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Original Article

Antimicrobial Susceptibility Pattern of Bacterial Isolates from Patients with Chronic Suppurative Otitis Media

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Abstract

Background: *Chronic suppurative otitis media (CSOM) is one of the common diseases of the middle ear especially in developing countries. Early and effective treatment based on the knowledge of causative micro-organisms and their antimicrobial sensitivity pattern ensures prompt clinical recovery and possible complications may be avoided.*

Objectives: *This study was done to determine the pattern of bacterial isolates and to detect their antibiogram.*

Methods: *A total of 103 patients clinically diagnosed of CSOM were enrolled in the study and the samples were obtained from each patient using sterile cotton swabs and cultured for bacterial isolates. Antimicrobial susceptibility test of the isolates were performed using Kirby-Bauer disc diffusion method.*

Results: Among the cases fe*males were more affected than males. Out of the 103 cases, bacteriological investigation revealed that Pseudomonas aeruginosa 42 (44.68%) and Staphylococcus aureus 31(32.97%) were the predominant bacteria. Ciprofloxacin and Ceftazidime revealed high level of sensitivity whereas high resistance rates were observed for Amoxycillin, Gentamicin and Cephalexin.*

Conclusion: *The study concluded that an appropriate knowledge of the etiological agents and antibacterial susceptibility of microorganisms would contribute to a rational use of antibiotics, success of treatment and reduce the complications of CSOM.*

Key words: *Chronic suppurative otitis media, bacteria, antibiogram.*

Introduction

Chronic suppurative otitis media (CSOM) is a persistent inflammation of the middle ear or mastoid cavity, characterized by recurrent or persistent ear discharge through a tympanic perforation [1]**.** It is one of the common diseases of the ear, particularly in childhood, as their Eustachian tube is shorter and more horizontal than adults and is made up of more flaccid cartilage, which can impair its opening and is the commonest cause of persistent mild to moderate hearing impairment [2, 3]. CSOM is usually classified into two types, tubotympanic and attico-antral depending on whether the disease process affects the pars tensa or pars flaccida of the tympanic

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membrane (TM). Tubotympanic is called as a safe type or benign type as there is no serious complication whereas, attico-antral is called as the unsafe or dangerous type because of associated complication and may be life threatening at times [4].

It is commonly a disease of the developing world with malnutrition, over-crowding, substandard hygiene, frequent upper respiratory tract infections and under-resourced health care, all linked to low socio-economic status [5]. Sources of infection in CSOM are solemnly dependent on the route by which infection reaches the middle ear and the chief route by which this occurs is the Eustachian tube. Infections of the sites like; nasopharynx, nose, sinuses, oropharynx, adenoids and tonsils may be the source. Bacterial infections of the middle ear normally originate from the upper respiratory tract, with the bacteria entering the ear through the auditory tube, the principal portal of entry to the ear [6]. The most common bacteria involved in such infections are *Haemophilus influenzae, Streptococcus pneumoniae, Streptococcus pyogenes, Staphylococcus aureus, Moraxella catarrhalis,* Escherichia coli, Pseudomonas *aeruginosa,* Klebsiella spp. and occasionally Proteus spp. CSOM can also be caused by fungi or virus [7].

In most cases, an allergy or upper respiratory tract infection causes congestion and swelling of the nasal mucosa, nasopharynx and eustachian tube. Subsequently, obstruction at the eustachian tube isthmus results in accumulation of middle ear secretions. Then secondary bacterial infection causes suppuration and features of otitis media set in. The effusion may persist for weeks or months after the infection resolves. Otitis media with effusion may occur spontaneously as a result of eustachian tube dysfunction or as an inflammatory response after acute otitis media [8]. The commonly occurring symptoms are ear discharge, deafness, itching, pain and sometimes fever [9]. If it is left untreated infection can spread from middle-ear to vital structures such as mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, post aural swelling, post aural sinus meningitis and intracranial abscess [4]. Findings may also include thickened granular middle ear mucosa, mucosal polyps and cholesteatoma within the middle ear [1].

