**Article Information**

**Authors addresses:**
*Aljamhory Teaching Hospital, Mosul - Iraq*

* Corresponding Author
E-mail address:

**Article history:**
Received: 28 Feb. 2013
Accepted: 6th May 2013

**Keywords:**

**Abstract**

**Background:** Chronic suppurative otitis media (CSOM) is the result of an initial episode of acute otitis media and is characterized by a persistent discharge from the middle ear through a tympanic perforation for at least 2 weeks duration. It is an important cause of preventable hearing loss, particularly in the developing world.

**Methods:**
1. To get an overview on the bacterial ear infection profile in general
2. To assess the antibiotic resistance of *Pseudomonas* infection (PS) particularly since it is usually the commonest infection to cause otitis media and the most difficult to treat due to the problem of multi drug resistance.

A cross sectional study was done which included 405 patients of CSOM patients. 196 (48%) case were males, 209 (52%) case were females. Swabs for aural discharge was taken from those patients. Discharge is cultured by inoculating it into blood, MacConkey agar, chocolate agars and Sabouraud agar (for fungi).

If the isolate shows to be *Pseudomonas* isolate growth then another culture of the isolate is performed on Muller Hinton Agar. Then the antibiotic susceptibility and resistance of *Pseudomonas* isolate is assessed by (Kirby-Bauer Method).

**Results:**
196 (48%) case were males.
209 (52%) case were females with a male to female ratio 1:1.1

150 (73%) cases were infected with *Pseudomonas* species (PS)

The sensitivity of the Pseudomonas isolates to the following antibiotics is shown below:
- Amikacin 91.7%
- Imipenem 89.7%
- Cefazidime 81.8%
- Ciprofloxacin 73.7%
- Garamycin 72.9%
- Tobramycin 67.7%
- Ticarcillin 66.7%
- Cefoperazone 42.9%

**Conclusions:** *Pseudomonas* species is the commonest microorganism in cases of CSOM.

Microbiological identifications and antibiotic resistance determination of pathogens isolated from the middle ear in patients with CSOM not responding to empirical antibiotic treatment gives possibility of the choice of an effective antibiotic and its proper dosage. Cefoperazone, a relatively new antibiotic that is used in Iraq to combat pseudomonal infections has proven to be poorly effective compared with other previously used antibiotics.

**Introduction: Definition of CSOM**

Chronic suppurative otitis media (CSOM) is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges or otorrhoea through a tympanic perforation (1).

1. The disease is the residue of an acute suppurative infection usually acquired in infancy or early childhood (2).

The disease commonly starts with painless perforation of the ear drum and purulent discharge. The perforation is usually central and often large. It remains for several years. During this time there are episodes of painless discharge of foul-smelling pus associated with a blocked ear canal and poor hearing. Between these episodes, the perforation remains, but the ear is usually dry and hearing can be normal or at least adequate (3).

Generally, patients with tympanic perforations which continue to discharge mucoid material for periods of from 6 weeks to 3 months, despite medical treatment, are recognized as CSOM cases. The WHO definition requires only 2 weeks of otorrhoea (1), but
The PREVALENCE

KCMJ

Zaid Ihsan

otolaryngologists tend to adopt a longer duration, e.g. more than 3 months of active disease (vii).

Risk factors for CSOM

Inadequate antibiotic treatment, CSOM were previous tympanostomy tube insertion ; having had more than 3 upper respiratory tract infections and/or acute OM in the past 6 months ; having parents with a low education level and having older siblings(vi),nasal disease (v), poor access to medical care (vi),bottle-feeding (vii), passive exposure to smoking (v), attendance in congested centers such as day-care facilities (v), and a family history of otitis media are some of the risk factors for otitis media (viii). The predisposition of certain races, such as the South-western American Indians (vii), Australian Aborigines(viii), Greenlanders, and Alaskan Eskimos(ix) , to CSOM is also well documented. These risk factors probably favor the development of CSOM by weakening the immunological defenses, increasing the inoculum, and encouraging early infection (vii).

Poor housing, hygiene and nutrition are associated with higher prevalence rates, and improvement in these aspects was found to halve the prevalence of CSOM in Maori children between 1978 and 1987 (vii). Proximity to a health care facility significantly reduced the otitis media attack rate among Arizona Indian children living in reservations (viii).

Bacteriology of CSOM

In CSOM the bacteria may be aerobic (e.g. Pseudomonas aeruginosa, Escherichia coli, S. aureus, Streptococcus pyogenes, Proteus mirabilis, Klebsiella species) or anaerobic (e.g. Bacteroides, Peptostreptococcus, Propionibacterium) (vii,viii). The bacteria are infrequently found in the skin of the external canal, but may proliferate in the presence of trauma, inflammation, lacerations or high humidity (vii). These bacteria may then gain entry to the middle ear through a chronic perforation (viii). The most common organisms are Pseudomonas spp. which rapidly develop resistance to antibiotics (viii) among these bacteria, P. aeruginosa has been particularly blamed for the deep-seated and progressive destruction of middle ear and mastoid structures through its toxins and enzymes(ix,xv).

