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A CASE-CONTROL STUDY OF RECURRENT ACUTE OTITIS MEDIA BASED ON MICROBIAL INFECTION

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ABSTRACT

Most children with acute otitis media and ear fluid evaluated in primary care had a bacterial aetiology on a typical swab taken at presentation. They seem to belong to a different clinical category, indicating the more severe spectrum of otitis media, and they might experience more long-term issues. In this study, the majority of children were prescribed antibiotics by the doctor when they presented. However, a sizeable portion of them required altering. According to this study, routine ear swabs might help direct short-term treatment in the future. Even yet, the current National Institute for Health and Clinical Excellence (NICE) recommendations support the use of such antibiotics. To help doctors with empirical therapy and the creation of treatment regimens, this study will give information on otitis media's aerobic bacterial and fungal profile. This aids in proper infection control, lowering problems and preventing the establishment of resistant strains.

Keywords Ear discharge; Aetiology; Therapy; Microbial infections.

1. Introduction

One of the most typical clinical presentations at ear, nose, and throat clinics in the tropics and subtropics is ear discharge[1]. Due to low socioeconomic position, overcrowding, inadequate cleanliness, and malnutrition, ear infections are common in India[2]. These infections, which can be viral, bacterial, or fungal, are widespread in children and adults[3]. Ear infections have been linked to several bacterial species[4]. Acute Otitis Externa is frequently associated with isolating *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Pseudomonas aeruginosa*. Anaerobes and pseudomonas are frequently linked to chronic external otitis[5].

Streptococcus pneumoniae, *Haemophilus influenzae*, and *Moraxella catarrhalis* are the most common pathogens in acute otitis media. *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Proteus species*, *Klebsiella species*, *Escherichia coli*, and anaerobes are the main causes of Chronic Suppurative Otitis Media[6]. The microbiological flora is continually changing due to the introduction of newer, broad-spectrum antibiotics. Group A Streptococcus was the most prevalent cause of acute otitis media in the pre-antibiotic period, but it is now rare[7]. The fungus may operate as the main pathogen or may be present in addition to bacterial infections. Humidity in the ear, an alkaline pH, epithelial debris and cerumen, an immunocompromised state, and the use of topical steroids and antibiotics are among the factors that promote the growth of the fungus[8]. A significant frequency of fungal infections is present in chronic otitis media patients due to the erratic and illogical use of antibiotics to treat bacterial infections. Aspergillus and Candida species are the two most prevalent fungi in ear infections[9]. As a result of the improper use of antibiotics, problems have decreased, but bacterial resistance has increased. Most of the time, empirical therapy is used, which has caused the establishment of several bacteria resistant to antibiotics[10–13]. For the logical use of medications for therapy, current knowledge of the most frequent causing organism and their antimicrobial susceptibility pattern is crucial. In light of this, this study was conducted to identify the environmental causes of ear discharge, focusing on the bacterial isolates' patterns of antibiotic sensitivity to facilitate effective treatment.

2. Materials & Methods

This cross-section study was carried out at the Department of Ear, Nose and Tongue (ENT), Sree Balaji Medical College and Hospital, Chennai.

2.1. Study period

This study was conducted over one year, from January 2021 to December 2021.

2.2. Study population

A total of 150 ENT patients from Sree Balaji Medical College and Hospital, Chromepet, Chennai, who met the criteria for inclusion, were included in the study.

2.3. Inclusion criteria

Patients suffering from hearing loss.

Male as well as female patients.

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Patients from all age classes.

2.4. Exclusion criteria

Previous antimicrobial treatment history within the past seven days.

Double the isolates of the same patient.

Patients who are unwilling to take part in this study.

2.5. Ethical consideration

Approval was obtained from the Ethics Committee at Sree Balaji Medical College and Hospital, chromepet, before commencing the study. All patients who participated in this study gave informed consent.

2.6. Statistical analysis

The statistical analysis was conducted using the Statistical Record for the Social Sciences (SPSS).

2.7. Sample collection

Throughout the research period, the study group comprised all patients who met the inclusion criteria. Each patient gave their informed permission. The patient was informed about the sample collection process and the study's ramifications. Name, age, sex, length of complaints, and past use of antibiotics were all collected as part of the study's history.

2.8. Collection of ear discharge

Under aseptic conditions, the ear discharge was collected using sterile swabs. There were three samples obtained. Three swabs were used: one for bacterial culture, one for fungal culture, and the other for Direct Gram Stain and KOH mount.

2.9. Preliminary examination

2.9.1. Direct gram stain:

A clean, grease-free glass slide was used to create a thin smear, which was then air-dried and heat-fixed. Under an oil immersion objective, gram staining was carried out to check for the sample's epithelial cells, pus cells, and potential pathogens.

