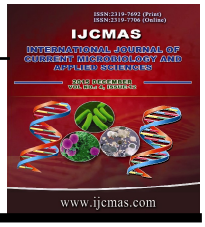
Int.J.Curr.Microbiol.App.Sci (2015) 4(12): 735-743

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 4 Number 12 (2015) pp. 735-743**
http://www.ijcmas.com



Original Research Article

Microbiological Profile of CSOM and their Antibiotic Sensitivity Pattern in a Tertiary Care Hospital

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Keywords

Chronic Suppurative Otitis Media, Bacterial, Fungal, *Pseudomonas aeruginosa*, Antibiotic sensitivity pattern

A B S T R A C T

Chronic Suppurative Otitis Media (CSOM) is a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharge or otorrhea through a tympanic membrane perforation. If left untreated, it can lead to serious intracranial & extracranial complications. Hence, the present study was undertaken to identify the pattern of aerobic microorganisms (bacterial and fungal) causing CSOM & to determine the antibiotic sensitivity pattern of the aerobic bacterial isolates prevalent in our hospital. The study included 130 clinically diagnosed cases of CSOM. Samples collected from the patients were processed using standard microbiological techniques. Out of 130 clinically diagnosed cases of CSOM, 116 samples were culture positive. The most predominant organism causing CSOM among aerobic bacteria was *Pseudomonas aeruginosa*, followed by *Staphylococcus aureus.* Of the fungal isolates *Aspergillus niger was commonest followed by Candida albicans & Aspergillus flavus.* Amikacin, gentamicin and ciprofloxacin were effective against most of the gram negative bacilli. Gentamicin, doxycycline & chloramphenicol were effective against gram positive cocci. The Knowledge of microbial pattern prevalent in our locality and their antibiotic sensitivity pattern helps in rational use of antibiotics and thus prevent the emergence of resistant strains and also the complications associated with CSOM.

Introduction

Chronic suppurative otitis media (CSOM) is a disease of multiple etiologies and is well – known for its persistence and recurrence in spite of treatment. CSOM is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharge or otorrhea through a tympanic membrane perforation (Acuin, 2004).

CSOM is one of the most important causes of preventable hearing loss in India and other developing countries. (Acuin, 2004).

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. (Acuin, 2004). The infection may occur during the first 5 years of child's life, with a peak around 2 years. (Bluestone, 1998). 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. (Kelvin Kong & Harvey, 2009; Zhang *et al.,* 2014).

The aerobic microorganisms most frequently found in CSOM are *Pseudomonas aeruginosa, Staphylococcus aureus, and Gram negative organisms such as Proteus spp, Klebsiella spp, Escherichia coli, Haemophililus influenza, and Moraxella catarrhalis.* (Verhoeff *et al.,* 2006; Martinez *et al.,* 2005). The most commonly isolated fungal isolates are *Aspergillus spp* especially *Aspergillus Niger* and *Candida spp.* (Poorey and Arati Iyer, 2002; Harvinder Kumar & Sonia Seth, 2011).

Untreated cases of CSOM can result in various complications. Such complications range from persistent otorrhea, mastoiditis, labyrinthitis, and facial nerve paralysis to serious complications like meningitis, intracranial abscesses, and thrombosis (Tomsaz, 1994). So, timely management of CSOM cases is important to prevent the threatening complications associated with it.

The indiscriminate use of broad spectrum antibiotics and poor follow – up of patients have resulted in the emergence of multiple resistant strains of bacteria leading to recurrence and persistence of low grade infections. Changes in the microbiological flora following the advent of sophisticated synthetic antibiotics increase the relevance of reappraisal of the modern day flora in CSOM, and their in-vitro antibiotic sensitivity pattern is very important for the clinician to plan a general outline of treatment for a patient with a chronically discharging ear.

Hence the present study was undertaken to know the local pattern of aerobic organisms causing CSOM & their antibiotic susceptibility pattern in order to help the clinician for proper management of the cases.

The main objective of this study includes that the pattern of aerobic microorganisms (bacterial and fungal) causing CSOM & to determine the antibiotic sensitivity of the aerobic bacterial isolates prevalent in our hospital.

Materials and Methods

Study Outline

The present study was a descriptive, prospective study, conducted for a period of 12 months from December 2012 – November 2013. A total of 130 patients attending the outpatient department of ENT, Rajarajeswari Medical College & Hospital, Bangalore, with complaints of ear discharge for more than 3 months were included in the study after the approval of Institutional Ethics Committee.

