BACTERIAL PROFILE OF MIDDLE EAR INFECTIONS, COEIXSTENCE OF PSEUDOMONAS, PROTEUS SPECIES IN MIDDLE EAR INFECTIONS AND THEIR ANTIBIOTIC SENSITIVITY PATTERN

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ABSTRACT

Introduction: Otitis media is the leading cause of hearing impairment in developed countries. The permanent hearing loss due to otitis media has the prevalence of 2 to 35 per 10,000. The major pathogens of acute otitis media are i. e; S. pneumonia, S.pyogenes, Moraxella catarrhalis, Haemophilus influenza and rarely S.aureus and those of chronic otitis media are i. e; Pseudomonas, Proteus, E. coli and S. aureus.

Objective: To determine the bacterial profile of otitis media, to estimate the coexistence of pseudomonas and proteus and to check the antibiotic sensitivity pattern of different bacteria in otitis media.

Material and methods: Sample size of 85 samples is estimated by using 95% confidence level, 10% absolute precision with expected percentage of susceptibility pattern of otopathogens as 32.8% the research article" Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge" (15)**.** Samples from outdoor patients of ENT department , Mayo Hospital, Lahore, with discharging ear of all ages and both genders were taken excluding patients with external ear infections.

Study design: Cross sectional study.

Setting: Department of Diagnostic Microbiology, the Mayo Hospital and the Institute of King Edward Medical University, Lahore

Sample technique: Non Probability Purposive Sampling

Results: Out of total 85 samples, 38(44.7%) and 47(55.3%) were male and female respectively. Mean age $\pm$ SD was 24 $\pm$ 16 years. Out of 85 samples 58 (68.2%) cases were positive with 27 (46.5%) samples positive in males and 31 (53.4%) samples positive in females. Out of positive cases, 18(31.0%) were Gram positive and 30(51.7%) cases showed growth of Gram negative organisms. The coexistence of Pseudomonas and Proteus was found in 12(20.6%) of positive cases.

Key Words: Ottitis media, Antibiotic resistance, Bacterial Profile

INTRODUCTION

Otitis media is the infection of the middle ear. It is the leading cause of hearing impairment in developing countries. The permanent hearing loss due to otitis media has the prevalence of 2 to 35 per 10,000.[1] Otitis media may be classified as acute otitis media infecting children aged under 2 years and chronic otitis media presents in <5 years old children.[2] Most of the children experience one episode of acute otitis media, with the peak incidence between ages 6 to 11 month.[3] The vulnerability of recurrent acute otitis media is associated with day-care nurseries and submissive exposure of smoking.[4] Recurrent otitis media cause damage to facial nerves and cochlea resulting in permanent hearing loss.

Pathogenic bacteria, virus and some fungi cause the inflammation of mucosal lining of middle ear.[5] Acute otitis media is the foremost cause of global childhood despondence. The major bacteria consider as pathogen in AOM are: Streptococcus pneumonia, Haemophilus influenza, Moraxella catarrhalis, Streptococcus pyogenes. If above are isolated in bacterial culture then considered true otopathogens.[6] The streptococcus pneumonia is associated with acute disease and Haemophilus influenza is with recurrent infection as well as with otitis media with effusion.[7] The major pathogens of chronic otitis media are: Pseudomonas aeruginosa, Staphylococcus aureus, Proteus mirabilis, Klebsiella pneumonia, E.coli. According to national and international studies

pseudomonas aeruginosa is the most prevalent pathogen of chronic otitis media.[8]

The antibacterial therapy is necessary to abolish pathogenic bacteria causing otitis media. As a consequence of misuse of antibiotics most of the microorganism develop immunity against these drugs and become resistant.[9] Recent studies show the 30-50% of S. pneumoniae are fully or moderately penicillin resistant.[10] Amoxicillin –clavulanate and ceftriaxone are considered drugs of choice of penicillin resistant bacterial pathogens of middle ear infection.[11]

Recent Studies in Pakistan shows that almost >90% of P. aeruginosa are sensitive to ciprofloxacin. Imipenem from carbapenem group is most active drug against it.[12] Ceftriaxone and aztreonam are highly resistant. The resistivity is either due to dose of antibiotic or due to insufficient time.[13] Sensitivity of ciprofloxacin and penicillin against S. aures is about 57-80% and resistance against streptomycin, vancomycin and trimethoprim is almost 83%.[14]

As there is no objective picture of the frequency of different bacteria and coexistence of pseudomonas and proteus in patients visiting Mayo hospital OPD, so the topic was selected to get a clear and objective picture of the situation.