2.9.2. Potassium hydroxide (KOH) wet mount

On a clean glass slide holding the specimen, a drop of 10% KOH was applied to break down the keratin covering the fungus. After 20 minutes, a clean coverslip was placed on top of it without producing any air bubbles, and it was checked for the presence of fungal components such as hyphae, spores, and budding yeast cells using 10X and 40X objectives.

2.9.3. Processing bacterial culture

The culture media were immunized with the second swab. The inoculation plates were overnight incubated aerobically at 37°C to check for growth. For individuals who demonstrated positive progress, cultural traits were detected. Gram stain, Catalase, Oxidase, and preliminary motility tests were conducted, and the organism was then identified using conventional processing and biochemical responses.

2.10. Biochemical reactions

The following biochemical tests are performed

2.10.1. GramPositive Cocci

Urease test, Mannitol motility medium, Mannitol salt agar, Phosphatase test, Coagulase test (Slide test and Tube test), and Gelatin liquefaction.

2.10.2. GramNegativeBacilli:

HughandLeifson’sOxidationandFermentationofmedium, Nitratereduction, Indoleproduction, Methylred test, Voges-Proskauertest, Simmons'Citrateutilization, Christensen’sUreasetest, Triplesugarironagar, Mannitol motility medium, Phenylalanine Deaminase agar, Moeller’sdecarboxylasetest, 1%Sugarfermentationtest-Glucose,Lactose,Sucrose, Maltose,and Mannitol.

2.11. Antimicrobial susceptibility testing

The modified Kirby-Bauer disc diffusion technique was used to test the isolates for antibiotic susceptibility, and the results were interpreted following CLSI 2018 criteria. Testing was done using the Kirby-Bauer Disc diffusion technique. First, four well-isolated colonies with the same morphology as the test organism were inoculated into 1 ml of peptone water and incubated at 37°C for two hours using a sterile bacteriological loop. The colony suspension's turbidity (1.5 X 108 CFU/mL) was matched to 0.5McFarland turbidity criteria. A lawn culture of the bacterial isolate was seeded onto the dry surface of a Mueller

Hinton agar plate. Sterilely, the antimicrobial discs were applied to the surface of the newly infected plate. Six discs may be arranged on a 100 mm plate with a minimum centre-to-centre separation of 24 mm, separating each pair. The diameter of the zone of inhibition surrounding each disc was measured in millimetres following 16–18 hours of incubation at 37°C. The CLSI standard M100, 28th edition, 2018 standards were followed for interpreting the zone of inhibition.

2.11.1. Test for detection of MBL in pseudomonas aeruginosa

2.11.1.1. Meropenem disc diffusion method

A lawn culture of the bacterial isolate was seeded onto the dry surface of a Mueller Hinton agar plate. In a sterile manner, the antimicrobial discs were applied to the surface of the newly infected plate. Six discs may be arranged on a 100 mm plate with a minimum centre-to-centre separation of 24 mm, separating each pair. The diameter of the zone of inhibition surrounding each disc was measured in millimetres following 16–18 hours of incubation at 37°C. The CLSI standard M100, 28th edition, 2018 standards were followed for interpreting the zone of inhibition. The zone size was interpreted as: Sensitive≥19mm; Intermediate16–18 mm, and Resistant≤15mm. Isolates with the zone of inhibition less than or equal to 15mm were consideredasMBLproducers.

2.11.2. Test for detection of ICR in *staphylococcus* species

2.11.2.1. Disc diffusion method-‘D’zonetest

Staphylococcus aureus isolates with erythromycin resistance were tested by the common disc diffusion method for induced clindamycin resistance. A Mueller Hinton Agar plate containing a grass culture of the test organism was seeded with a 15 g Erythromycin disc and a 2 g Clindamycin disc, spaced 15 to 26 mm apart edge to edge. After 16 to 18 hours of incubation at 37 °C in free air, the zone of inhibition was identified. The zone of inhibition was interpreted as: Flattening of the zone of inhibition adjacent to the Erythromycin disc, i.e. 'D'zone=PositiveforInducible Clindamycin Resistance, and Hazy growth within zone of inhibition around Clindamycin disc=Constitutive Clindamycin Resistance.

2.11.3. Test for detection of MRSA

2.11.3.1. Cefoxitin disc diffusion method

Staphylococcus aureus isolates were tested using the common disc diffusion method for

methicillin resistance. A Mueller Hinton agar plate that had been planted with a lawn culture of the test organism and a 30g Cefoxitin disc was used for the experiment. After 16 to 18 hours of incubation at 37 °C in free air, the zone of inhibition was identified. The zone size was interpreted as: Susceptible≥22mm= mecA, negative Resistant≤21 mm=mecApositive. Isolates with a zone of inhibition less than or equal to 21mm were considered Methicillin-resistant *Staphylococcus aureus*(MRSA).