Selection Criteria

Inclusion Criteria

Patients of any age, both gender, discharge from unilateral or bilateral ears & patients with ear discharge of more than 3 months duration were included.

Exclusion Criteria

Patients with ear discharge of less than 3 months duration, patients with ear discharge with intact tympanic membrane (otitis externa) & patients receiving antibiotics at the time of presentation or within a week of presentation will be excluded.

The patients who met the above selection

criteria, having signed an informed consent were included in the study. A detailed clinical history regarding name, age, sex, address and socioeconomic status, history of onset and duration of ear discharge, other associated symptoms and antibiotic therapy were taken from the patients.

Sample Collection

The ear discharge was collected using sterile cotton swabs under aseptic precautions with the aid of an aural speculum. Two sterile swabs properly labeled for each patient, were used to collect the specimen. The samples collected were transported & processed immediately in the Microbiology laboratory.

Isolation and Identification of Pathogens

The first swab was used for direct smear examination by Gram's stain and KOH mount. The second swab was inoculated onto Mac Conkey agar, Blood agar, Chocolate agar for isolation of aerobic bacteria & onto Sabouraud's Dextrose Agar for isolation of fungal pathogens. The inoculated aerobic bacterial cultures were incubated at 37^0C for 24-48 hours. The bacterial isolates grown were identified based on morphology, cultural charecteristics and biochemical reactions according to standard techniques. (Collee *et al.,* 1996). Antimicrobial sensitivity testing for bacterial isolates was carried out on Muller Hinton Agar by Kirby Bauer disc diffusion method, according to Clinical Laboratory and Standard Institute guidelines (CLSI, 2014).

The specimen inoculated onto Sabouraud Dextrose Agar (SDA) plates were incubated at room temperature. The growth was identified based on their morphological and cultural characteristics and microscopic examination was done using lactophenol cotton blue staining technique. (Emmons *et al.,* 1997).

Results and Discussion

The present study included 130 patients attending the ENT OPD of Rajarajeswari Medical College & Hospital, Bangalore, with complaints of ear discharge for more than 3 months. Age group of the patients ranged from 1yr to 80 yrs, with highest incidence in children with age group of 1 – 10 yrs (20.76%) followed by 11-20 yrs (18.4%) age group. There was male predominance (53.07%) in the occurrence of CSOM when compared to females (46.92%). Unilateral infection was more common than bilateral. Majority of them belonged to lower socio-economic group (60%).

Out of total 130 cases, 116 were culture positives, 10 showed no growth & 4 were skin contaminants (mirococci) Table (1). Out of 116 culture positives, 139 aerobic organisms were isolated, of which 120 were bacterial and 19 were fungal isolates.

Among the aerobic bacterial isolates *Pseudomonas aeruginosa* was predominant, followed by *Staphlococcus aureus, Klebsiella spp, Proteus mirabilis, Citrobacter spp, Escherichia coli, Enterobacter spp, Enterococcus spp, Acinetobacter spp* & *Coagulase negative staphylococcus*. Among the fungal isolates, *Aspergillus niger* was predominant followed by Candida *albicans* & *Aspergillus flavus* (Table 2).

Of the 116 culture positive, 16 cases showed polymicrobial growth. Mixed infection involving *Pseudomonas aeruginosa* with *Klebsiella pneumoniae* were more commonly seen. The next common mixed

isolates were *Pseudomonas* with *Staphylococcus aureus* and *Staphylococcus* with *Aspergillus niger*. The other mixed isolates are shown in (Graph 1).

The anitibiotic susceptibility pattern of *Pseudomonas aeruginosa* showed that the isolates were highly sensitive to amikacin and imipenem followed by ciprofloxacin, piperacillin, tobramycin, netilmicin & gentamicin as shown in (Graph 2). They were less sensitive to ceftazidime and cefipime, and resistant to aztreonam.

Staphylococcus isolates were 100% sensitive to vancomycin and linezolid. They were highly sensitive to gentamicin, followed by doxycycline, chloramphenicol & co-trimoxazole. They showed less sensitivity against commonly used antibiotics like amoxiclav, cefoxitin, & erythromycin. They were resistant to penicillin, ciprofloxacin & clindamycin. (Graph 3).