The study was conducted to determine the frequency of different bacteria in otitis media i.e. middle ear infection, to estimate the coexistence of pseudomonas and proteus in middle ear infections and to check the antibiotic sensitivity of different bacteria in otitis media.

MATERIALS AND METHOD

The study design was approved by the Institutional Review Board. A Cross sectional study with total 85 samples, Sample size of 85 samples is estimated by using 95% confidence level, 10% absolute precision with expected percentage of susceptibility pattern of otopathogens as 32.8% the research article" Microbiological profile and their antimicrobial sensitivity pattern in patients of otitis media with ear discharge" (15), using non-probability purposive sampling technique was conducted in ENT department and Microbiology lab, Pathology Department of King Edward Medical University, Lahore was done. All the patients of both genders and all ages with middle ear infections diagnosed by ENT specialist were included in the study. Swabs were taken from the discharging ear and transported immediately to Microbiology laboratory for further processing. Bacterial culture and sensitivity performed in Microbiology Department and the cultures and sensitivity tests were reported by the consultant Microbiologist. All collected data was entered and analyzed by using Statistical package for social sciences (SPSS version 21).

RESULTS

Out of 85 samples 58 (68.2%) cases were positive with 27 (46.5%) samples positive in males and 31 (53.4%)samples positive in females. 27(31.76.7%) samples did not show any pathogenic growth. Out of positive cases, 9(15.5%) were Gram positive with S.pneumoniae in 6(8.6 %), S. pyogenes in 2(3.4%) and S. aureus in 1(1.44%) samples of acute otitis media. 39(67.2%) cases of chronic otitis media were positive. S. aureus in 9 (13.4%) samples of chronic otitis media. 30(51.7 %) cases showed growth of Gram negative organisms. Pseudomonas spp. 11(18.9 %), Proteus 9(15.5%), Klebsiella spp. 5(8.6%), E.coli spp. 4(6.8%), Acinetobacter 1(1.8%) were the organisms isolated in chronic otitis media. 10 samples (17.2 %) showed mixed growth of different bacteria. **The coexistence of Pseudomonas and Proteus was found in 12(20.6%) of positive cases.**

Out of 58 positive samples 28(48.2%) cases fall in age group(0-15 years), 16(27.5%) cases fall in (16-30 years) age group, 10(17.2%) fall in age group of (31-45 years) and 4(6.8%) fall in age group of (46-60 years).

Pseudomonas and Proteus spp. were Sensitive to imipenem and tazobactum+pipracillin and moderately sensitive to ciprofloxacin and mostly resistant to ceftazidime. S.aureus were sensitive to Linezolid and vancomycin and mostly resistant to septran and erythromycin. S.aureus were all sensitive to methicillin indicating that mostly community acquired S.aureus is MSSA (methicillin sensitive staph.aureus). E.coli and Klebsiella were sensitive to tazobactum, imepenem, ceftazidime and gentamicin and moderately sensitive to ciprofloxacin and ceftriaxone, mostly resistant to Amoxicillin –clavulanic acid and moderately resistant to cefoperazone-sulbactam.