Histopathological features of CSOM

Otitis media presents an early acute phase, with essentially reversible mucosal and bony pathological changes, which continues to a late chronic phase with well established, intractable mucoperiosteal disease. The recurrent episodes of otorrhoea and mucosal changes are characterized by osteonecrosis, bony erosions, and osteitis that include the temporal bone and ossicles (xv).

The mucous membrane may be thickened by edema and submucous fibrosis and infiltration with chronic inflammatory cells. Mucosal edema may proceed to the formation of polyps. Persistent suppuration may proceed formation of granulation tissue and bone resorption. In more advanced cases, osteitis of ossicles, mastoid bone and labyrinth (xvi). The drug resistance of CSOM isolates is increasing and has been shown to vary with geographical location (vii,viii,xv). The antibiotic susceptibility and resistance is assessed by (Kirby-Bauer Method) using commercially obtained disks for the following antibiotics:

- The following antibiotic disks were produced by BIOANALYSE company: imipenem (IM 10ug/disk), piperacillin (PIP100ug/disk), cefpime (CP 30ug/disk), ceftaxime (CE 30ug/disk), ceftriaxone (CTX 30ug/disk), carbenicillin (CAB 100ug/disk), ticarcillin (TIC 75ug)
- The following antibiotic disks were produced by Al-Raze Center for Research and Medical Therapeutic Production: tobramycin (TB 10ug), ciprofloxacine(CIP5ug), amikacin(AK 30ug), garamycin(GR 10ug)
- The following antibiotic disks were produced by BD company: aztreonam(30ug), cefazidime (CZ 30ug)

Cefoperazone (CEP 75ug) containing disks were prepared in the laboratory. Appropriate concentration of cefoperazone (1 gm Cefobid [trade name for cefoperazone]) vial source manufactured by Pfizer was diluted in appropriate volume of sterile distilled water and incubated with disks which were made of filter paper. The disks were allowed to dry for 2 hr at room temperature and were stored under desiccation at 40°C.

Statistical Analysis: demographic data were demonstrated using percentages for male to female ratio. Prevalence of the pathogenic micro-organisms which were discovered and sensitivities of the tested antibiotic disks were shown by percentages.

RESULT: Over a period of 3 years (between march 2008 till march 2011), a total of 405 case of chronic otitis media were collected in the years 2008-2011 (Figure 1). 196 (48%) case were males. 209 (52%)case were females with a male to female ratio 1:1.1

Methods: A cross sectional study was done which included 405 patient of CSOM patients (patients with aural discharge for 2 weeks or more). The patients came to the ENT consultant clinic in Al-Khadimiya Teaching Hospital in the period 2008-2011. Swabs for aural discharge were taken from those patients from which a smear is stained with gram stain and examined by light microscope.
Regarding the pathogenic micro-organisms as found by the culture method (Figure 2):

- 150 (37%) cases were infected with *Pseudomonas* species (PS)
- 58 (14.3%) cases were infected with *Staphylococcus aureus* (SA)
- 34 (8.3%) cases were infected with *Proteus* species (PR)
- 27 (6.6%) cases were infected with *Staphylococcus epidermidis* (SE)
- 15 (3.7%) cases were infected with *E. coli* (EC)
- 14 (3.4%) cases were infected by *Enterobacter* (E)
- 4 (0.9%) cases were infected by *Klebsiella* (K)
- 3 (0.7%) cases were infected by *Streptococcus pneumoniae* (SP)
- 4 (0.9%) cases were infected by fungi (F)
- 40 (9.8%) case there was mixed infection (M)
- 53 (13%) case there was no growth (NG)

Regarding the sensitivity of *Pseudomonas* species isolates to the following antibiotics it is shown below (Figure 3):

- Ciprofloxacin (CIP) 73.7%
- Garamycin (GR) 72.9%
- Tobramycin (TB) 67.7%
- Ticarcillin (TIC) 66.7%
- Cefoperazone (CEP) 42.9%
- Pipacillin (PIP) 20.7%
- Ceftriaxone (CTX) 3.4%
- Carbinicillin (CAB) 0.0%
- Cefotaxime (CE) 0.0%
- Aztreonam (ATM) 0.0%
- Cefipime (CP) 0.0%

**Discussion**

The male to female ratio in this study is 1:1.1. Compared to another study which has showed that the ratio is 1:1.7 (xxx). Generally no gender bias is obvious in previous studies and it can occur in any age group (xxx).