Gram negative isolates other than *Pseudomonas* showed highest sensitivity to imipenem. They were highly sensitive to amikacin and gentamicin followed by ciprofloxacin, co-trimoxazole, chloramphenicol & meropenem. They were less sensitive towards commonly used antibiotics like amoxiclav, ceftazidime and cefoxitin. They were resistant to ampicillin and cefuroxime (Graph 4).

In the present study, the age of the patients ranged from 1 yr to 80 yrs. Maximum number of cases were found in the age group of 1 - 10 yrs, followed by 11 – 20 yrs. This is in comparison with studies of (Poorey and Arati Iyer, 2002; Arati agarwal *et al.,* 2013; & Choudary, B.L. *et al.,* 2014.) This could be due to the short, wide and straight eustachian tube in infants and children. However, studies of (Harvinder Kumar & Sonia Seth, 2011; Bansal sulabh *et al.,* 2013; & Rejitha, I.M. *et al.,* 2014) have reported maximum number of cases in second and third decade of life.

In the present study, *Pseudomonas aeruginosa* was the predominant organism causing CSOM followed by *Staphylococcus aureus, Klebsiella spp, Proteus mirabilis, Citrobacter spp* and others. Our findings correlate with other studies of (Poorey and Arati Iyer, 2002; Harvinder Kumar & Sonia Seth, 2011; & Rakesh Kumar *et al.,* 2013) who also found that *Pseudomonas aeruginosa* was the predominant organism causing CSOM. But our findings are in contrast to studies of (Singh A.H. *et al.,* 2012; & Prakash, M. *et al.,* 2013) who have found *Staphylococcus spp* as the predominant organism causing CSOM. Among the fungal isolates the most predominant isolate was *Aspergillus spp*, followed by *Candida albicans*. Among *Aspergillus spp* there were 9 cases of *Aspergillus niger* & 4 cases of *Aspergillus flavus*. Our findings correlated with studies of (Loy *et al.,* 2002; & Rejitha, I.M. *et al.,* 2014) wherein *Aspergillus niger* was the predominant isolate followed by *Candida albicans*.

Antibiotic susceptibility patterns serve as a useful guideline for choosing the appropriate antibiotic. In the present study, majority of *Pseudomonas* isolates were highly sensitive to amikacin and imipenem followed by ciprofloxacin, piperacillin, gentamicin, tobramicin, netilmicin and cefuroxime. Our findings correlate with the study done by (Harvinder Kumar & Sonia Seth, 2011) wherein amikacin was found to be the most effective drug followed by ciprofloxacin, piperacillin and co – trimoxazole. Other studies with similar findings were of (Arati agarwal *et al.,* 2013; Prakash, M. *et al.,* 2013; & Bansal sulabh *et al.,* 2013).

Table.1 Growth Pattern of CSOM Cases

Sl No	Growth pattern	Number	Percentage
1	Positive Culture	116	89.2%
2	No Growth	10	7.69%
3	Skin Contaminants	4	3.07%
	Total	130	100

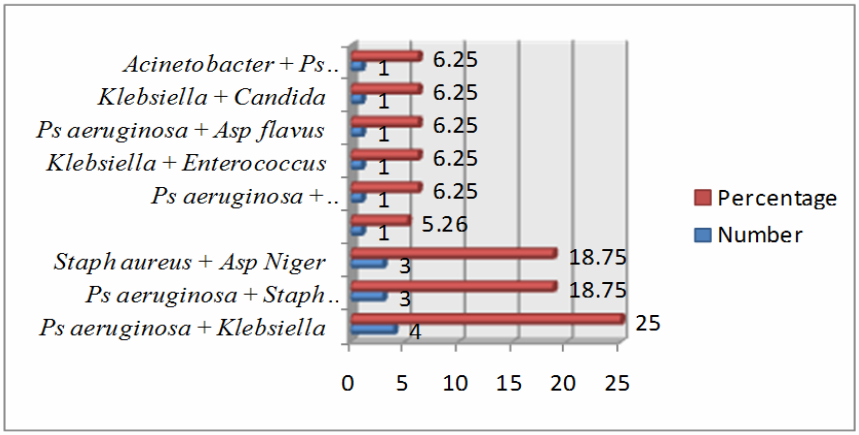
Table.2 Distribution of Aerobic Bacterial Organisms Causing CSOM

