isolates were 100% sensitive to carbapenem group. Among *S. aureus* high resistance is seen with ciprofloxacin (61.5%) and cotrimoxazole (40.4%), while only one isolate was Methicillin resistant *S. aureus* and all were sensitive to Vancomycin Table 3.

Table 1. Age-wise and sex-wise distribution of various isolates in CSOM patients

Age groups	Male	Female	Total
0-10 yrs	11	5	16 (11%)
10-20 yrs	39	20	59 (40.7%)
20-30 yrs	16	14	30 (20.7%)
30-40 yrs	7	13	20 (13.8%)
40-50 yrs	7	3	10 (6.9%)
> 50 yrs	8	2	10 (6.9%)
Total	**88 (60.7%)**	**57 (39.3%)**	**145**

Table 2. Distribution of various isolates in CSOM patients

Organisms isolated	Frequency	Percentage
P. aeruginosa	71	49%
Staphylococcus aureus	52	35.9%
Coagulase negative *Staphylococcus*	3	2.1%
E. coli	12	8.2%
Acinetobacter spp.	2	1.3%
Proteus spp.	2	1.3%
Klebsiella spp.	1	0.7%
Candida albicans	2	1.3%
Total	145	

4. DISCUSSION

India has been identified as one of the high prevalent countries for chronic SOM. One of the reasons for this kind of prevalence could be that SOM is often considered as a part of normal childhood phenomenon and people tend to tolerate the disease and live with its complications into adult life. Children constitute the most vulnerable group on account of their frequent exposure to upper respiratory tract infections. CSOM is a major cause of preventable hearing loss in developing countries. In children this may affect speech, psychological adaptability, cognitive development etc [6]. Adults face the risk of social stigma and decreased avenues of employment.

In the present study most of the isolates were from patients in the age groups of 10-20 years (40.7%) followed by 20-30 years (20.7%) and indirectly signal acute exposure during the childhood. Similar age pattern has been reported by Mansoor et al. [7], and Poorey et al. [8]. Predominant involvement of males (60.7%) in our study corroborates with data reported by other authors [9,10,11].

Managing CSOM cases on the basis of microbial causes, identification of aerobic, anaerobic and fungal isolates along with drug susceptibility testing is indispensable for taking appropriate clinical decisions. In our study, organisms were grown in 67.1% of the samples from CSOM patients which is similar to other study from India and other countries [12,13]. *P. aeruginosa* (49%) was the most common isolate in CSOM followed by *S. aureus* (35.9%) which is in comparison with previous studies [14,15]. However other studies found *S. aureus* as the most common isolate [2]. Gulati et al. in 1997 [16] has reported *Klebsiella* spp. as the most common isolate. This shows that the bacterial spectrum in CSOM varies with time as well as from place to place depending upon the climatic conditions, antibiotic usage & geographical factors. Since antimicrobial resistance is not restricted to the hospital setting, rather manifesting at the community level also and CSOM is mainly the ailment operating at the community level, it is imperative to perform antibiotic sensitivity testing among isolates from CSOM. Antibiotic sensitivity pattern of *P. aeruginosa* in our study revealed 100% susceptibility to Meropenem, Piperacillin/Tazobactum, and Piperacillin while 53-58% of the isolates were found resistant to Gentamicin and Ciprofloxacin. All the strains of *S. aureus* were found susceptible to Vancomycin and Linezolid. Only 1 strain was Methicillin Resistant *S. aureus* while 40-60% of *S.aureus* strains showed resistance to ciprofloxacin and cotrimoxazole. These findings are in comparison with previous studies [14,15,17]. Other Gram negative isolates i.e *Escherichia coli*, *Klebsiella* spp. ,and *Acinetobacter* spp. were found 100% sensitive to Imipenem and 90% sensitive to Piperacillin/Tazobactum along with varying susceptibility patterns to other routine antibiotics [14,15].

Table 3. Resistance pattern of various bacterial isolates in chronic suppurative otitis media

Organisms (Gram negative)	No.	G (%)	AK (%)	Cf (%)	Ca (%)	Ce (%)	Co (%)	Pc (%)	PT (%)	Imp/Mr (%)
P. aeruginosa	71	41(57.7)	22(31)	38(53.5)	14(19.7)	-	-	0	0	0
E. coli	12	3(25)	1(8.3)	10(83.3)	1(8.3)	1(8.3)	9(75)	-	0	0
Acinetobacter spp.	2	2(100)	2(100)	2(100)	2(100)	2(100)	2(100)	-	2(100)	0
Proteus spp.	2	1(50)	1(50)	1(50)	0	0	0	-	0	0
Klebsiella spp.	1	0	0	0	0	0	0	-	0	0
Gram positive cocci		**Ox**	**T**	**E**	**Cf**	**Co**	**Cn**	**Va**		
S. aureus	52	1 (1.9)	7 (13.4)	19(36.5)	32(61.5)	21(40.4)	1 (1.9)	0		
CoNS	3	0	0	0	1(33.3)	1(33.3)	0	0		

**G-Gentamicin(10µg), Ak-Amikacin(30µg), Cf-Ciprofloxacin(5µg), Ce-Cefotaxime(30µg), Ca-Ceftazidime(30µg), Co-Cotrimoxazole, Pc- Piperacillin(100µg), PT- Piperacillin- Tazobactam(100/10µg) , Imp- Imipenem(10µg)*

Management of CSOM consists mainly of eradicating infection and closure of tympanic membrane. Perforated tympanic membrane is a permanent threat of microbial attack of the middle ear and persistent infection is a cause of associated morbidity. Antimicrobials can be prescribed at the peripheral level but surgical intervention would require specialized facilities. Policy planners should consider organizing outreach ear clinics in areas where people do not have access to specialized sources so that patients requiring referral for intracranial or extracranial complications can be recommended to the concerned experts.

5. CONCLUSION

The patients of CSOM report to tertiary care centre's on account of non-response to the treatment, relapse or associated complications. Selection of topical, oral or systemic drugs should be on the basis of antimicrobial sensitivity testing pattern of the isolates. The widespread use of antibiotics is changing the pattern of pathogenic organisms and their sensitivity profile. Most common organisms were *P. aeruginosa* and *S. aureus* and these were less susceptible to commonly used drugs like ciprofloxacin, cotrimoxazole and gentamicin. *Acinetobacter* spp. was found to be most resistant. Hence periodic evaluation of antimicrobial susceptibility profile of microbial pathogens is necessary to institute effective treatment and prevent potential risk of complications. Role of ear toilet needs emphasis for better efficacy of topical antibiotics. To minimize complications of SOM, the time lag between onset of symptoms and provision of specialized services requires to be reduced to the fastest possible.

CONSENT

Not applicable.

ETHICAL APPROVAL

Not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history.php?iid=848&id=19&aid=7050