The results show clearly that *Pseudomonas* species infections are the commonest constituting 37% of all cases. In addition to that pseudomonas species infections are the most virulent regarding the rapidity of progress and the severe complication that may happen due to the deteriorating global problem of multi drug resistance. Todar described *Pseudomonas* as being notorious for its resistance to antibiotics and for this, it is a dangerous and dreaded pathogen (xxx). The species Pseudomonas comprises of more than 140 species, only few of these are pathogenic to man like *P. aeruginosa, P. oryzihabians, and P. pleocoglossida* (xxx) but pseudomonas aeruginosa is by far the most frequent cause and the most important pathogen in the species (xxx).

The others are essentially saprophytic and occur widely in nature (xxx).

1. Other bacteria found by culture are: (14.3%) 58 cases *Staph. aureus*, 34 (8.3%) cases *Proteus* species, 27 (6.6%) cases *Staph. Epidermidis*, 15 (3.7%) cases. Although *Staph. Epidermidis* is well known as normal flora of the external ear, it can sometimes become pathogenic causing otitis media especially when the defense mechanisms are weak (xxx).
2. *E. coli* 14 (3.4%) cases *Enterobacter* 4 (0.9%) cases *Klebsiella* 3 (0.7%) cases *Strep. pneumoniae* 4 (0.9%) cases fungi 40 (9.8%) case mixed infection 53 (13%) case no growth.

3. While in a study done in Basrah 2005, results were as follows: *Staphylococcus aureus* 25%, *Pseudomonas* 18.8% *Streptococcus pneumoniae* 18.8%, *Proteus* sp. 8.3%; *Klebsiella* sp. 6.3%. *E. coli* 4.2%. No growth 18.8%.

4. In Nigeria a study showed that: *Pseudomonas* 30% (44%), *Staphylococcus* 18% (27%), *Proteus* 12% (18%), *Klebsiella* 8% (12%), and (0.02%) 2 were incidental fungal isolates (Candida species). 8% (12%) were contaminants while 10% (15%) did not have any growth at all.

5. Amikacin in this study is the most effective antibiotic in terms of sensitivity 91.7%, this finding coincides with that of a study in Singapore (16%) 90.4%, and

6. Spain 91% (44).

7. Cefoperazone a third generation cephalosporin has been introduced in Iraq relatively recently (in the last few years) to combat the problem of emerging drug resistance.

8. Antibiotic sensitivity regarding cefoperazone was 42.9%. In a study done in India the sensitivity was 55.87% (44). In another study done in Lithuania the sensitivity was 31.7% (44). In a study done in Bulgaria the sensitivity for cefoperazone was 15% (44).

**Conclusions:**

Pseudomonas infection in chronic otitis media is a major health problem due to its high prevalence and resistance to many drugs. Even some relatively newly developed and used drugs like cefoperazone are not very effective in combating the rapidly emerging problem of multidrug resistance.

New researches should be done to explore in depth the mechanisms of drug resistance leading to concerted efforts on the way of developing new antibiotic drug therapies.

**Acknowledgment**

It appreciate the efforts done by:

1. Dr. Mithaq Sabeeh Khudr (M.Sc Microbiology). Head of Laboratory of Al-Kindy Teaching Hospital

2. Dr. Mazin Kais Ameen (Ph.D Microbiology) Bacteriologist in Laboratory of Al-Kindy Teaching Hospital.

3. Amera Abdullah Hasan microbiologist in the microbiology lab in Al-Khadiamiy Teaching Hospital.

4. Dr. Wafaa Hazim microbiologist in the Microbiology Dept. in Al-Kindy College of Medicine

for their assistance and advice that led to the fulfillment of this research.

**References:**


24. WHO. Chronic suppurative otitis media. Switzerland: 2004:10


xxxi. AS Adoga et al. Swab and aspiration specimen collection methods and antibiogram in chronic suppurative otitis media at Jos University Teaching Hospital: Which is superior?. Department of Surgery, Ear, Nose and Throat unit, Jos University Teaching Hospital. Ibadan. Nigeria. 2010; 9(4): 230-234


xxviii. Ahmed M. Al-Abbasi. Efficacy of Povidone Iodine in Treatment of Active Chronic Suppurative Otitis Media. JIMA.2006;(38) 118-121

xxix. S Adoga et al. Swab and aspiration specimen collection methods and antibiogram in chronic suppurative otitis media at Jos University Teaching Hospital: Which is superior?. Department of Surgery, Ear, Nose and Throat unit, Jos University Teaching Hospital. Ibadan. Nigeria. 2010; 9(4): 230-234


xliii. S Shenoy, S Baliga. Antibiotic sensitivity patterns of Pseudomonas aeruginosa strains isolated from various clinical specimens. Medicina (Kaunas) 2007; 43(1)

xliv. he peculiarities of Pseudomonas aeruginosa resistance to antibiotics and prevalence of serogroups

Greta Gailiene, Alvydas Pavilonis, Violeta Kareiviené
Department of Microbiology, Kaunas University of Medicine, Lithuania