Sl.No	Bacterial Isolate	Number	Percentage
1	*Pseudomonas aeruginosa*	46	33.09%
2	*Staphylococcus aureus*	30	21.58%
3	*Klebsiella spp*	13	9.35%
4	*Proteus mirabilis*	8	5.75%
5	*Citrobacter spp*	8	5.75%
6	*Escherichia coli*	5	3.59%
7	*Enterobacter spp*	3	2.15%
8	*Enterococcus spp*	3	2.15%
9	*Acinetobacter spp*	2	1.43%
10	CONS	2	1.43%
	Total	120	86.33%

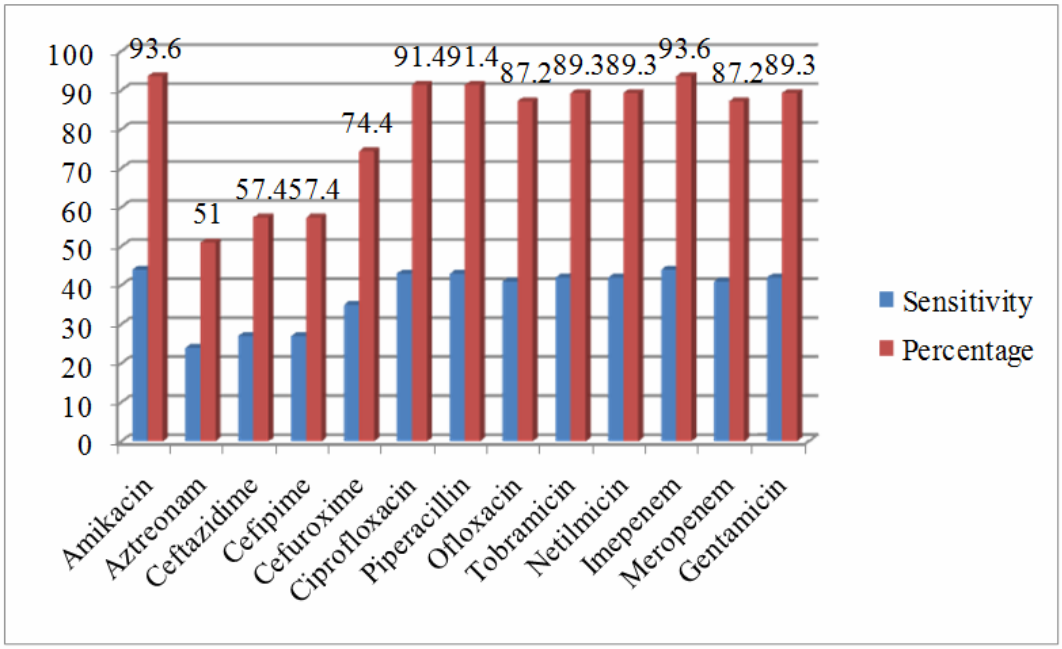
Table.3 Distribution of Fungal Organisms causing CSOM

Sl.No	Fungal Isolate	Number	Percentage
1	*Aspergillus Niger*	9	6.47%
2	*Aspergillus flavus*	4	2.87%
3	*Candida albicans*	6	4.31%
	Total	19	13.66%

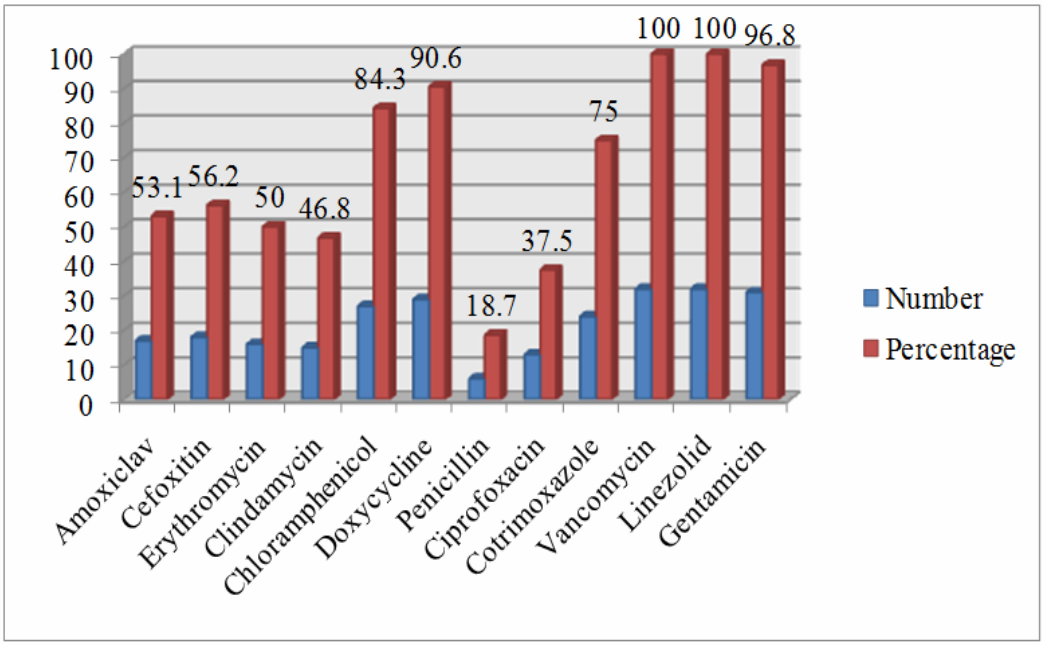
Graph.1 Distribution of Mixed Isolates in CSOM