2.11.4. Test for detection of vancomycin susceptibility in MRSA

2.11.4.1. Epsilometer test

Vancomycin susceptibility testing was done on methicillin-resistant Staphylococcus aureus isolates. The test organism's grass culture was planted onto a Mueller Hinton agar plate. It was covered with a vancomycin E-strip. The intersection of the ellipse and the MIC scale on the strip is noticed after 16 to 18 hours of incubation at 37 C in ambient air.Susceptible ≤2μg/mL, Intermediate4–8μg/mL, and Resistant ≥16μg/mL.

2.12. FUNGAL CULTURE

The waste material was removed from the external auditory canal and cultured using a sterile swab. It was then inoculated onto two slopes of Sabouraud Dextrose Agar, which had its pH adjusted to 5.6 and was treated with the antibiotic Gentamicin to prevent bacterial infection. The cultures were incubated at 25 and 37 degrees Celsius for four to six weeks. The slopes were checked for growth twice a week after the first week when it was checked daily. Even after six weeks of incubation, failure to grow was regarded as a sign that fungal growth had not occurred and was discarded as sterile.

3. RESULTS

This cross-sectional study was carried out over a year, from January 2021 to December 2021, at the SreeBalajiMedical College and Hospital, Chennai. 150 samples of ear discharge from 1 to 80yearold males and females were collected and processed. Based on clinical diagnosis, there were 114 cases of chronic suppurative otitis media, 114 acute otitis media, 7 otitis externa, and 16 cases of otomycosis (**Figure 1**).

140 of the 150 samples demonstrated positive culture, whereas 10 exhibited no growth. 122 bacterial isolates and 18 fungi were found in the 140 instances with culture positivity. *Aspergillusniger, Aspergillusflavus, Candida tropicalis*, and *Candida glabrata* made up 12 of the 18 fungal isolates. 52 *Pseudomonas aeruginosa* and 38 *Staphylococcus aureus* were

found among 122 bacterial isolates. *Staphylococcus aureus* was the most frequently isolated microorganism in cases of acute otitis media and otitis externa. In CSOM, *Pseudomonas aeruginosa* predominated, while *Aspergillusniger* predominated in otomycosis. The bacterial isolates underwent Kirby-Bauer disc diffusion antimicrobial susceptibility testing. Pseudomonas showed no signs of MBL. Vancomycin was effective against all 4 of the MRSA that were found. Ciprofloxacin and amikacin had superior overall sensitivity across all isolates.

The distribution of ear infections in our research by age is shown in Figure 1. 20 were in the age range of 1 to 10 years (13.33%), 28 were in the age range of 11 to 20 years (18.67%), 26 were in the age range of 21 to 30 years (17.33%), 25 were in the age range of 31 to 40 years (16.67%), 22 were in the age range of 41 to 50 years (14.67%), 19 were in the age range of 51 to 60 years (12.67%), 7 were in the age range of 61 to 70 years (4.66 (2 percent). 80 men (53.33 percent) and 70 females out of 150 cases, respectively (46.67 percent). Among them, 67 girls and 73 guys had positive cultures.Out of 150 instances, 145 (96.66%) were unilateral and 5 (0.05%) were bilateral (3.34 percent). 80 instances (53.33 percent), and 65 cases involved the right side of the ear (43.33 percent). Most 114 of the 150 patients were CSOM instances (76 percent). There were 16 instances of otomycosis (10.66%), 13 cases of AOM (8.67%), and 7 cases of OE (4.67%). Only 10 of 150 culture samples (6.67%) exhibited no growth; the remaining 140 had positive culture findings (93.33 percent).

122 bacterial isolates (87.14 percent) and 18 fungi were identified from 140 culture-positive findings, respectively (12.86 percent). 44 Gram Positive Cocci and 78 Gram-Negative Bacilli (55.71 and 31.43 percent, respectively) were isolated. *Aspergillusniger* dominated the 18 fungal isolates, accounting for 12 isolates (8.57%), followed by 3 *Candida tropicalis* (2.14%), 2 *Aspergillusflavus* (1.43%), and 1 *Candida glabrata* (0.7%) (Figure 2).

52 isolates of *Pseudomonas aeruginosa*, or 37.14 percent of the 122 microorganisms, were isolated, followed by 38 isolates of *Staphylococcus aureus* (27.14 percent). 10 Proteus species (7.15%), 6 CoNS (4.29%), 6 *Klebsiellapneumoniae* (4.29%), 6 Acinetobacterbaumannii (4.29%), and 4 Escherichia coli were among the other organisms found (2.86 percent). Ceftazidime resistance was the highest (55.77%) among the 52 Pseudomonas aeruginosa isolates, followed by Gentamycin resistance (28.85 percent). The organisms were respectively 84.62 percent, 86.54 percent, and 88.46 percent sensitive to ciprofloxacin, amikacin, and piperacillin-tazobactam. Figure 3 displays that all 52

Pseudomonas aeruginosa isolates were completely sensitive to Meropenem. Penicillin had the highest level of resistance, or 78.9 percent, of the 38 *Staphylococcus aureus* isolates, followed by Cotrimoxazole (52.63) and Erythromycin (39.47%) (Figure 3).

