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Study of Bacterial Isolates and their Susceptibility Pattern in Chronic Suppurative Otitis Media

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Abstract: *Chronic Suppurative Otitis Media (CSOM) is one of the common ear diseases which can cause many complications if not treated properly . This study was done to determine isolates causing CSOM and their antibiotic susceptibility pattern. The study was carried out from November 2014 to April 2015. Ear swabs were collected & cultured from one hundred and twenty patients with CSOM attending the ENT Out Patient Clinic in Al- Hillah Teaching hospital. The specimens were cultured The isolated organisms were identified by standard microbiological methods. The antibiotic susceptibility testing of the isolates was done using the Kirby-Bauer disc diffusion method.CSOM was less common among elderly and women. Pseudomonas aeruginosa was the most common isolated bacteria (37.5%) followed by Staphylococcus aureus (20.83%), and Streptococcus pneumoniae (16.67%).The most effective antibiotics in this study were ciprofloxacin and ceftazidime , whereas the highest resistance levels were observed for trimethoprim, carbenicillin, lincomycin and erythromycin.*

Keywords: *Chronic suppurative otitis media, Pseudomonas aeruginosa, Staphylococcus aureus, antibiotic susceptibility.*

I. Introduction

Otitis media is an inflammation of the middle ear that affects the tympanic membrane [1]. It is a disease of multiple etiology and pathogenesis of otitis media are multifactorial including genetic predisposition, infections, allergy, environmental, social and racial factors and eustachian tube dysfunction [2].

There are three common types of otitis media, acute purulent otitis media, otitis media with effusion and chronic suppurative otitis media [3]. Chronic Suppurative Otitis Media (CSOM) is a chronic inflammation of middle ear and mastoid cavity that may present with recurrent ear discharges or otorrhoea through a tympanic perforation [4]. It is one of the most common diseases of all age groups, especially of childhood and is prevalent in developing countries [5].

The common micro organisms most frequently isolated in CSOM cases are Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella spp, Escherichia coli, Aspergillus spp. and Candida spp. but these organisms vary in various geographical areas [4]. The bacteria are uncommon in the skin of the external canal, but in the presence of inflammation, trauma, lacerations or high humidity may proliferate [6]. These bacteria may then gain an entry to the middle ear through a chronic perforation [7]. However, antimicrobial resistance profile of bacteria causing CSOM has been reported to vary with time because of differences in geographical areas as well as from continent to another probably due to indiscriminate use of the antibiotics [8 , 9].

This study performed to evaluate the prevalence of bacterial agents in cases of CSOM and their antibiogram pattern to provide a guideline for empirical antibiotic therapy.

II. Materials And Methods

In this study one hundred and twenty patients of CSOM who presented to the Ear, Nose, and Throat (ENT) Out Patient Clinic in Al- Hillah Teaching Hospital from November 2014 to April 2015 were included. Only patients who had not received topical or systemic antibiotics for the previous 5 days were included in the study.

A total of 120 swabs were collected using sterile cotton swabs and transferred immediately to the laboratory by brain heart infusion broth. Ear discharge samples were cultured on Nutrient agar, MacConkey agar and Blood agar plates and then incubated aerobically at 37 ºC for 24 hours. All the isolated organisms were identified according to standard microbiological methods [10].

Antimicrobial susceptibility tests of bacterial isolates were carried out using Kirby- Bauer disk diffusion method on Mueller-Hinton agar medium (Himedia, India) [11]. The tested antimicrobial agents were: L: Lincomycin (2 µg), PY: Carbenicillin (100 µg), E: Erythrymycin (15 µg), AMC: Amoxi-clav (30 µg), CAZ: Ceftazidime (30 µg), CRO: Ceftriaxone (30 µg), TMP: Trimethoprim (25 µg), CN: Gentamycin (10 µg), TOB: Tobramycin (10 µg), CIP: Ciprofloxacin (5 µg) (Bioanalyse, Turkey). The antibiotic disc impregnated culture plates were incubated at 37 ºC overnight. Results were interpreted according to the National Committee for Clinical Laboratory Standards [12].