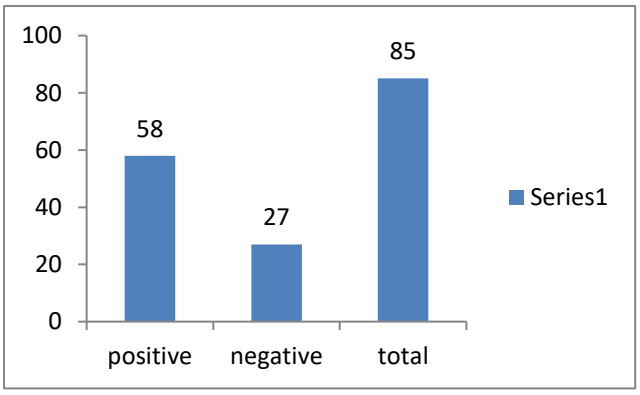

Figure 1: Distribution of positive and negative

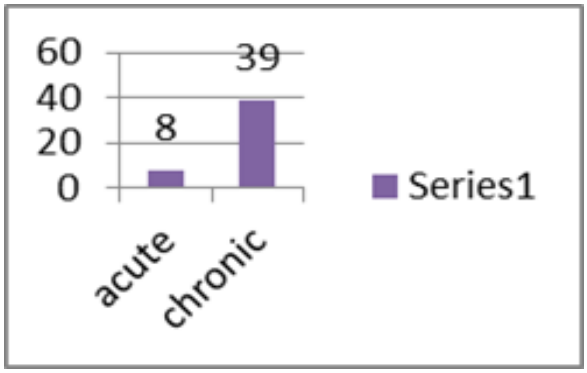

Figure 2: Frequency of acute and chronic growths in otitis media otitis media

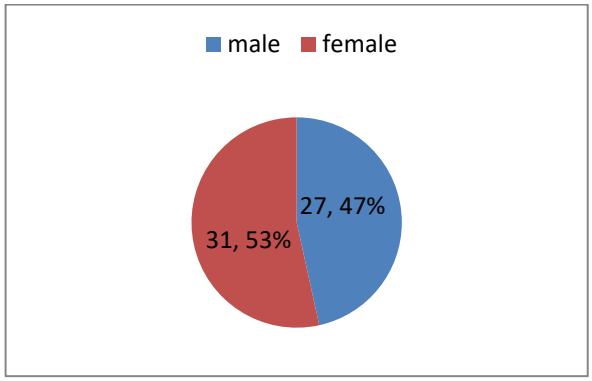

Figure 3: Gender distribution in otitis media

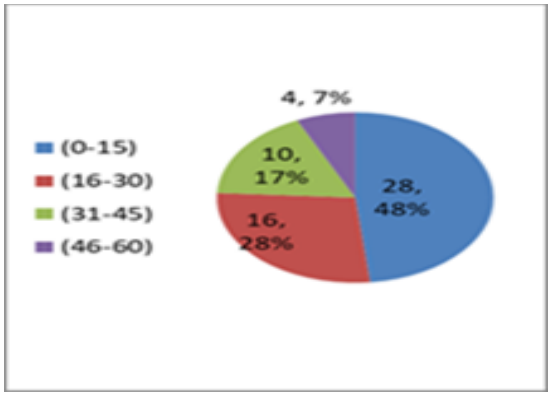

Figure 4: Age distribution in otitis media

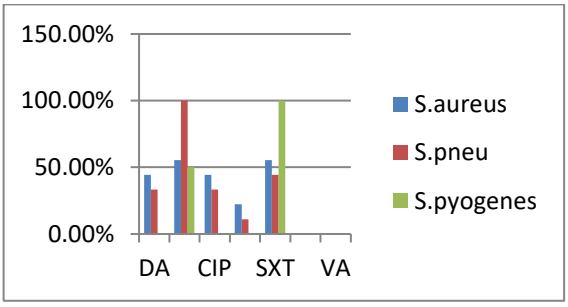

Fig. 5: Antimicrobial susceptibility pattern of gram positive cocci

Table.1: Different isolated bacteria in otitis media

MICRORGANISM	FREQUENCY	% age
S. aureus	10	14.8%
S. pneumoniae	5	8.6 %
S. pyogenes	2	3.4%
Ecoli	4	6.8%
Klebsiella	5	8.6%
Pseudomonas	11	18.9%
Proteus	9	15.5%
Acinatobacter	1	1.8%
Mixed growth	10	17.2%
Coeixstance	10	17.2%

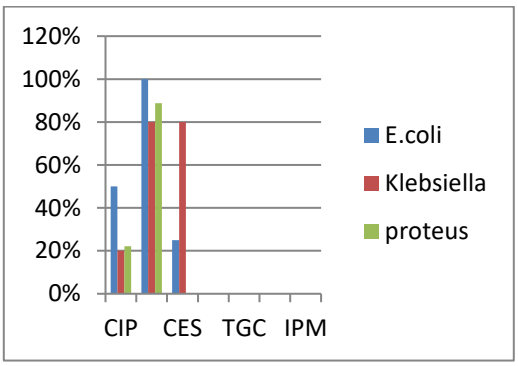

Fig. 6: Antimicrobial susceptibility pattern

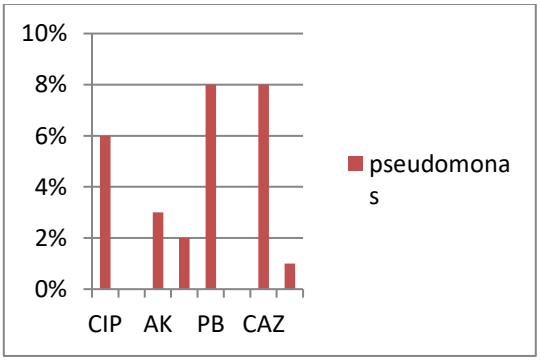

Fig. 7: Antimicrobial susceptibility pattern of Pseudomonas of Enterbacteriaceae

DISCUSSION

Chronic suppurative otitis media is one of the chronic infectious diseases globally, usually having its onset in childhood and causing substantial morbidity into adulthood. According to WHO, Chronic suppurative otitis media is defined as a chronic inflammation of the middle ear and mastoid cavity, which presents with repeated ear discharges or otorrhea through a tympanic membrane perforation. [16]