The organisms were 84.21 percent sensitive to clindamycin and ciprofloxacin. All demonstrated complete sensitivity to vancomycin (Figure 4). All 52 *Pseudomonas aeruginosa* isolates had complete meropenem sensitivity, meaning no MBL was found. Four of the 38 *Staphylococcus aureus* isolates, or MRSA isolates, were resistant to cefoxitin (10.53 percent).

The macroscopic and microscopic morphological characteristics of tubes containing positive cultures were studied. The colonies' color, texture, and pace of development on the obverse's macroscopic characteristics were recorded. Any pigment synthesis that reversed was observed. To analyze the morphological characteristics of the fungal isolates, a wet mount of filamentous fungus was created using Lacto Phenol Cotton Blue stain. A little piece of the fungal culture was removed on a glass slide. Two dissecting needles were used to tease the culture after adding a drop of LPCB dye. After carefully dropping a coverslip to prevent air bubbles, the mount was inspected for fungal components using the microscope's 10X and 40X lenses (Figure 5).

Candida albicans can be rapidly recognized with this test. *Candida albicans* have germinal tubes, which look like filamentous tubes but do not get tighter instead of forming. One candida colony was inoculated into 0.5 ml sterile serum in a test tube. Incubated at 37°C for 2 hours, one drop was transferred to a glass slide, and a packing slip was added without forming air bubbles. The culture has been examined under the objectives 10X and 40X of a microscope for the formation of a germinative tube (Figure 6).

3.1. CHROM agar

Various chemical dyes, or substrates for fluorochromes, are used in CHROM agar, a selective and differential chromogenic medium, to identify various enzyme activities. The color of the isolate colonies was observed after they had been streaked on the agar and incubated at 25°C room temperature. *Candida albicans* (light green), *Candida tropicalis* (blue with pink halo), and *Candida glabrata* (pink to purple) were identified as the isolates, respectively (Figure 7).

4. Discussion

An ear infection is one of the most typical diagnoses presented to ENT Outpatient Departments worldwide. In developing nations like India, it is a serious health issue. It has a

connection to avoidable hearing loss. It carries a higher chance of developing potentially severe long-term consequences. Knowing their aetiological agents and antimicrobial sensitivity pattern will therefore aid in determining the best course of therapy and helping avoid problems. The Department of ENT, Sree Balaji Medical College and Hospital, conducted this cross-sectional study. The research comprised 150 individuals who visited the ENT department with ear infection signs. Patients of both sexes, ranging in age from 1 to 80 years, were included.

In our study, the prevalence of ear infections varied by age, with 13.33 percent of cases occurring in children aged 1 to 10 years, 18.67 percent in children aged 11 to 20, 17.33 percent in children aged 21 to 30, 16.67 percent in children aged 31 to 40, 14.67 percent in children aged 41 to 50, 12.67 percent in children aged 51 to 60, 4.66 percent in children aged 61 to 70, and 2 percent in children aged 71 to 80. Our study's age distribution analysis reveals that the second decade of life has the highest incidence rate (18.67 percent). This might be brought on by inadequate care, poor hygiene, poverty, and crowding[14]. Another typical risk factor for young adults is an upper respiratory infection. Gulathi et al. found that the fifth decade of life had the highest prevalence (27%), followed by the third decade (25.42%) and the first decade (45.84 percent)[15]. Due to their underdeveloped immune systems and short, broad, and more horizontal Eustachian tubes, children may have a higher prevalence of upper respiratory tract infections than adults.

Our research reveals that men (53.33 percent) were more adversely affected than women (46.67 percent). There is little information on the distribution of ear infections by gender, however male preponderance may be related to their more exposed, active lifestyles or the manner they clean their ears. 3.34 percent of patients included bilateral ear infections. Most individuals are right-handed, which commonly results in infections into the right ear, which is why the right ear (53.33 percent) was afflicted more than the left ear (43.33 percent).

Similar to research by Kechker et al., which revealed 95.54 percent positivity, cultural positivity was found in 93.33 percent and negative in 6.67 percent[16]. Antibiotic use in the past or infection with stringent anaerobes or viral agents might cause the lack of growth in the culture. 87.14 percent of the culture-positive cases included isolates of aerobic bacteria, while 12.86 percent contained fungus. Fungal development is caused by the fact that cerumen and environmental fungal spores settle in the external auditory canal's wetness and warmth. Opportunistic fungi may arise due to prolonged topical, broad-spectrum antibiotic instillation that suppresses the natural bacterial flora. Due to its low nutritional needs and capacity for growth in damp environments, *Pseudomonas aeruginosa* may predominate.

