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RESEARCH ARTICLE

Chronic Suppurative Otitis media: Microbial and Antimicrobial Findings

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Abstract

Objective: To identify the most frequent microorganisms associated with chronic suppurative otitis media and their antimicrobial**.**

Patients and Methods: In our study we examined 107 patients for bacteriological findings. All patients were evaluated through detailed history and clinical examination. Patients were divided into 3 groups: chronic suppurative otitis media, chronic suppurative otitis media with cholesteatoma, and chronic suppurative otitis media with polyps. Pus samples were collected from the discharging ear(s) and sent to the hospital laboratory where culture and sensitivity studies were done for aerobes, anaerobes and fungi and antibiotic sensitivity patterns.

Results: There are 5 different species and organisms and all of them were aerobic. Three of them were Gram-negative and two of them were Gram-positive, whereas no fungi or anaerobe was isolated. The most frequently isolated bacteria were Pseudomonas aeruginosa, Proteus mirabilis and Staphylococcus aureus (more than 50%). Gram-negative bacteria increased in subjects of 20 years and above and Gram-positive bacteria increased in subjects younger than 19 years in examination according to the age group. Drug sensitivities pattern of Pseudomonas aeruginosa showed that ciprofloxacin was active against majority 95% of isolates followed by amikacin 85%, gentamicin and tobarmycin 60% and cefotaxime 42%. Staphylococcus aureus isolates were resistant to penicillin, ampicillin and amoxicillin in 76.9% whereas majority was sensitive to Amoxicillin clavulanate (augmentin) 79.4% and cephradine 84.6%.

Conclusion: Our study confirmed that the most common isolated bacteria are Pseudomonas aeruginosa, Staphylococcus aureus and Proteus mirabilis. Majority of isolates of Pseudomonas aeruginosa were sensitive to ciprofloxacin. Majority of strains of Staphylococcus aureus were resistant to penicillin. Cephradine and augmentin were effective against most of the isolates of Staphylococcus aureus.

Introduction:-

Chronic suppurative otitis media (CSOM) is a long standing purulent infection of middle ear cleft presenting as purulent ear discharge which may be associated with variable degree of hearing loss. Chronic inflammation of middle ear cleft is slow and insidious in its course, tends to be persistent and often produce irreversible local destruction of middle ear cleft mucosa and underlying bone. This local destruction sometimes leads to serious extra and intracranial complications. Early and appropriate antibiotic treatment may reduce the risk of the serious complications. [1, 8]

It is common in infants and children especially of lower socio-economic group. The disease is mainly classified into two types: tubotympanic and atticoantral depending upon whether the disease process affects the pars tensa or the

pars flaccida of the tympanic membrane. Typically the disease follows viral infections of the upper respiratory tract but soon invades middle ear with pyogenic organisms. [2]

In many cases of CSOM, antibiotics are prescribed indiscriminately. The consequences are treatment failures, prolongation of disease course, and emergence of resistant organisms, increased complication rate and increased treatment cost. Knowledge of commonest organisms responsible for chronic discharging ear and their resistant patterns in the community is helpful in selecting correct antimicrobial agents. [3]

Changes in the microbiological flora following the advent of sophisticated synthetic antibiotics increase the relevance of reappraisal of the modern day flora in C.S.O.M, 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. [4]

This study was undertaken to identify commonest microorganisms involved in CSOM and their sensitivity patterns to commonly prescribed drugs.

Material and methods:-

The sample of this study was conducted in the period from March 2010 to April 2014, in the Department of Otorhinolaryngology, royal medical services (Amman-Jordan).

After institutional ethical committee clearance and written informed consent, 107 patients of either sex and all age groups who attending the Outpatient Department of Otorhinolaryngology, with active chronic suppurative otitis media were included in the study.

Patients who have used topical or systemic antibiotics for the last 10 days, history of ear surgery, immunocompromised or diabetic were excluded from the study.
A baseline data of cases were recorded including history, general examination, systemic examination, Otorhinolaryngological examination investigations and treatment received in the past.

The microbiological swabs were taken of 3 groups of patients:
• Chronic suppurative otitis media (54 cases)
• Chronic suppurative otitis media with cholesteatoma (31 cases)
• Chronic suppurative otitis media with polyps (22 cases)

Aural swabs were taken on the first day of attendance of the patients to ENT, OPD before any local medication using sterile cotton wool swabs and sterile ear specula especially prepared and autoclaved. Only those cases were selected who had not taken any treatment either systemic or local in the form of ear drops for the last seven days.

All care was taken to avoid surface contamination and the swabs were taken to the microbiology laboratory for further bacteriological processing.