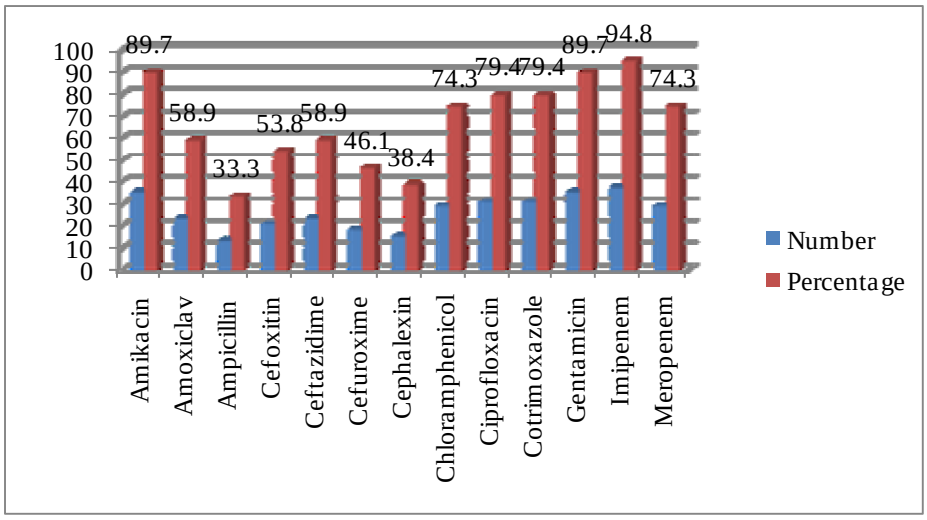
Graph.2 Antibiotic Susceptibility Pattern of *Pseudomonas aeruginosa*



Graph.3 Antibiotic Sensitivity Pattern of *Staphylococcus* Spp



Graph.4 Antibiotic Sensitivity Pattern of Gram Negative Bacilli



In the present study *Pseudomonas aeruginosa* were less sensitive to aztreonam, ceftazidime, and cefipime. These findings correlate with the study of (Monsoor, T. *et al.,* 2009) that the isolates were less sensitive to aztreonam, but there was good sensitivity to ceftazidime which is in contrast to our findings wherein the isolates were less sensitive to ceftazidime.

Gram positive isolates like *Staphylococcus aureus* and *CONS* were 100% sensitive to vancomycin and linezolid. They were highly sensitive to gentamicin (96.8%), followed by doxycycline (90.6%), chloramphenicol (84.3%), and co – trimoxazole (75%). Similar studies which correlate with our study findings are (Dilshad arif *et al.,* 2014; Choudary, B.L. *et al.,* 2014; Abdul sattar *et al.,* 2012; & Singh A.H *et al.,* 2012). Gram positive cocci in our study were less sensitive to commonly used antibiotics like amoxiclav & cefoxitin. They were resistant to ciprofloxacin, clindamycin, and erythromycin.