Staphylococcus aureus (31.14 percent) and Coagulase Negative Staphylococcus were the two most prevalent among the Gram Positive cocci. *Staphylococcus aureus* 34.44 percent and Coagulase Negative Staphylococcus 3.33 percent were found in our study.

Pseudomonas aeruginosa (37.14 percent) and *Staphylococcus aureus* were the two most frequently isolated organisms (27.14 percent). The geographical and climatic changes may cause the variances in the isolated organisms. Our research is related to the pattern of species isolated in tropical environments. Clinical diagnoses for the 150 patients included otitis externa in 4.67 percent, acute otitis media in 8.67 percent, chronic suppurative otitis media in 76 percent, and otomycosis in 10.66 percent. 38.46% of acute otitis media patients and 100% otitis externa cases had positive cultures. *Staphylococcus aureus* was the organism isolated from these culture-positive cases, making it the most prevalent causal organism. 61.54 percent of patients of acute otitis media with a clinical diagnosis had no growth in culture. The fact that anaerobes are the most frequent organisms producing acute suppurative otitis media may be the origin of this culture's hostility. Anaerobic microorganisms are not included in our investigation.

Pseudomonas aeruginosa (45.61 percent) and *Staphylococcus aureus* were the two most prevalent organisms among the 114 CSOM patients (22.81 percent). Additionally, Proteus species (8.77%), *Klebsiella pneumoniae* (5.26%), *Escherichia coli* (3.51%), *Acinetobacterbaumannii* (5.26%), and Coagulase Negative Staphylococcus were also identified (5.26 percent). Meropenem was effective against all 52 *Pseudomonas aeruginosa* isolates. None were Metallo-Lactamase producers, suggesting that Meropenem is the most effective medication for treating ear infections caused by *Pseudomonas aeruginosa*. However, 8.4% and 7.5 percent of resistance to Meropenem have been documented.Ceftazidime sensitivity was 44%, Amikacin sensitivity was 86.5%, Gentamycin sensitivity was 71%, Ciprofloxacin sensitivity was 85 %, and Piperacillin-Tazobactam sensitivity was 88.5 % for *Pseudomonas aeruginosa* isolates. When an organism is resistant to three or more antimicrobial classes, it is said to be multidrug Resistant. Three MDR pathogens were found in our study's 52 *Pseudomonas aeruginosa* isolates (5.77 percent).

Four of the 38 *Staphylococcus aureus* isolates, or MRSA (methicillin-resistant *Staphylococcus aureus*), were resistant to cefoxitin (MRSA - 10.53 percent). Methicillin was sensitive to the remaining 34 isolates (MSSA - 89.47 percent). Vancomycin is the medication of choice for MRSA isolates since all four MRSA isolates were completely responsive to it. The frequent empirical prescription of these medications over an extended period may cause this diminished sensitivity to penicillin, cotrimoxazole, and erythromycin.

The most typical bacterium invading the outer ear is Coagulase Negative Staphylococcus (CoNS).

19 of the 44 Staphylococcus species that were identified exhibited erythromycin resistance. No inducible Clindamycin resistance was discovered when the "D" zone test was performed on these 19 isolates. Clindamycin constitutive resistance was only seen in 8 isolates. Clindamycin is a lincosamide antibiotic, whereas erythromycin is a macrolide. Both have a restricted spectrum and work against Gram Positive bacteria by preventing protein synthesis in the bacterium. *Proteus mirabilis, Proteus vulgaris, Klebsiella pneumoniae*, and *Escherichia coli* are all members of the Enterobacteriaceae family, and all isolates from this family shown complete sensitivity to the antibiotics Amikacin, Piperacillin-Tazobactam, and Meropenem. Enterobacteriaceae have 70–80% susceptibility to cephalosporins, aminoglycosides, and fluoroquinolones, according to AartiAgarwal[17].

Gentamycin, Ciprofloxacin, Piperacillin-Tazobactam, and Meropenem were all completely effective against *Acinetobacterbaumannii* isolates. Our investigation identified 50% resistance to ceftriaxone and 33% resistance to cotrimoxazole. Due to their ability to thrive even in nutrient-poor environments, *Aspergillusniger* is the most frequent cause of otomycosis. The current investigation demonstrates that *Staphylococcus aureus* and *Pseudomonas aeruginosa* are our system's most frequent causes of ear infections. These isolates are extremely sensitive to the bactericidal medications ciprofloxacin, amikacin, and piperacillin-tazobactam, which are safe for people of all ages.