In CSOM, the contributory bacteria may be aerobic (e.g. Staphylococcus aureus, Streptococcus pyogenes, Pseudomonas aeruginosa, Escherichia coli,

Proteus mirabilis, Klebsiella species) or anaerobic (e.g. Propionibacterium, Bacteroides, Peptostreptococcus,). The bacteria are occasionally found in the skin of the external auditory canal, but may multiply in the presence of trauma, high humidity or inflammation. These bacteria may enter into the middle ear through a chronic puncture.Among these bacteria, Pseudomonas aeruginosa in well-known to cause deep seated and progressive destruction of middle ear and mastoid structures through its toxins and enzymes.

In our study, the highest incidence of CSOM was found in the 1st and 2nd decade, possibly because of the frequent upper respiratory tract infections seen in this age group due to Eustachian tube dysfunction. The females showed increased incidence than males reason being the multiple factors which may contribute to decreased immunity or the difference in sexual preponderance may just be incidental, and has no anatomical factors predisposing either sex to the development of CSOM.

A single bacterium was isolated from 46 cases, 79.3%. Two or more than two bacteria were isolated from 12 samples (20.6%). No growth was found in 27 cases (31.7%). A study by Prakash et al showed pure growth in 57.84%, mixed growth in 33.33% and no growth in 8.82% of samples. [17] A study in 62 children with only atticoantral type of CSOM showed monomicrobial growth in 90.90%, polymicrobial growth in 9.09% and sterile in 5.11%.[18] Another study on 71 CSOM patients presenting with complications showed 42.25% of cultures to be sterile and 57.74% were positive with aerobic isolates. Out of these, 68.29% showed monomicrobial isolates and 31.7% showed polymicrobial isolates .The findings of this study are quite close to our study .[19] The reason for such grossly varied differences in studies could be the swabs being contaminated or usage of prolonged course of various antibiotics yielding the cultures sterile.

Pseudomonas aeruginosa was the most common organism isolated in this study 11 (18.9%); Staphylococcus aureus was the second most common organism isolated in this study 09 (15.5%). Staphylococcus aureus was the most commonly isolated organism in CSOM in five studies whereas four other studies found that Pseudomonas aeruginosa was the most commonly isolated organism in CSOM. [(17),(18),(19),(20),(21),(22),(23),(24)]

Coexistence of Pseudomonas and proteus was seen in 12 (20.6%) of the cases. 9(15.5%) samples showed growth in acute otitis media and 49(84.4%) samples showed growth in chronic otitis media cases.

Antibiotic susceptibility testing was carried out for all the microorganisms isolated. Most of the isolates were found to be sensitive to Meropenem, Piperacillin Tazobactam and GentamIcin. Pseudomonas isolates were most sensitive to Piperacillin Tazobactam and Staphylococcus aureus isolates were most sensitive to Linezolid and vancomycin. Most of the studies showed maximum susceptibility of culture isolates to amikacin. [(17),(21),(23)] Ceftazidime was found to be the most sensitive antibiotic in one study.[6] Study by Prakash et al showed ciprofloxacin and gentamicin as an effective first line topical antibiotic in the treatment of otorrhea in CSOM.[17] In this study, most of the organisms were found to be resistant to regularly used cell wall inhibitors like penicillin group of drugs and cephalosporins.

- As the study reflected that the most commonly isolated organisms are pseudomonas and staph aureus which were mostly isolated in younger age groups indicating the need to improve the immune status of that age group and the importance of timely diagnosis and treatment was highlighted as the organisms isolated are highly pathogenic and are able to cause severe complications leading to increased morbidity.
- To reduce the morbidity, the antibiotics judicious and timely usage is mandatory and our study clearly indicated that the organisms isolated were resistant to 1st line drugs, and were sensitive to 2nd and 3rd line drugs, highlighting the importance of Antimicrobial stewardship.
- So it is suggested that timely diagnosis and treatment with appropriate antibiotics according to the culture and antibiotics sensitivity is the most important way to counteract and decrease the morbidity caused by different bacteria and empirical therapy always needs to be escalated or deescalated according to the laboratory results.

CONCLUSION

Pseudomonas aeruginosa was the most commonly isolated organism followed by Staph.aureus in chronic otitis media, followed by Proteus, Klebsiella, E.coli, and Acinetobacter. Co-existence of Pseudomonas and Proteus was not uncommon. It was found that most organisms isolated were resistant to first line antibiotics but moderately sensitive to second and third line antibiotics.

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