III. Results And Discussion

One hundred and twenty ear discharge samples of patients with the clinical diagnosis of CSOM were examined. There were total 70 males and 50 females, male patients (58.3%) were more commonly affected with CSOM than females (41.7%) (Fig.1). which is in agreement with studies done by Nia et al. (2011) [13] and Gül et al. (2006) [14]. But it differs from study done by Lakshmi et al.(2013) [15] showed that 55% of CSOM patients were females and 45% were males, the difference in results may be due to geographical reasons.

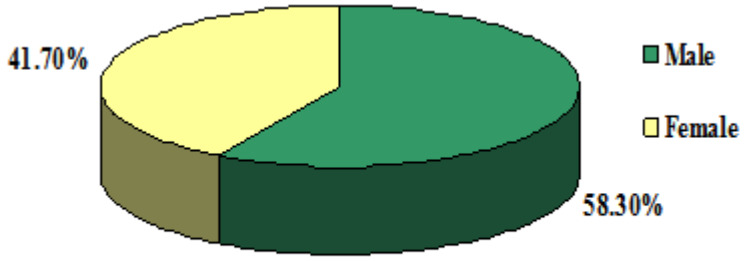

Figure (1): Distribution of patients based on gender

The age ranged from 1 to 60 years , CSOM was most prevalent in the age groups < 10 years and between 11-20 years as shown in Table (1). This is in accordance with previous studies [15, 16, 17]. The high incidence of the CSOM in this age group is due to multiple reasons, that younger children are more liable to otitis media related to the shorter and horizontal nature of eustachian tubes, the immaturity of their immune status, frequent exposure to upper respiratory tract infections and malnutrition [18] also mothers breast feeds her child in supine position. In contrast, Loy et al. (2004) [19] showed increased prevalence of CSOM in age group 30 - 40 years.

Table (1): Distribution of patients based on different age groups

Age group (in year)	Number of patients (%)
< 10	43 (35.8%)
11- 20	37 (30.8%)
21- 30	22 (18.3%)
31- 40	11 (9.2%)
41- 50	5 (4.2%)
> 50	2 (1.7%)

The microbiological profile of the bacterial isolates from CSOM patients demonstrated that gram-negative bacteria (62.5%) were the dominant isolates of the ear discharge compared to gram- positive bacteria (37.5%). Moreover, other investigators [17, 20] have reported 60.5% and 57.38% of gram- negative bacteria, respectively. From the total isolates (n= 120). The most common identified organism was Pseudomonas aeruginosa (37.5%) followed by Staphylococcus aureus (20.83%) followed by S. pneumoniae (16.67%) (Fig. 2). In their study, Alsaimary et al. (2010) [21] also showed that P. aeruginosa was the most common isolates followed by S. aureus, but the percentages of isolation were lesser (19.41% and 16.99% respectively) when compared to the present study. In other studies P. aeruginosa was the predominant organism followed by S. aureus (30%) [22, 23]. In contrast, several previous studies elsewhere in the world have reported S. aureus to be the first common isolated bacteria followed by P. aeruginosa [24, 25]. The observations made from different studies have reported different organisms in different proportions and these variations depending on patient population, climate and whether antibiotics have or have not been recently used [26].