A semi-synthetic ureidopenicillin is a piperacillin. Due to its wide spectrum Penicillin and anti-pseudomonial activity, it is effective against both Gram Positive and Gram Negative bacteria. A beta-lactamase inhibitor, tazobactam binds to the enzyme's active site to block beta-lactamase activity, restoring the action of primary beta-lactam antibiotics. In our investigation, Piperacillin-Tazobactam was sensitive to 88.46% of *Pseudomonas aeruginosa*. A semi-synthetic aminoglycoside antibiotic with the broadest range is amikacin. In our investigation, amikacin was sensitive to 86.54 percent of *Pseudomonas aeruginosa*. Ciprofloxacin is the strongest fluoroquinolone of the first generation, which has a broader range of action and superior tissue penetration. They delay the emergence of bacterial resistance and have a protracted post-antibiotic impact. Ciprofloxacin was sensitive to 84.62 percent of *Pseudomonas aeruginosa* and 84.21 percent of *Staphylococcus aureus* in our study.

Amoxicillin capsules and Erythromycin pills frequently treat ear infections in our ENT OPD. This explains why these organisms are more susceptible to the antibiotics amikacin,

ciprofloxacin, and piperacillin-tazobactam. This also explains why *Pseudomonas aeruginosa* that produce Metallo- -Lactamase are uncommon in ear infections. However, if these antibiotics are misused, resistant strains may develop. Thus, using these antibiotics wisely and abiding by the antibiotic rules is crucial. Giving the correct antibiotic at the right dose and time requires regular examination and understanding of the microbiological profile and antimicrobial sensitivity pattern in that area. As well as preventing the establishment and spread of resistant strains, this will aid in avoiding consequences that may develop if the infection is not appropriately treated.

5. CONCLUSION

In developing nations like India, ear infections are a serious health concern. Early identification of the etiological agents and knowledge of their antibiotic sensitivity pattern might help reduce the prevalence of ear infections. According to this study, *Staphylococcus aureus* and *Pseudomonas aeruginosa* are the most typical causes of ear infections. The regularly prescribed medications Gentamycin, Amoxicillin, Erythromycin, and Cotrimoxazole, have been proven less effective against these pathogens. Ciprofloxacin was effective against the majority of the isolates. This study demonstrated that *Pseudomonas aeruginosa*, which causes ear infections, did not create any MBLs. MRSA strains were also found, according to this investigation. To stop their spread, cleanliness and hygiene must be practised. Due to regional antibiotic prescribing methods and resistant bacterial strains, the kinds of bacteria that cause ear infections vary according to geographic location, and the antimicrobial resistance profile also does. To aid in selecting medications for therapy, antimicrobial susceptibility testing should be performed on all isolates.

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Figure 1. Age distribution of cases

