PSEUDOMONAS AERUGINOSA IN CHRONIC SUPPURATIVE OTITIS MEDIA- A DRUG-SENSITIVITY STUDY

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ABSTRACT

BACKGROUND

Chronic suppurative otitis media is one among the commonest ENT disease seen in day-to-day practice. It is seen mainly among low socioeconomic class.

MATERIALS AND METHODS

The present study was conducted in the Department of ENT, Shadan Institute of Medical Sciences. Fifty patients with CSOM of all age groups and both sexes attending the Outpatient Department of ENT were selected randomly for the study.

RESULTS

From our study, we found mainly children of age group 10-11 years commonly affected. They belong to poor socioeconomic background. Pseudomonas aeruginosa is the most common organism isolated in the present study. Ciprofloxacin was found to be the most sensitive antibiotic to Pseudomonas aeruginosa.

CONCLUSION

We noticed that drug resistance is on the rise due to misuse of antibiotics, over-the-counter treatment, inadequate period of therapy and less awareness among public regarding drug resistance. Constant monitoring of antibiotic sensitivity is needed to prevent drug resistance in CSOM.

KEYWORDS

Chronic Suppurative Otitis Media, Sensitivity, Drug Resistance, Ciprofloxacin.

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BACKGROUND

Infections of the middle ear space and their sequelae have plagued mankind from the beginning of time. First described by Hippocrates in 450 B.C., this universally observed process continues to present one of the most perplexing medical problems of infancy and childhood while being the leading cause of hearing loss in paediatric age group.[1]

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Chronic Suppurative Otitis Media (CSOM) is defined as chronic inflammation of middle ear and mastoid cavity, which presents with recurrent ear discharge or otorrhoea through a tympanic perforation. The episode of otorrhoea is provoked by upper respiratory tract infections. This is particularly common in children.[2]

Antimicrobial therapy is used to eradicate the bacterial agents causing CSOM, but most of the microorganisms are acquiring antibiotic resistance. In developing countries, this problem is rapidly increasing due to misuse of antibiotics. Antibiotic resistance can be natural or acquired.[3]

The microbial pathogens causing CSOM, as well as, their antibiotic sensitivity pattern may change from time to time and place to place. Therefore, knowledge of current drug resistance pattern of the common pathogenic bacteria in a particular region is useful in clinical practice.

This study was undertaken to identify frequency of Pseudomonas aeruginosa involved in patients of CSOM and the sensitivity pattern to commonly prescribed antibiotics in our local community.

MATERIALS AND METHODS

The present study "Incidence of Pseudomonas aeruginosa in chronic suppurative otitis media and its changing antibiotic sensitivity spectrum" was conducted in the Department of ENT, Shadan Institute of Medical Sciences. Fifty patients with CSOM of all age groups and both sexes attending outpatient department were selected randomly for the study.

Inclusion Criteria

Ear discharge for more than 3 months on otoscopy tympanic membrane showing perforation, cholesteatoma and retraction.

Exclusion Criteria

Any antibiotic use within 2 weeks, recent ear surgery or in-situ grommet or tympanostomy tube, mastoid surgery in the preceding 12 months, any congenital ear anomaly and any hearing problems obstructed middle ear (polyp) and acute otitis media.

A proforma was filled for each patient documenting age, sex, address and clinical information, including chief complaints, duration of symptoms, predisposing factors and any previous history of treatment. Other medical history like diabetes mellitus, hypertension and tuberculosis were noted.

Collection of sample ear discharge was collected using conventional methods under aseptic precautions in clinically diagnosed cases of CSOM. Excess discharge was mopped out from external auditory canal.

With the two sterile swabs, specimen was collected. One was for Gram staining and the other one was for culture, both swabs were processed immediately in the laboratory.

Direct Smear Examination

With one swab, a thin smear is made on a clean glass slide and is fixed with 95% methanol by pouring one or two drops on the smear and allowed to act for a minimum of 2 minutes or until the methanol dries on the smear.

Gram staining is done for the smears so made and is examined under oil immersion objective to note the various morphological types of bacteria, their number, gram reaction, presence or absence of inflammatory cells and also to note numbers of squamous epithelial cells in the sample.

Culture and Sensitivity

The second swab was used for inoculation on blood agar, nutrient agar and MacConkey agar plates. All plates were incubated aerobically at 37°c and evaluated at 24 hours, 48 hours and 72 hours and plates were discarded if there was no growth. The specific identification of bacterial pathogens was done based on microscopic morphology, staining characteristics, cultural and biochemical properties using standard laboratory techniques.

Antimicrobial susceptibility of Pseudomonas aeruginosa to the commonly used antibiotics were done by Kirby-Bauer disc diffusion method. The antibiotics used were amikacin, gentamicin, netilmicin, ciprofloxacin, sparfloxacin, lomefloxacin, sulbactam, cefotaxime, cefoperazone, cefadroxil, ceftazidime and ceftriaxone.

