

# Etiological Profile and Sensitivity Spectrum of Isolates from Chronic Suppurative Otitis Media studied at a tertiary care hospital

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## ABSTRACT

**Objective:** To determine the etiological profile and sensitivity spectrum of microorganisms of chronic suppurative otitis media studied at a tertiary care hospital.

**Material and methods:** This study was conducted at outpatient department of ENT, Head and Neck Surgery, Postgraduate Medical Institute Lady Reading Hospital Peshawar from June 20 10 to June 2011. This study included 285 patients who had discharging ears more than 3 months. The swabs were plated on Mac Conkey agar, Blood agar and Chocolate agar and incubated for 24 to 48 hours at 37°C. Identification of bacterial strains was done by colonial morphology on selective and differential medium. Minimal inhibitory concentrations (MIC) of these antibiotics were monitored according to the guideline of National Committee for Clinical Laboratory Standards (NCCLS).

**Results:** This study included 285 cases constituting 184 male and 101 female, with male:female ratio of 1.8:1. The age of the patients ranged from 08-46 years with mean age of 39.91±S.D 15.27 years. In majority of patients (73.68%) single organism was isolated. Among the isolates *Pseudomonas aeruginosa* was the commonest (46.31%). The antibiotic susceptibility profile of the bacterial isolates revealed that ciprofloxacin had highest sensitivity against pathogens isolated from CSOM.

**Conclusion:** *Pseudomonas aeruginosa* is the commonest etiological agent in chronic suppurative otitis media in our set up and ciprofloxacin is the antimicrobial agent with highest sensitivity.

**Key words:** Etiology, sensitivity, microorganisms, chronic suppurative otitis media

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## INTRODUCTION

Otitis media (OM) is inflammation of the middle ear drum and the inner ear, including a duct known as the Eustachian tube. There are three types of otitis media, and these are, acute purulent otitis media, otitis media with effusion (OME) and chronic suppurative otitis media (CSOM)<sup>1</sup>. Chronic suppurative otitis media (CSOM) is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges through a tympanic perforation. Otitis Media is highly prevalent worldwide.<sup>2</sup> Otitis media is very common in childhood and is almost always accompanied by a viral upper respiratory infection (URI) with a peak incidence between 4–7 years of age. Seventy–five percent of children experience at least one episode by their third birthday. Almost half of these children will have 3 or more ear infections during their first 3 years.<sup>1,2</sup> The reason for the higher frequency in these populations is the anatomic differences in skull base and Eustachian tube and biologic susceptibility<sup>3</sup>. The significant risk factors in otitis media include socioeconomic status, cultural, seasonal, and age

factors, as well as family history of middle ear disease. Over 50 percent of the cases of otitis media are caused by bacteria<sup>2</sup>. Occasionally, otitis media may be caused by fungi, viruses, *Mycoplasma pneumoniae* and *Chlamydia trachomatis*. The most common bacterial pathogens of OM are *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Moraxella catarrhalis*. Other pathogens responsible for OM are *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella* species, *Pseudomonas aeruginosa* and *Proteus* species<sup>4</sup>. Microbial infection can indeed involve different parts of the ear, but irritation of the squamous epithelium or skin appendages of the external auditory canal occurs less frequently because of lateral migration of keratin and debris, low pH, and wax formation which contains a variety of antimicrobial substances.<sup>5</sup> Clinically CSOM presents with ear discharge and conductive deafness. The presence of otalgia, foul smelling discharge, and blood stained pus are indicators of mounting complications<sup>6</sup>. Though the treatment of CSOM is controversial to some extent and subjected to change especially in developing country like Pakistan<sup>5</sup>. The antibiograms of these organisms has been reported to vary with time and geographical area as well as continent to continent, probably due to the use and abuse of antibiotics<sup>7</sup>.

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Therefore this study was conducted to know the new trend of prevalence and antibiogram profile of bacterial agents of CSOM in our community.

## MATERIAL AND METHODS

This descriptive study was conducted at outpatient department of ENT, Head and Neck Surgery, PGMI Lady Reading Hospital Peshawar from June 2010 to June 2011. This study included 285 patients. All the patients of any age, any race and either sex who had discharging ears more than 3 months duration were included in this study. Patients using topical or systemic antibiotics for more than a week discharge with intact tympanic membrane (otitis externa) and those having discharging ears less than 3 months duration were excluded from the study. A detailed history regarding ear discharge, onset, duration, frequency and associated illness was taken from patients or parents. Thorough examination of ears, nose and throat specifically focusing on discharging ears and systemic examination was also performed. Well informed consent was taken from patients/parents explaining the procedure, its risks, and benefits and the study was approved by the hospital ethical committee. The samples were collected with sterile swab sticks which were properly labeled for each patient. The swab sticks were taken to Microbiology Laboratory, for analysis. The swabs were plated on Mac Conkey agar (Oxoid CM115), Blood agar (Oxoid CM55) and Chocolate agar and incubated for 24 to 48 hours at 37°C. Identification of bacterial strains was done by colonial morphology on selective and differential medium. All isolates were biochemically tested. The swab sticks were streaked directly on the well labeled Sabouraud Dextrose Agar (SDA) plates and incubated at room temperature for fungal growth. The growth was identified based on their morphological and cultural characteristics and microscopic examination was done using lactophenol blue staining technique. All isolated strains were tested for susceptibility to antibiotics by agar dilution method using Mueller- Hinton agar (Oxoid CM337). The antibiotics tested were amikacin (Bristol Myers Squibb), gentamicin (Reckitt Benckiser), ciprofloxacin (Sami Pharmaceuticals), ceftazidime (Glaxo Wellcome), ceftriaxone (Bosch Pharmaceuticals), imipenem (Merck Sharp & Dohme) and aztreonam (Bristol Myers Squibb). Minimal inhibitory concentrations (MIC) of these antibiotics were monitored according to the guideline of National Committee for Clinical Laboratory Standards (NCCLS). All these patients were followed up to 3 months. The data was collected on a preformed proforma and statistical analysis was performed using the SPSS version 17.