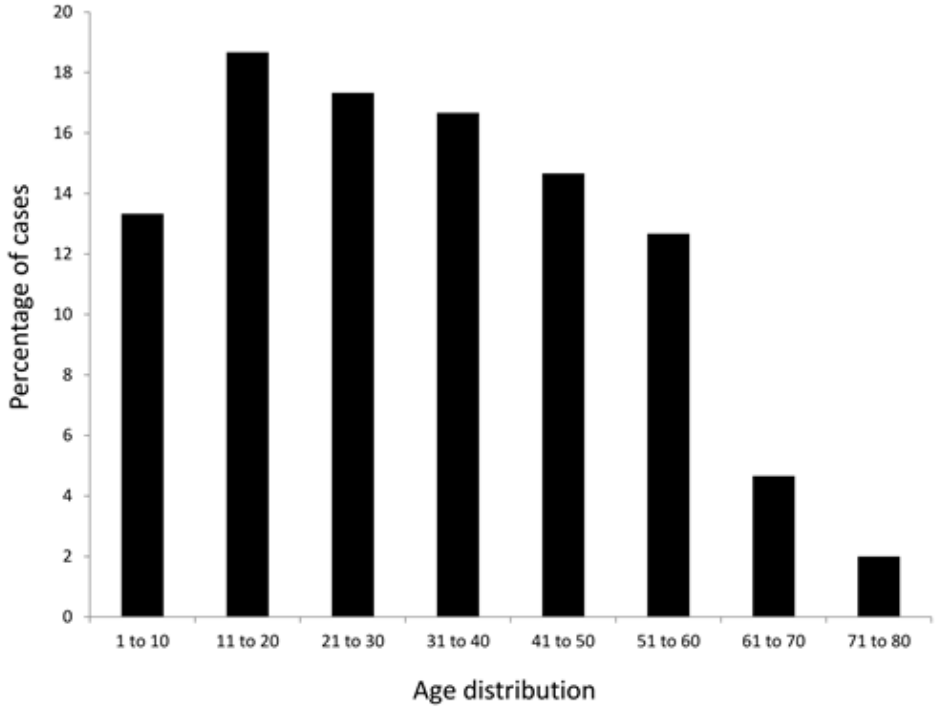

Figure 2. Percentage distribution of bacterial culture isolates

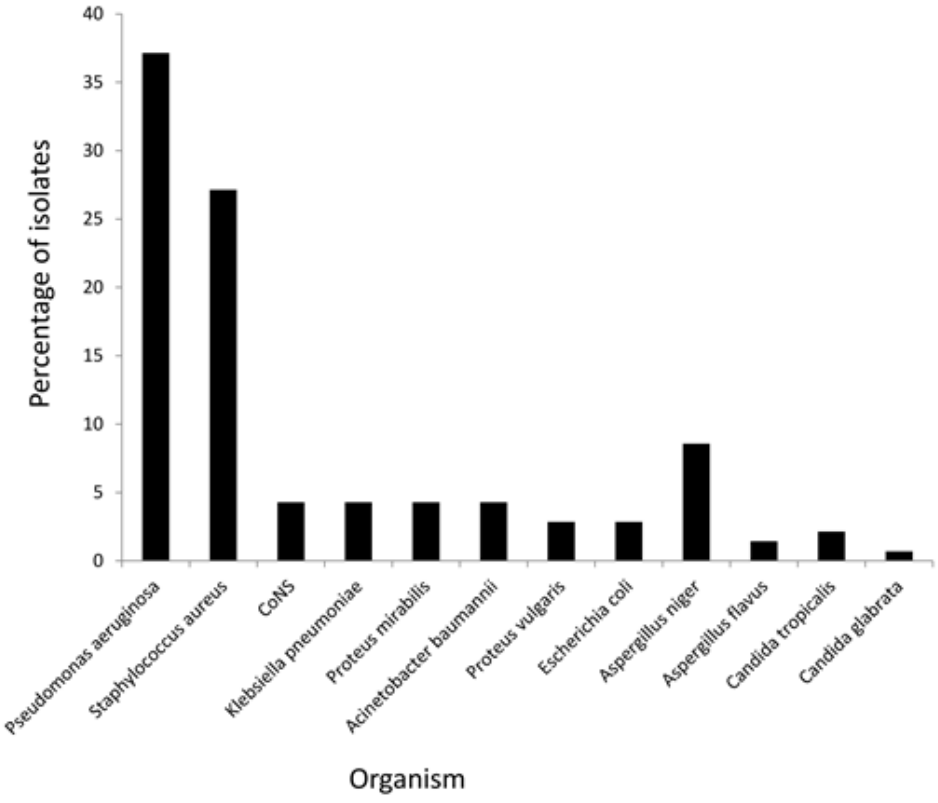

Figure 3. AST of *Pseudomonas aeruginosa*

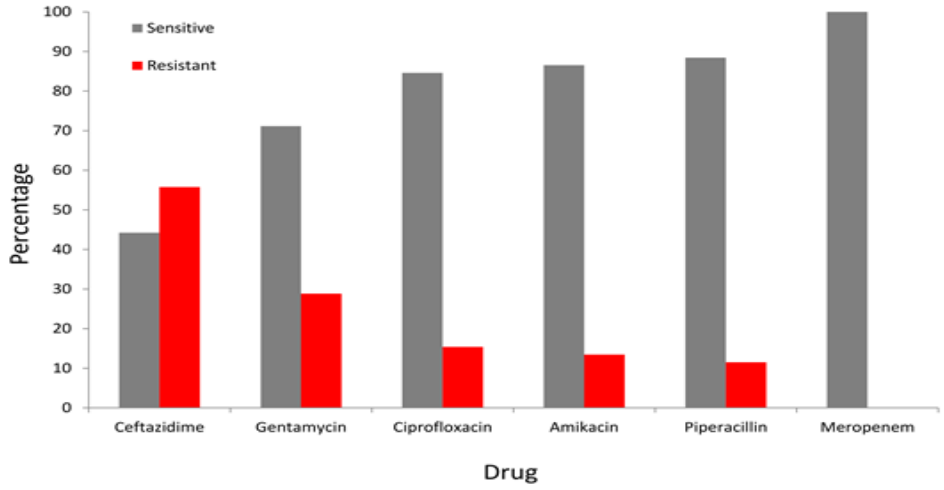

Figure 4. AST of *Staphylococcus aureus*

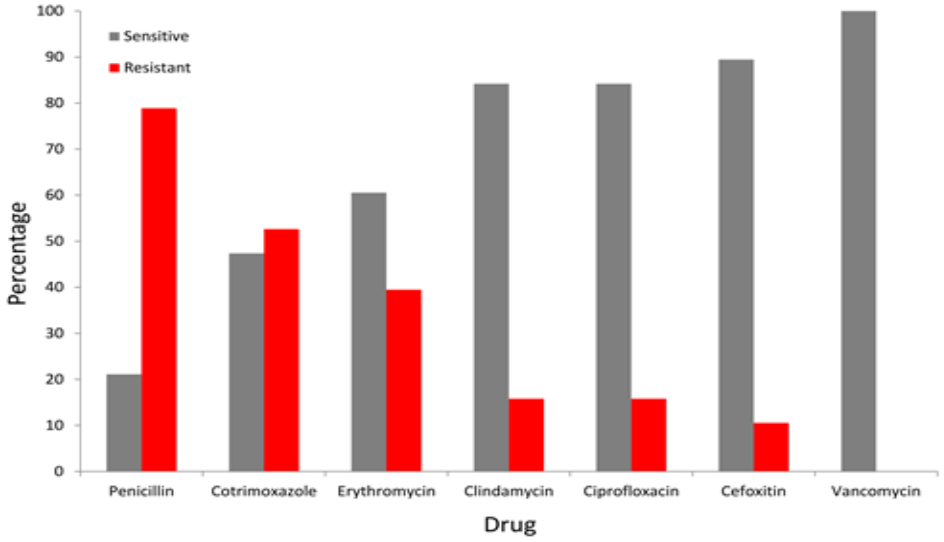

Figure 5. A. MRSA, B. Vancomycin E-test, C andD. AST of *Pseudomonas aeruginosa*.

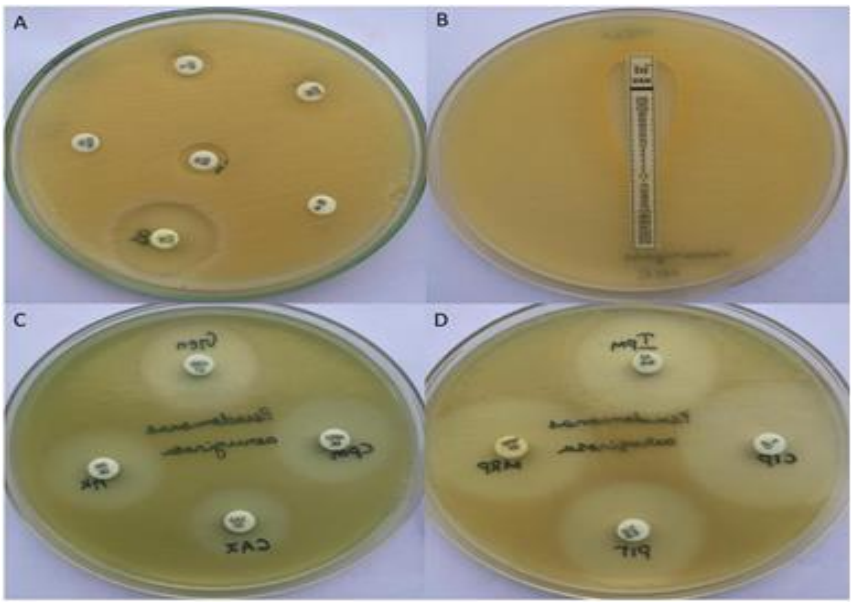