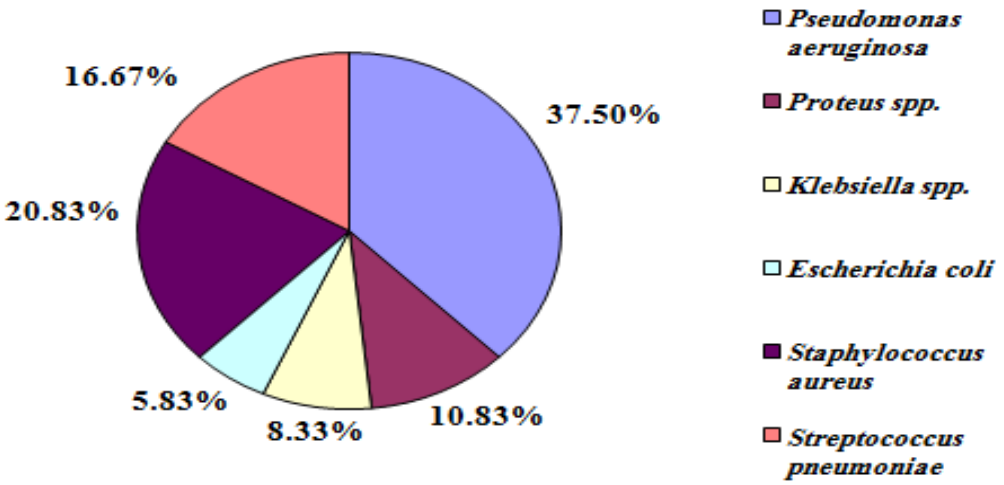

Figure 2. The bacteriological profile of CSOM patients

The overall antimicrobial susceptibility demonstrated that ciprofloxacin was the effective drug which is sensitive against 65.8% of CSOM isolates followed by ceftazidime (62.5%) (Fig. 3). This is in accordance with some investigators who found that ciprofloxacin was the most effective antibiotic against CSOM isolates [23, 27, 28, 29].

However, different investigators reported different sensitivity patterns in similar studies. Some workers found amikacin was the most effective drug against CSOM pathogens [15, 30]. Orij and Dike (2015) [31] found that the most effective antibiotics tested was gentamicin followed by ciprofloxacin. Other investigators reported sensitivities to amikacin and gentamicin approach 100% [32, 33]. In previous study results showed that ciprofloxacin, amoxi-clav, and gentamicin were (70- 80%) sensitive to different bacterial species in CSOM [21].

Results showed that 74.2% and 70.3% of the isolates showed resistance to trimethoprim and carbenicillin respectively. In contrast, investigators found that most of CSOM isolates were resistant to amoxicillin [8, 15] .

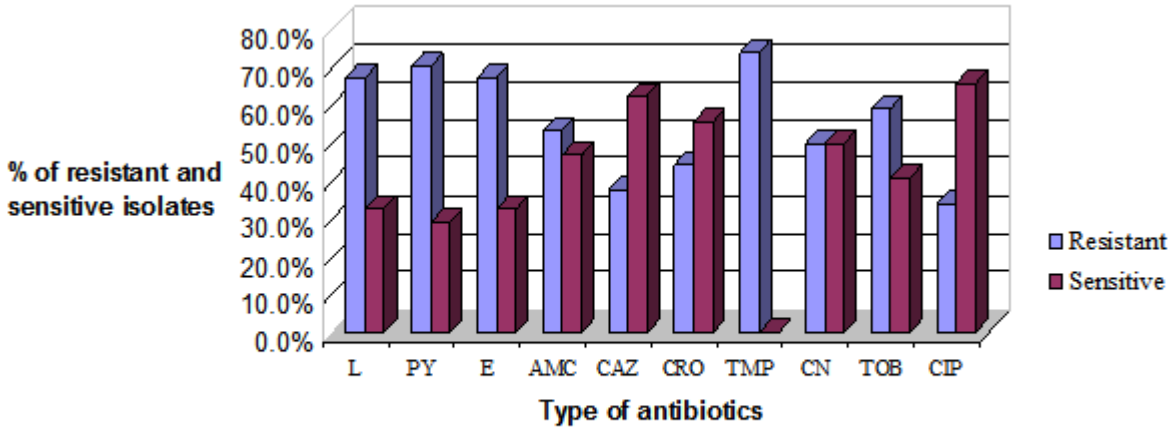

Figure (3): Overall resistance and sensitivity patterns of antimicrobial agents for bacterial isolates of CSOM

L: Lincomycin, PY: Carbenicillin, E: Erythrymycin, AMC: Amoxi-clav, CAZ: Ceftazidime, CRO: Ceftriaxone, TMP: Trimethoprim, CN: Gentamycin, TOB: Tobramycin, CIP: Ciprofloxacin.