OBSERVATIONS AND RESULTS

Fifty clinically diagnosed cases of CSOM attending ENT Outpatient Department, Shadan Institute of Medical Sciences, Hyderabad, were studied. Observation made from the study are depicted in Table 1 to 10.

Sex	Number of Cases	Percentage
Male	30	60
Female	20	40
Total	**50**	**100**
Observation- Incidence of CSOM is more in males		

Table 1. Sex Distribution

Area	Number of Cases	Percentage
Rural	40	80
Urban	10	20
Total	50	100

Table 2. Area Wise Distribution

Out of 50 cases, 40 (80%) cases were from rural areas and 10 (20%) were from urban areas. Above table shows that incidence of CSOM was more common in rural areas compared to urban areas.

Side	Number of Cases	Percentage
Right	21	42
Left	23	46
Bilateral	6	12
Total	**50**	**100**

Table 3. Side Wise Distribution

Chief Complaints	No. of Cases	%
Ear discharge	50	100
Ear discharge + hearing loss	35	75

Table 4. Chief Complaints

Nature	Number of Cases	Percentage
Mucopurulent	40	80
Purulent	10	20
Total	**50**	**100**

Table 5. Nature of Discharge

Type of Perforation	No. of Cases	%
Central	44	88
Marginal	3	6
Attic	3	6

Table 6. Type of Perforation

44 cases had central perforation, 3 cases had marginal and 3 cases had attic perforations.

Degree of Hearing Loss	No. of Cases	%
Normal	12	24
Mild	18	36
Moderate	15	30
Severe	5	10
Total	**50**	**100**

Table 7. Degree of Hearing Loss

Above table shows mild degree of hearing loss in 36% of cases and moderate degree in 30% of cases.

Culture Results	Positive	Percentage
Positive	40	80
Negative	8	16
Fungal	2	4

Table 8. Culture Results

Nature of Growth	Number of Cases	Percentage
Monomicrobial	39	78%
Polymicrobial	1	2%
No growth	10	20%

Table 9. Type of Growth

In the present study, 80% specimens were positive and 16% were negative for the culture and 2% of cases showed fungi. Among the positive cultures, 78% cases showed monomicrobial growth and 2% cases showed polymicrobial growth.

Organisms	No. of Cases	%
Pseudomonas aeruginosa	18	36
Klebsiella + Ps aeruginosa	1	2
Staphylococcus aureus	9	18
Coagulase -ve staph aureus	6	12
Klebsiella	2	4
E. coli	2	4
Proteus mirabilis	2	4
Candida albicans	2	4
NBG	8	16
Total	**50**	**100**

Table 10. Type of Organism Cultured in Ear Discharge

DISCUSSION

In a study done by Mansoor T et al in 2006, it was observed that the incidence of CSOM was more in females (52%) than in males (48%).

Incidence of CSOM was more in females (55.2%) than in males (44.8%) as observed in a study by Shrestha B L et al in 2010.

In the present study, it was observed that incidence of CSOM was more in males (60%) than in females (40%).

The observation in present study was parallel with findings of few other studies 27, 28 and in contrast with others. Male predominance maybe because of their more exposed way of life.

In the present study, maximum incidence of CSOM was observed in the age group of 11-20 years (32%).

The observation of the present study closely corroborates with that made by Naz Parween et[4] al. Most of the studies show that the incidence is more in children and this may be attributed to the fact that they are more prone for upper respiratory tract infections. Our present study is compared with various other studies as shown from Table 11 to 14.

Study	Unilateral	Bilateral
Ovakinpelu et al (2005)	67%	33%
Prakash Adhikari et al (2009)	69.9%	31.1%
Shrestha BL et al (2010)	93.9%	6.1%
Hirapure PV et al (2012)	71%	29%
Present study	88%	12%

Table 11. Comparing Side Wise Distribution

In various studies, unilateral CSOM was observed to be more common than bilateral.

In the present study, it was observed that unilateral CSOM (88%) was common than bilateral and correlates with various studies.[5,6,7,8]

Study	Central	Marginal	Attic
Asif Alam et al	69%	20%	11%
Present study	88%	6%	6%

Table 12. Comparing Type of Perforation

In a study by Asif Alam et al[9] in 2003, perforation was central in 69%, marginal in 20% and attic in 11% of cases.

In the present study, perforation was central in 88%, marginal in 6% and attic in 6% of cases.

Degree of hearing loss was variable in various other studies.

In a study by Asif Alam et al[9] reported mild degree of hearing loss in 18% of cases, moderate in 68% of cases and severe in 14% of cases.

In a study by Bansal Sulabh et al,[10] degree of hearing loss was mild in 37%, moderate in 45.2% and severe in 14.2%.