The etiologies of chronic otitis media differ in geographical area. Moreover, antimicrobial resistance profile of bacteria varies among population because of difference in geography, local antimicrobial prescribing practices and prevalence of resistant bacterial strains. This is why, up to date information on microbial resistance needs to be available at national and local levels to guide the rational use of the existing antimicrobials. Thus, the study was performed to identify the pattern of bacterial agent and to determine their antibiotic susceptibility pattern to generate information to guide for empirical treatment of CSOM patients.

Methods

The present study is carried out in the department of ENT CMH Dhaka from July 2013 to June 2014. A total of 103 patient irrespective of age and sex attending ENT outpatient department presented with clinical symptoms & signs of otitis media and did not receive antimicrobial therapy (topical or systemic) for the last 7 days were included in the study. Patients with otitis externa, referred otalgia, receiving antibiotic treatment and those who did not give consent to

participate in the study were excluded. Using sterile swab stick, swabs were collected for aerobic culture and were inoculated on blood agar (BA), MacConkey's agar and chocolate agar (CA) media. Much care was taken to avoid surface contamination and the swabs were transported to the microbiology department of the hospital for culture and sensitivity testing. The plates were incubated at 37°C for 48 hours. Organisms were identified using standard procedures. Antibiotic susceptibility testing was carried out using the Kirby-Bauer disc diffusion technique on Muller-Hinton agar and commercial antibiotic discs were used for antimicrobial testing [10].

Results

In this study, males were found more affected then females (Table-I). Discharge 103 (100%) were present in all patient followed by hearing impairment 91 (88.34 %) were the most common presenting symptoms.

The results of bacteriological investigation revealed that out of the 103 cases of otitis media studied, 94 (91.26%) cases yielded positive cultures and 9 (8.73 %) cases yielded no growth on culture. Among the bacterial isolates Pseudomonas aerugenosa 42 (44.68%) and Staphylococcus aureus 31(32.97%) were the predominant bacteria. Next to those Proteus spp. 08 (8.51%), Escherichia coli 06 (6.38%), Streptococcus pneumoniae 04 (4.25%) and Klebsiella spp. in 03 (3.19%) cases were seen. Regarding antimicrobial susceptibility we found ciprofloxacin followed by Ceftriaxone were the most effective drugs against Staph. aureus. Imipenem was most sensitive against Pseudomonas aerugenosa and Amikacin followed by Ceftazidime were found most sensitive against Escherichia coli.

Table-I

Sex distribution of cases (n=103)

Sex	Number	Percentage
Female	64	62.13%
Male	39	37.87%

Table II

Clinical presentations of the cases (n=103)

Symptoms	Number	Percentage
Discharge	103	100 %
Hearing impairment	91	(88.34 %)
Pain in the ear	22	21.35 %
Tinnitus	21	20.38%
Headache	11	10.67%
Post auricular swelling	06	5.82 %
Vertigo	05	4.85 %

Table-III

Bacteria isolated from culture (n=94)

Bacteria	Number	Percentage
Pseudomonas aeruginosa	42	44.68%
Staphylococcus aureus	31	32.97%
Proteus spp	8	8.51%
Escherichia coli	6	6.38%
Streptococcus pneumoniae	4	4.25%
Klebsiella spp	3	3.19%

Table-IV

Antibiotic susceptibility pattern of Staph. aureus

Name of antibiotic	*Staph. aureus*
Amoxycillin	31.25%
Ciprofloxacin	87.5%
Gentamycin	50 %
Ceftriaxone	64.70%
Ceftazidime	56.25 %
Trimethoprim-sulfamethoxazole	56.25%
Cephalexin	46%
Netilmycin	18.75%
Chloramphenicol	62.5 %
Erythromycin	47.5%
Amikacin	6.25%