For aerobes, samples were inoculated into blood agar, Mac Conkey's agar and chocolate agar whereas Robertson's cooked meal medium and neomycin blood agar were used for anaerobes. These plates were incubated at 37oC for 24 to 48 hours. Sabourad's glucose agar was used to culture fungi at room temperature for up to one week. Isolates were identified and characterized by their cultural, morphological pigment production, beta haemolysis in blood agar, motility and conventional biochemical tests. Disc diffusion test was the method used for drug sensitivity testing.[5]Antibiotic susceptibility interpreted according to the zone size chart adapted from M2-A3 "Performance Standards for Antimicrobial Disks Susceptibility Tests".

Results:-

Microbiology of 107 ears with chronic suppurative otitis media was studied for aerobes, anaerobes and fungi. There are 5 different species and organisms and all of them were aerobic. Three of them were Gram-negative and two of them were Gram-positive, whereas no fungi or anaerobe was isolated.

The swab cultures of 3 groups of patients were analyzed:
In group I (Chronic suppurative otitis media, 54 cases) the most frequently isolated bacteria were Staphylococcus aureus (54%) and Pseudomonas aeruginosa (22%), (Table 1).

In group II (chronic suppurative otitis media with cholesteatoma, 31 cases) the most frequently isolated bacteria were Pseudomonas aeruginosa (52%) and Proteus mirabilis (23%), (Table 2). In group III (chronic suppurative otitis media with polyps, 22 cases) the most frequently isolated bacteria were Pseudomonas aeruginosa (54%) and Staphylococcus aureus (23%), (Table 3).

In our study we noticed that the Gram-negative bacteria increased in patients of 20 years and above and decreased in patients between 0 and 19 years. Gram-positive bacteria decreased in patients of 20 years and above and increased in patients younger than 19 years (Table 4).

Drug sensitivity patterns of pseudomonas aeruginosa showed that ciprofloxacin was active against 95% of isolates followed by aminoglycosides (amikacin 85%, gentamicin 60%, tobramycin 60% and cefotaxime 42.5%).(Table 5).

Staphylococcus aureus isolates were resistant to penicillin, ampicillin and amoxicillin in 76.9% of cases whereas majority was sensitive to cephradine 84.6%, Amoxicillin clavulanate (augmentin) 79.4% and tetracycline 76.9 %.(Table 6).

Discussion :-

Chronic Suppurative Otitis Media (C.S.O.M.) and its complications are among the most common conditions seen by the Otologist, Paediatrician and the General Practitioner. It is a persistent disease with great risk of irreversible complications. Early bacteriological diagnoses of all cases will assume accurate and appropriate effective therapy.

Microbiological analysis of chronic otitis media shows an interaction between local infection and the disease. The predominant organisms are Pseudomonas aeruginosa and Staphylococcus aureus in our study. This correlates well with other studies. [2]

The microbiology of chronic suppurative otitis media without cholesteatoma has been reported by Kenna and coworkers (1986). The most common bacterial species isolated was Pseudomonas aeruginosa, which was presented in 67 per cent. [6] The bacteriology of chronic otitis media with cholesteatoma has been reported (Harker, 1977; Brook, 1981). The most common aerobic microbiologic organisms isolated were Pseudomonas aeruginosa, Staphylococcus aureus and Proteus mirabilis. [7]

It is important to make the distinction between chronic suppurative otitis media with and without cholesteatoma, since tympanomastoid surgery is indicated when cholesteatoma is present whereas medical management may be effective when cholesteatoma is absent. [8]Contrary to other studies[9,10,11]which showed that anaerobes were isolated in significant number of patients; we were not able to isolate any anaerobe or fungi in our study although specimens were cultured for this purpose. The probable reasons may be that majority of our patients were referred from peripheral health care facilities where they were given systemic and topical antibiotics. The antibiotic therapy may be responsible for elimination of anaerobes by the time samples were collected for this study. Moreover, enough time was allowed for the slow growing anaerobes to grow. These cultures were incubated for only 48 hours. Another reason for not growing anaerobes was that pus sample taken from discharging ear should be immediately transferred to Robertson's cooked meal medium or an appropriate transport medium. Any delay in transfer will result in non-growth of anaerobes which may be the probable reason of not isolating anaerobes in this study.

It was observed in our study that the Gram-negative bacteria increased in patients of 20 years and above and decreased in patients between 0 and 19 years. Gram-positive bacteria decreased in patients of 20 years and above and increased in patients younger than 19 years.

By mechanisms not yet defined, certain upper respiratory tract bacteria localize and multiply within the middle ear space, causing an influx of polichromonuclear leukocitoses, a release of inflammatory mediators and the appearance of the purulent effusion.

In our study Gram-positive bacteria increased in subjects younger than 19 years probably depending on the influence of the bacterial flora in upper respiratory tract and the disease in that period.