## RESULTS

Table 1: Gender, age, season, socioeconomic, site of CSOM and number of isolates in this study (n=285).

Patients Status	=n	%age
Male	184	64.56
Female	101	35.43
<10 years	114	40
11-20 Years	96	33.68
>20 years	75	26.31
Summer	89	31.22
Winter	78	27.36
Autumn	66	23.15
Spring	52	18.24
Lower Socioeconomic group	187	65.61
Middle Socioeconomic group	70	24.56
High Socioeconomic group	28	9.82
Unilateral CSOM	194	68.07
Bilateral CSOM	91	31.92
Right CSOM	156	54.73
Left CSOM	129	45.26
Single Isolates	210	73.68
Mixed Isolates	70	24.56
No growths	5	1.75

Table 2: Microbiological profile of bacteria in this study (n=285)

Types of organisms	Frequency	%age
<b>A: Aerobic organisms</b>	<b>275</b>	<b>96.49</b>
<b>1. Gram positive bacteria</b>	<b>106</b>	<b>37.19</b>
Staphylococcus aureus	96	33.68
Staphylococcus epidermidis	7	2.45
Corynebacterium sp	2	0.70
Streptococcus sp	1	0.35
<b>B: Gram negative bacteria</b>	<b>169</b>	<b>59.29</b>
Pseudomonas aeruginosa	132	46.31
Klebsiella sp	23	8.07
Escherichia coli	7	2.45
Proteus mirabilis	4	1.40
Enterobacter sp	2	0.70
Citrobacter sp	1	0.35
<b>C: Anaerobic organisms</b>	<b>5</b>	<b>1.75</b>
Bacteroides sp	5	1.75
<b>D: Fungal Organisms</b>	<b>5</b>	<b>1.75</b>
Aspergillus niger	3	1.05
Candida sp	2	0.70

This study included 285 cases constituting 184 male and 101 female, with male: female ratio of 1.8:1. The age of the patients ranged from 08-46 years with mean age of 39.91±S.D 15.27 years. Majority of the patients (40%) were less than 10 years of age. Most of the patients (65.61%) belonged to lower socioeconomic group of the society. The patients presented mainly (31.22%) in summer time of the year. Unilateral CSOM was found in 68.07% and right ear was involved in 54.73% patients. In majority of patients (73.68%) single organism was isolated (Table 1). Among the isolates Pseudomonas

aeruginosa was the commonest (46.31%) gram negative bacteria while Staphylococcus aureus was the commonest (33.68%) amongst gram negative microorganisms (Table 2). The antibiotic

susceptibility profile of the bacterial isolates revealed that ciprofloxacin had highest sensitivity against pathogens isolated from CSOM (Table 3).

Table 3: Antibiotic susceptibility profile of the bacterial isolates (n=280).

Types and number of isolates	Antibiotics Tested						
	Amikacin	Gentamicin	Ciprofloxacin	Ceftazidime	Ceftriaxone	Imipenem	Aztreonam
Staphylococcus aureus (n-96)	52(54.16)	21(21.87)	87(90.62)	0(0.0)	0(0.0)	0(0.0)	33(34.37)
Staphylococcus epidermidis (n-7)	4(57.14)	6(85.71)	3(42.85)	5(71.42)	2(28.57)	6(85.71)	4(57.14)
Corynebacterium sp (n-2)	1(50)	1(50)	2(100)	0(0.0)	0(0.0)	1(50)	0(0.0)
Streptococcus sp (n-1)	1(100)	0(0.0)	1(100)	0(0.0)	0(0.0)	1(100)	1(100)
Pseudomonas aeruginosa (n-132)	76(57.57)	98(74.24)	119(90.15)	37(28.03)	21(15.90)	11(8.330)	9(6.81)
Klebsiella sp(n-23)	14(60.86)	9(39.13)	18(78.26)	0(0.0)	16(69.56)	5(21.73)	0(0.0)
Escherichia coli (n-7)	5(71.42)	3(42.85)	4(57.14)	2(28.57)	1(14.28)	0(0.0)	2(28.57)
Proteus mirabilis (n-4)	1(25)	2(50)	4(100)	3(75)	0(0.0)	1(25)	0(0.0)
Enterobacter sp (n-2)	1(50)	0(0.0)	2(100)	0(0.0)	1(50)	2(100)	0(0.0)
Citrobacter sp(n-1)	0(0.0)	0(0.0)	1(100)	0(0.0)	0(0.0)	1(100)	0(0.0)
Bacteroides sp(n-5)	4(80)	2(40)	1(20)	2(40)	3(60)	4(80)	0(0.0)