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Figure 6. A. *Aspergillusniger* LPCB (Hyphae are hyaline and septate, Conidiophores are smooth walled, Vesicles are spherical, Phialides are biseriate, and each phialide bears abundant conidia in compact columns); B. *Aspergillusflavus*Macroscopy (OBVERSE – mat-like, flat or rugose, yellow green colonies, REVERSE – colourless)

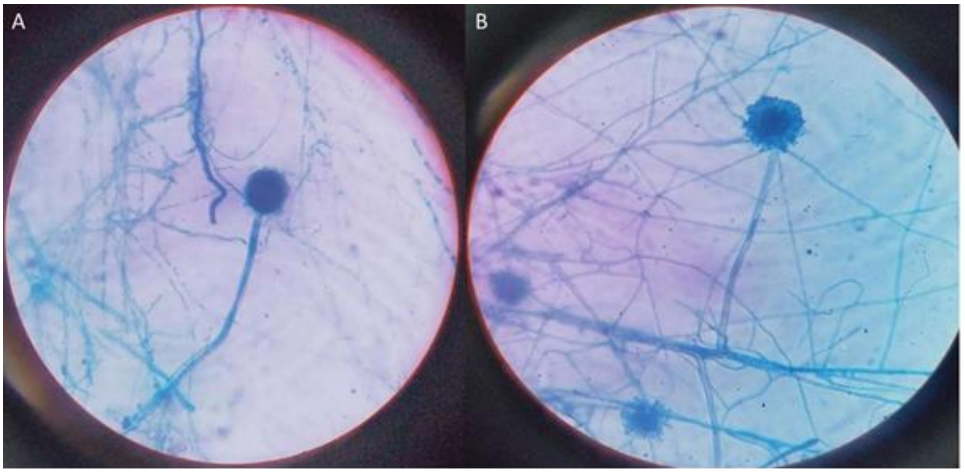

Figure 7. A. *Candida tropicalis* on SDA; B.*Candida tropicalis* on CHROM agar.