In the present study, the degree of hearing loss was mild in 36% of cases, moderate in 30% of cases and severe in 10% of cases.

Antibiotic	No. of Cases	Percentage
Amikacin (AN)	15	79
Ciprofloxacin (CIP)	17	89
Cefotaxime (CF)	3	16
Sparfloxacin (SF)	11	58
Cefoperazone (CFP)	12	63
Gentamicin (G)	13	68
Cefadroxil (CD)	3	16
Lomefloxacin (LM)	14	74
Ceftazidime (CPZ)	0	0
Netilmicin (NET)	9	47
Sulbactam (SLB)	1	5
Ceftriaxone (CTX)	6	32

Table 13. Sensitivity of Pseudomonas to Antibiotics in the Present Study

In the present study, out of 18 isolates of Pseudomonas, 17 (89%) were sensitive to ciprofloxacin, 15 (79%) were sensitive to amikacin, 14 (74%) were sensitive to

lomefloxacin, 13 (68%) were sensitive to gentamicin, 12 (63%) were sensitive to cefoperazone, 11 (58%) were sensitive to sparfloxacin, 9 (47%) were sensitive to netilmicin, 6 (32%) were sensitive to ceftriaxone, 3 (16%) were sensitive to cefotaxime and cefadroxil each and 1 (5%) was sensitive to sulbactam.

Study	Sensitivity pattern
Asif Alam et al (2003)	Imipenem (98%) Levofloxacin (97%) Ciprofloxacin (95%) Amikacin (92.3%)
Mansoor T et al (2006)	Amikacin (96%) Ceftazidime (89%) Ciprofloxacin (85%) Gentamicin (81%)
Gaur et al (2011)	Piperacillin (94%) Ceftazidime (83%) Amikacin (81%) Netilmicin (63%)
Present study (2015)	Ciprofloxacin (89%) Amikacin (79%) Levofloxacin (74%) Gentamicin (68%) Cefoperazone (63%) Sparfloxacin (58%)

Table 14. Comparing Study of Pseudomonas to Antibiotics

One study carried out in 1996 in Turkey[11] revealed only 6% of Pseudomonas aeruginosa isolates to be resistant to ciprofloxacin, whereas in South Korea[12] in a study carried out in 2004, ciprofloxacin resistance was noted in 100% of isolates. In a study by Asif Alam et[9] al in Pakistan in 2003 ciprofloxacin sensitivity was noted in 95% of isolates and in India in a study by Hirapure PV et al[8] in 2012. Ciprofloxacin sensitivity was noted in 89.5% of isolates of Pseudomonas aeruginosa.

In the present study, maximum sensitivity of Pseudomonas was observed to ciprofloxacin (89%) followed by amikacin (79%), lomefloxacin (74%), gentamicin (68%), cefoperazone (63%) and sparfloxacin (58%).

When the results of present study were compared with the findings of other researches, it was clear that microbial profile and antibiotic sensitivity pattern of CSOM has been changing with due course of time. Geographical variation and difference in patient population studied could be the possible factor for variability. For the antibiotics, commonly available as topical ear drops, ciprofloxacin showed good activity against pseudomonas and hence can be used as effective first line topical antibiotic in the treatment of CSOM. Studies[13,14] have revealed that quinolones like ciprofloxacin are safe and effective against pseudomonas.

Emergence of antimicrobial resistance is becoming more common. Indiscriminate and haphazard antibiotic use as well as negligence on patient part are the factors responsible. As the symptoms subside, many patients stop taking antibiotics before the completion of therapy and allow the partly resistant microbes to flourish. Patients should be instructed avoid such practices.

Changes in the microbial flora following the advent of sophisticated synthetic antibiotics increase the relevance and reappraisal of the modern day flora in CSOM and their in vitro antibiotic sensitivity pattern is very important for the clinician to plan the treatment of a chronically discharging ear.

CONCLUSION

The present study showed Pseudomonas aeruginosa as the predominant causative agent of CSOM followed by Staphylococcus aureus, coagulase-negative staph aureus, Klebsiella, E. coli and proteus.

The antibiotic sensitivity testing of Pseudomonas aeruginosa showed ciprofloxacin as the most sensitive drug followed by amikacin, lomefloxacin, gentamicin, cefoperazone, sparfloxacin and netilmicin.

Looking at the results of the present study and previous studies, there are differences in organisms isolated and they have different sensitivity pattern.

Because of the variation in climate, community, patient population and inadvertent use of antibiotics, the pattern of microbial flora and their sensitivity pattern vary in CSOM.

Therefore, continuous and periodic evaluation of microbial pattern and antibiotic sensitivity in local area is necessary for early institution of appropriate treatment and thus minimising its complications and emergence of resistant strains.

In addition, patients also should be educated to avoid misuse of antibiotics.

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