Gram negative isolates showed 94.87% sensitivity to imipenem, they were highly sensitive to amikacin & gentamicin (89.74%), followed by ciprofloxacin (79.4%), co-trimoxazole (79.4%), chloramphenicol (74.3%). The findings of our present study are in accordance with (Poorey and Arati Iyer, 2002; Harvinder Kumar & Sonia Seth, 2011; & Bansal sulabh *et al.,* 2013). In the present study gram negative bacilli were less sensitive to commonly used antibiotics like amoxiclav, ceftazidime, & cefoxitin. They were resistant to ampicillin, cephalexin, and cefuroxime. Similar findings were seen by (Dilshad arif *et al.,* 2014) wherein the isolates were resistant to amoxiclav, cefotaxime & cefuroxime. The resistant pattern towards most commonly used antibiotics in the present study could be because of indiscriminate use of antibiotics. And surprisingly, in the present study gram positive isolates were showing good sensitivity for the older drugs like tetracycline's and chloramphenicol, this might be because these drugs are not commonly being used recently after the advent of newer drugs flouroquinolones like ciprofloxacin, ofloxacin which are less ototoxic and good topical antibiotics for CSOM. Hence, knowing the antibiotic sensitivity pattern before prescribing the

drugs becomes very essential as the pattern of sensitivity and the organisms causing CSOM keeps changing.

In conclusion, the present study showed that *Pseudomonas aeruginosa* was the most common aerobic bacterial isolate causing CSOM followed by *Staphylococcus aureus*. Among the fungal isolates *Aspergillus niger* was predominant followed by *Candida albicans*. Antibiotic susceptibility test showed that amikacin was most effective drug, followed by ciprofloxacin and gentamicin for most of the gram negative bacilli including *Pseudomonas aeruginosa*. Gram positive isolates were highly sensitive to gentamicin, followed by doxycycline, chloramphenicol and co-trimoxazole. Overall gentamicin was most effective against both gram positive and gram negative isolates. The organisms were resistant to commonly used drugs like amoxiclav, ceftazidime, cefoxitin and ciprofloxacin. This might be due to injudicious use of broad spectrum antibiotics. Therefore, periodic evaluation of microbiological pattern and their antibiotic sensitivity pattern in local area becomes important & helpful in prescribing empirical antibiotics for successful treatment of CSOM and thus minimizing its complications and emergence of resistance strains.

Acknowledgement

We like to thank our staff of Department of Microbiology and Department of Otorhinolaryingology, of our teaching hospital, for their constant guidance and support.

Reference

Abdul Sattar, Alamgir, A., Hussain, Z., Sarfraz, S., Nasir, J., Badar - e -Alam. 2012. Bacterial Spectrum and their Sensitivity Pattern in Patients of Chronic suppurative otitis media. *Journal of the College of Physicians and Surgeons Pakistan*. Vol. 22 (2):128 – 129.

Acuin, J. 2004. Department of Child and Adolescent health Development and Team for Prevention of Blindness and Deafness. Chronic suppurative otitis media: burden of illness and management options. *Geneva: World Health Organisation*.

Arati Agarwal, Kumar, D., Ankur Goyal, Sapna Goyal, Namrata Singh, Khandewal, G. 2013. Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge. *Indian Journal of Otology*. Vol 19 (1): 5-8.

Bansal Sulabh, Ojha Tarun, Kumar Suresh, Singhal Amit, Vyas Pratibha. 2013. Changing Microbiological trends in cases of CSOM. *Int J Cur Rev*. Vol 5(15): 76-81.

Bluestone, C.D. 1998. Epidemiology and pathogenesis of chronic suppurative otitis media: Implications for prevention and treatment. *Int J Pediatr Otorhinolaryngol*. 42: 207 - 223.

Chaudhary, B.L., Snehanshu Shukla. 2014. Bacteriological Profile and their Antibiotic Susceptibility pattern in cases of otitis media. *Bulletin of Pharmaceutical & Medical Sciences.* vol 2 (2):2209-2212.

CLSI, 2014. Performance standards for antimicrobial susceptibility testing; twenty- fourth informational supplement. CLSI document M100- S24. Clinical and Laboratory Standards Institute, Wayne, P.A.

Collee, J.G., Duguid, J.P., Fraser, A.G., Marmion, B.P., Simmons, A. 1996. Laboratory strategy in the diagnosis of infective syndromes. Mackie and McCartney practical medical microbiology, 14th edn. Churchill Livingstone, Singapore. Pp. 53 - 94.

Dilshad arif, Mukhia, R.K., Goud, S.K.T., Nissar, J., Prasad, R.S., Singh, S. 2014.