## DISCUSSION

Chronic suppurative otitis media usually begins in childhood as a spontaneous tympanic perforation due to an acute infection of the middle ear, known as acute otitis media, or as a sequel of less severe forms of otitis media. CSOM and various complications associated with the disease such as irreversible local destruction of middle ear structures, facial palsy, serious intracranial and extracranial complications are among the most common conditions seen by the otologist, paediatrician and the general practitioner<sup>2,6</sup>. It is more common in children belonging to lower socioeconomic group. Most common microorganisms found in CSOM are Pseudomonas aeruginosa, Staphylococcus aureus and Escherichia coli but these organisms vary in various geographical areas<sup>4</sup>. The basic principles of medical management of CSOM are aural hygiene and the use of a topical antimicrobial agent. The indiscriminate and haphazard use of antibiotics and poor follow-up of these patients has resulted in the emergence of multiple resistant strain of bacteria<sup>7</sup>. Ear infection occurs in both sexes. In our study male gender was dominant (64.56%) simulating Okesola<sup>8</sup> study but disagreeing study of Abdullah<sup>9</sup> who had female predominance. CSOM can be experienced at any age but mostly younger children are affected as we found that 40% of patients were less than 10 years which is comparable to study of Adoga<sup>10</sup>. This disease may occur everywhere and any time but in

our study there was seasonal predilection with 31.22% cases were registered in summer time simulating other studies<sup>3,6,7</sup>. There are multiple risk factors responsible for CSOM. Poverty is the main culprit leading to CSOM. In this study 65.61% of patients belonged to lower socioeconomic group of society which is in accordance to study of Bowd<sup>11</sup> and Srivastava<sup>12</sup>. In this study single pathogen was the commonest (73.68%) finding which simulates the study of Okesola<sup>8</sup> who found single pathogen in 90.9% patients. However mixed pathogen was found in 24.56% and in 5 cases (1.75%) no growth was isolated which is in agreement with work of Loy<sup>13</sup> who found single pathogen in 63.3% cases, mixed organisms in 34.44% patients and sterile culture in 2.2% patients. In this study both aerobic and anaerobic bacteria were cultured from patients having CSOM. However Pseudomonas aeruginosa was the commonest gram negative bacteria (46.31%) while Staphylococcus aureus was on top (33.68%) amongst gram positive bacteria which is in accordance to Hassan's<sup>14</sup> study where Pseudomonas aeruginosa was accounting for the highest (38.50%) followed by Staphylococcus aureus (30.8%). My results are different from results of Ibekwe<sup>15</sup>, Yamanaka<sup>16</sup> and Segal<sup>17</sup> who found Hemophilus influenza and Streptococcus pneumonia the most prevalent organisms. Bacteroides Sp was the only anaerobic bacteria collected from 5 patients (1.75%) and fungal pathogens were also found in 1.75% patients. Similar findings are also reported in study of

Osazuwa<sup>18</sup>, Ramakrishnan<sup>19</sup> and Srivastava<sup>12</sup>. Sensitivity pattern of different antibiotics was checked according to the NCCLS guidelines. *Pseudomonas aeruginosa* showed highest sensitivity to ciprofloxacin (90.15%) followed by gentamicin (74.24%) which is agreeable to study of Mansoor<sup>20</sup> and Abdullah<sup>9</sup> but at variance to the study of Osazuwa<sup>18</sup>. *Staphylococcus aureus* showed highest susceptibility to ciprofloxacin (90.62%) followed by amikacin (54.16%) and gentamicin (21.87%) which is comparable to study of Okesola<sup>8</sup> and Loy<sup>13</sup> who also reported that *Staphylococcus aureus* had maximum sensitivity to ciprofloxacin and gentamicin. Regarding *Staphylococcus aureus* sensitivity our results differs from that of Hassan's<sup>14</sup> who found that *Staphylococcus aureus* had maximum susceptibility to streptomycin. In this study some pathogens also showed resistance to majority of antimicrobial agents which are reported in literature<sup>10,15</sup>.

## CONCLUSION

It is concluded that *Pseudomonas aeruginosa* is the commonest etiological agent in chronic suppurative otitis media followed by *Staphylococcus aureus* in our set up and ciprofloxacin is the antimicrobial agent with highest sensitivity. The high resistance of microbial agents can be prevented by avoiding indiscriminate and injudicious use of antibiotics.

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