Immunochemical and bacteriological investigations were carried out by Lin and associates. [12] They found bacteria in 77 percent of effusions by means of a smear. Bacterial recovery rate was inversely related to the dramatic increase with age of IgA and IgG and lysosime levels in effusion.

Certain bacterial products may also play a role in middle ear inflammation and local immunologic responses. Bacterial products that have been implicated include capsular polysaccharide antigens, certain components of the bacterial cell wall, and oxidative and hydrophilic bacterial enzymes. [13]

Drug sensitivity patterns of Pseudomonas aeruginosa showed that ciprofloxacin was active against majority of isolates. This is supported by many other studies. [14, 15]

Aminoglycosides were also active against most strains but their side effects limit their usage whereas side effects of ciprofloxacin are less as compared to aminoglycosides. Ciprofloxacin should be avoided in children due to damaging effects on developing cartilage and bones. Third generation cephalosporin is a suitable alternative in children.
Staphylococcus aureus was resistant to penicillin, amoxicillin, ampicillin, lincomycin and tetracyclines in majority of cases. Major cause of resistance to penicillins and other antimicrobial agents is production of beta lactamase.[16] Amoxicillin-clavulanate (augmentin) and cephradine were active against majority of strains of Staphylococcus aureus as these antibiotics are resistant to beta lactamase.This observation necessitate the choice of beta lactamase stable antibiotics as first line treatment.

Tables::-

Table 1: Distribution of 54 cases of chronic suppurative otitis media according to the bacteriological findings.

Bacteriological findings	No.	%
Staphylococcus aureus	29	54
Pseudomonas aeruginosa	12	22
Proteus mirabilis	6	11
Streptococcus pyogenes	4	7
Escherichia colli	3	6

Table 2. Distribution of 31 cases with chronic suppurative otitis media with cholesteatoma according to the bacteriological findings.

Bacteriological findings	No.	%
Pseudomonas aeruginosa	16	52
Proteus mirabilis	7	23
Staphylococcus aureus	5	16
Escherichia colli	2	6
Streptococcus pyogenes	1	3

Table 3. Distribution of 22 cases with chronic suppurative otitis media with polyps according to the bacteriological findings.

Bacteriological findings	No.	%
Pseudomonas aeruginosa	12	54
Staphylococcus aureus	5	23
Proteus mirabilis	2	9
Streptococcus pyogenes	2	9
Escherichia colli	1	5

Table 4. Bacterial distribution according to age group.

Bacteriological findings	Age group							
	0-19		20-39		40-61		Total	
	No.	%	No.	%	No.	%	No.	%
Aerobes Gram (+)	11	73	16	31	13	33	40	37
Staphylococcus aureus	7	47	10	19	9	23	26	24
Streptococcus pyogenes	4	27	6	12	4	10	14	13
Aerobes Gram (-)	4	27	36	69	27	68	67	63
Pseudomonas aeruginosa	2	13	20	38	17	43	39	36
Proteus mirabilis	1	7	10	19	7	18	18	17
Escherichia colli	1	7	6	12	3	8	10	9
Total	**15**		**52**		**40**		**107**	

Table 5.Drug sensitivities pattern of Pseudomonas aeruginosa.

Antibiotic	Sensitive	Intermediate	Resistant
ciprofloxacin	38	1	1
Amikacin	34	3	3
Gentamicin	24	5	11
Tobarmycin	24	5	11
Cefotaxime	17	10	13

Table 6. Drug sensitivities pattern of Staphylococcus aureus.

Antibiotic	Sensitive	Intermediate	Resistant
Penicillin	0	9	30
Ampicillin	0	9	30
Amoxicillin	0	9	30
Augmentin	31	4	4
Cephradine	33	0	6
Tetracycline	30	0	9
lincomycin	21	2	16

Conclusion:-

Microbial organisms are one of the supporting factors in developing of the chronic otitis media. Clinical manifestations, treatment, course and prognosis of chronic otitis media depends on local infection and its treatment.

Our study confirmed that Pseudomonas aeruginosa and Staphylococcus aureus were the most common bacteria isolated from chonic discharging ears. Ciprofloxacin was active against majority of isolates of Pseudomonas aeruginosa. Majority of strains of Staphylococcus aureus were resistant to penicillin whereas cephradine and Amoxicillin-clavulanate (augmentin) were active against most of the isolates of Staphylococcus aureus.

In the era of antibiotics the emergence of antibiotic resistance is becoming more common. Human negligence is a factor responsible for the development of antibiotic resistance. As soon as symptoms subside, many patients stop taking antibiotics before completion of therapy and allow partially resistant microbes to flourish. Such practice should be condemned strongly and people should be educated to avoid the same.

There are differences between age group in microbiological flora.

The aim is to enable quick and right diagnosis and smart therapeutic choice in order to improve patient's recovery and shorten treatment time as a financial benefit.

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