Bacteriological Profile of Ear Infections and Its Antibiotic Susceptibility Pattern in Tertiary Care Hospital Navi Mumbai. *IOSR Journal of Dental and Medical Sciences*. vol 13 (5): 58 – 62.

Emmons,W.C., Binford Chapman, H., John, P., Utz, Kwon-Chung K.J. 1977 Medical Mycology, 3rd edition, , Lea & Febiger, Philadelphia, Chap. 19. 30: 285-304, 483-84.

Harvinder Kumar, Sonia Seth. 2011. Bacterial and Fungal Study of 100 cases of Chronic Suppurative Otitis Media. *Journal of Clinical and Diagnostic Research. 5(6):1224-1227.*

Hiremath, S.L., Kanta, R.C., Yeshwanatharao, M., Vasantha Kumar, C.M. 2001. Aerobic bacterial isolates of CSOM and their antibiotic sensitivity pattern. *The Indian Practitioner*. 54(7): 486-89.

Kelvin kong, Harvey, L.C. 2009. Otitis Media 2009: An Update - Natural History, definitions, risk factors, and burden of otitis media. *Med J Aust* .191: S39 – S43.

Loy, A.H.C., Tan, A.L., Lu, P.K.S. 2002. Microbiology of chronic suppurative otitis media in Singapore. *Singapore Med. J*. 43(6): 296 - 299.

Mansoor, T., Musani, M.A., Gulnaz Khalid, Mustafa Kamal. 2009. Pseudomonas aeruginosa in chronic suppurative otitis media: Sensitivity spectrum against various antibiotics in Karachi. *J Ayub Med Coll Abbottabad*. 21(2): 120 – 123.

Martinez, D.M.I., Quintana, D.R.C., Rivero, B.M., Macias, R.A. 2005. Aetiology and therapeutic considerations in chronic otitis media. Analysis of a 5 year period. *Acta Otorhinolaryngol Esp.* 56:459-62.

Poorey, V.K., Arati, Iyer. 2002. Study of Bacterial Flora in Chronic Suppurative Otitis Media and its clinical significance. *Ind. J. Otolaryngol H & N Surg*. 54(2): 91- 95.

Prakash, M., Lakshmi, K., Anuradha, S., Swathi, G.N. 2013. Bacteriological Profile and their Antibiotic Susceptibility Pattern of cases of CSOM. *Asian J Pharm Clin Res.* Vol 6 (3): 210-212.

Rakesh Kumar, Srivastava, P., Sharma, M., Rishi, S., Nirwan, P.S., Hemwani, K., *et al.*, 2013. Isolation and Antimicrobial Sensitivity profile of bacterial agents in CSOM patients at NIMS Hospital, Jaipur. *Int J Pharm Bio Sci.* Vol 3 (4): 265-269.

Rejitha, I.M., Sucilathangam, G., Kanagapriya, M. 2014. Microbiological Profile of CSOM in a Tertiary Care Hospital. *International Jounal of Scientific Research.* vol 3 (2): 474 – 475.

Shrestha, B.L., Amatya, R.C.M., Shrestha, I., Ghosh. 2011. Microbiological Profile of Chronic Suppurative Otitis Media. *Nepalese Journal of ENT Head & Neck Surgery.* July-dec. 2(2).

Shyamala, R., Reddy, P.S. 2012. The study of bacteriological agents of chronic suppurative otitis media-aerobic culture and evaluation. *J Microbiol. Biotech. Res*. 2(1): 152-162

Singh, A.H., Basu, R., Venkatesh, A. 2012. Aerobic bacteriology of chronic suppurative otitis media in Rajahmundry, Andhra Pradesh, India. *Biology and Medicine.* 4(2): 73-79.

Tomasz, A. 1994. Multiple-antibiotic resistant pathogenic bacteria. A Report on the Rockfeller University Workshop. *New Engl-J Med*. 330:1247-1251.

Verhoeff, M., van der Veen, E. L., Rovers, M., Sanders, E. A., Schilder, A .G. 2006. Chronic suppurative otitis media: a review. *Int J Pediatr Otorhinolaryngol.*70: 1-12.

Zhang, Y., Xu, M., Zhang, J., Zeng, L., Wang, Y., Zhang, Q.Y. 2014. Risk Factors for Chronic and Recurrent Otitis Media – A Meta –Analysis. *PloS ONE.*, 9 (1): e86397.