Table V

Antibiotic susceptibility pattern of Ps. Aeruginosa

Name of antibiotic	*Ps. aeruginosa*
Amoxycillin	9.52%
Gentamycin	31.81%
Ciprofloxacin	47.61%
Ceftriaxone	28.57%
Ceftazidime	52.38%
Trimethoprim-sulfamethoxazole	23.80%
Cephalexin	19.04 %
Netilmycin	57.14 %
Chloramphenicol	23.80%
Carbenicillin	36.36%
Amikacin	31.81%
Imipenem	63%
Levofloxacin	4.54%

Table VI

Antibiotic susceptibility pattern of Esch. coli

Name of antibiotic	Esch. coli
Amoxycillin	16.6%
Gentamycin	33.33
Ciprofloxacin	66.66%
Ceftriaxone	50%
Ceftazidime	66.66%
Trimethoprim-sulfamethoxazole	66.66%
Cephalexin	33.3%
Netilmycin	83.33%
Chloramphenicol	50%
Amikacin	80%

Discussion:

Chronic suppurative otitis media and its complications are among the most common conditions seen by otologists and general practitioners. It is a persistent inflammation of the middle ear or mastoid cavity and is characterized by recurrent or persistent ear discharge through a perforation of the tympanic membrane [10].

Out of 103 cases, we found females were more affected than males in our study. The predominance of infection in females does not match with the result of Ayson *et al*. They found, males were more affected than females [11]. In another study done by Moorthy *et. al*. from India in 2013, also found males were more affected than females [12]. This difference is due to the place of study and study population. In CMH only the defense persons and their family members are entitled and the defense persons undergo through regular medical *checkup* procedure and take medical treatment during the accute stage of the disease. So the chance of development of CSOM is less.

Clinical presentations are summarized in Table . We found discharge from ear in all the 103 (100%) cases followed by different degree of hearing impairment in 91 (88.34 %) cases which is simillar with the study done by [13] Magsi *et. al.* in 2012. In another study by Khan *et al.* also found that discharge is the leading presentation which is followed by hearing loss and headache [14].

In our study we found *Pseudomonas aeruginosa* 42 (44.68%) *as leading cause followed by Staphylococcus aureus* 31(32.97%) and Proteus spp. in 08 (8.51%) cases. In a study done by Shyamala and Reddy from India found Ps. aeruginosa as the most predominant species in 40% cases, followed by Staphylococcus aureus in 31% cases [15]. In another study done by Fatima *et. al*. also found Ps. aeruginosa as the most common isolate, followed by Staph. aureus [9].

In the present study Ciprofloxacin was the most effective antibiotic against Staph. aureus. In studies done by Sharma *et al*. and

Moorthy *et al*. also found Ciprofloxacin as the most effective drug against Staph. aureus [16, 12]. We also found that Ceftazidime is the most effective against Ps. aeruginosa and Esch. coli. Another study done by *Natarajan et al*. from India, found most of the isolates were sensitive to Amikacin. In another study done by Madana *et al*. from India, found *Pseudomonas* highly sensitive to Ceftazidime, Ciprofloxacin and Amikacin. They also found *Staphylococcus* significantly sensitive to Vancomycin, Ciprofloxacin and Erythromycin. In general, their findings showed that gram negative organisms had increased sensitivity to Ceftazidime, Ciprofloxacin and Amikacin, while gram positive organisms to Vancomycin, Erythromycin and Ciprofoxacin [17]. The observations made from different studies indicate that there may be variation in causative organism and their antimicrobial sensitivity due to differences on ethnic and geographic fact and also the pattern of use of antibiotics.

Conclusion

With the widespread use of antibiotics, the types of pathogenic micro-organisms and their resistance to antibiotics have changed. Knowing the etiological agents of CSOM and their antimicrobial susceptibility is essential for an efficient treatment, prevention of both complications and development of antibiotic resistance and finally, the reduction of the treatment costs. Thus continuous and periodic evaluation of microbiological pattern and antibiotic sensitivity of isolates is necessary to decrease the potential risk of complications by early institution of appropriate treatment.

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