Table (2) shows the sensitivity rates of bacterial isolates from patients of CSOM to various antibiotics. Antimicrobial susceptibility of P. aeruginosa isolates revealed that ceftazidime was sensitive in 93.33% , ceftriaxone was sensitive in 84.44%. Ciprofloxacin was sensitive in 73.33% and 51.11% was sensitive to amoxi-clav. These results suggested that 3rd generation cephalosporins and ciprofloxacin are effective, but resistance against amoxi-clav increases progressively. Mansoor et al. (2009) [34] reported that 89% of P. aeruginosa isolates were found to be sensitive to ceftazidime , 85% were sensitive to ciprofloxacin, while only 21% of isolates showed sensitivity to ceftriaxone. Khan (2012) [35] found that 81% of P. aeruginosa isolates were

sensitive to ceftazidime, while only 51% of the isolates showed sensitivity to ceftriaxone. However, Ahmed (2013) [24] revealed that ceftazidime was sensitive in 100%, Gentamicin was sensitive in 91%, Ciprofloxacin was sensitive in 85% of P. aeruginosa isolates.

All of S. aureus isolates showed complete resistance (100%) to carbenicillin and amoxi-clav, but showed low sensitivity to ceftriaxone. In previous studies, Abdul Sattar et al. (2012) [36] reported that S. aureus showed > 80% sensitivity to amoxi-clav and ciprofloxacin. In contrast, other workers found that all S. aureus isolates were sensitive to amoxi-clav and ceftriaxone [31].

S. aureus isolates showed low levels of sensitivity to 3rd generation cephalosporins and flouroquinilones as compared to previous investigation [23].

Results also showed that gentamycin was more active (64%) against S. aureus isolates which is in parallel with study showed that gentamycin was more active (88%) against S. aureus isolates [36], but it differs from results found 83% 0f S. aureus isolates were sensitive to gentamycin [31].

Table (2): Susceptibility of bacterial isolates from patients of CSOM to various antibiotics

Types and numbers of isolates	Tested Antibiotics									
	L (%)	PY(%)	E(%)	AMC(%)	CAZ(%)	CRO(%)	TMP(%)	CN(%)	TOB(%)	CIP(%)
Pseudomonas aeruginosa (n= 45)	10 (22.22)	12 (26.67)	14 (31.11)	23 (51.11)	42 (93.33)	38 (84.44)	7 (15.56)	22 (48.89)	15 (33.33)	33 (73.33)
Staphylococcus aureus (n= 25)	6 (24)	0 (0)	13 (52)	0 (0)	6 (24)	4 (16)	6 (24)	16 (64)	12 (23.08)	12 (23.08)
Sreptococcus pneumoniae (n= 20)	12 (60)	12 (60)	0 (0)	13 (65)	8 (40)	6 (30)	8 (40)	8 (40)	6 (30)	16 (80)
Proteus spp. (n= 13)	7 (53.85)	5 (38.46)	7 (53.85)	9 (69.23)	11 (84.62)	11 (84.62)	5 (38.46)	8 (61.54)	10 (76.92)	10 (76.92)
Klebsiella spp.(n= 10)	2 (20)	3 (30)	3 (30)	7 (70)	8 (80)	7 (70)	3 (30)	6 (60)	6 (60)	7 (70)
E. coli (n= 7)	2 28.57)	3 (42.86)	2 (28.57)	4 (57.14)	0 (0)	1 (14.29)	2 (28.57)	0 (0)	0 (0)	1 (14.29)

L: Lincomycin, PY: Carbenicillin, E: Erythromycin, AMC: Amoxi-clav, CAZ: Ceftazidime, CRO: Ceftriaxone, TMP: Trimethoprim, CN: Gentamycin, TOB: Tobramycin, CIP: Ciprofloxacin

IV. Conclusion

The empirical treatment may not be successful in all cases of CSOM as the antibiotic susceptibilities of the causative organisms keep changing. Hence, appropriate antimicrobials should be prescribed after proper diagnosis of the microorganisms and their antimicrobial susceptibility patterns. This will help in preventing the emergence of drug-resistant strains.

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