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Prevalence of Bacteria in PatientsWith Otitis Media at Thi-Qar Province

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Abstract

The present study was carried out in October 2021 to March 2022 to determine the prevalence of pathogenic bacteria in the middle ear effusions of patients with OM by way of direct culture , as well as to determine the resistance of these bacteria to antibiotics, represent patients referred to the Al-Haboby Teaching Hospital at Thi-Qar province. their bacterial culture were performed according to standard techniques. This study was conducted on 30 ear swab.

The prevalence of otitis media infection in this study was 90% as indicated by positive ear swab culture, the infections were distributed as the following: females 93.8% were higher than males 85.7%. with no significant differences (P≤0.01).

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The present study revealed four type of positive and negative gram stain bacteria were infect otitis media patient,the highest percentage of infection was with *Pseudomonas aeruginosa* (48.14%) followed by *Proteus* (25.92%) , *Staphylococcus aureus*(18.51%) and the lowest percentage of infection was with *E . coli* (7.40%) .

Children are more likely to suffer from otitis media than adults are. Adult infections were caused by tobacco smoke exposure, seasonal variations in respiratory infections, and allergies.

Keywords:otitismedia,pseudomonas,aeruginosa,proteus,staphylococcus,aureus.

1.The introduction

Middle ear disease (otitis media) in all of its forms is a chronic condition that affects many people in various regions of the world, presenting a particularly serious health problem in the latter stages till death, During the early years of life, (60-80%) of children have a recurrence of middle ear infection (Kalcioglu *et al.*,2006). Up to 40% of hearing loss is caused by ear infections, which can be avoided by limiting the overuse of antibiotics, This has resulted in the spread of the infection's causes, particularly in the developing globe(Getaneh *et al*.,2021). Ear infections can occur in the ear's outer (Otitis Externa (OE), middle (Otitis Media) (OM), or inner (Otitis Interna (OI) sections (Szmuilowicz & Young,2019). There are two types of middle ear infections: acute otitis media and chronic otitis (MI, M. G *et a*l., 2000). Otitis media with effusion is a form of middle ear infection distinguished by the presence of fluid in the middle ear in the absence of any symptoms or signs of infection (Shekelle *et al*., 2002). Effusional middle ear infection develops spontaneously as a result of a Eustachian tube weakening or in reaction to an acute middle ear infection. It has been reported that (90%) of children get effusional middle ear infection before starting school, with the majority developing it between the ages of (6) months and (4) years (Paradise *et al*., 1997). According to Shekelle et al., approximately 2.2% of one million cases of effusion middle ear infections

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are diagnosed in the United States each year, and it has been discovered that these infections have an economic impact, as inappropriate treatment of these infections may

increase their spread, in addition to contributing to bacteria resistance to antibacterials. The acute suppurative type (AOM) is the most common and important type in the globe (Lismarani *et al*, 2021). The repeated and increasing use of antibiotics in treating medical conditions for long periods of time has led to the emergence of side effects that harm the health of the individual on the one hand and the emergence of resistant strains on the other hand. It was necessary to conduct a study to determine the pathogenic causes of the infection and try to find the appropriate antibiotic to treat it, so we decided to conduct the current study. In order to achieve the following goals: - Isolation and diagnosis of some bacterial causes of otitis media and Studying the sensitivity of bacterial isolates to antibiotics used in treatment in order to identify the most appropriate antibiotics for treatment.

2.Materials and Methods

Sterile cotton swabs were used to collect samples from ear exudate (30) patients with Otitis media who attended private surgery for diagnosis and treatment from October to the end of March. Fifty-one instances tested positive for bacterial infection, with the remaining 24 cases showing no growth. Culturing: All samples taken were cultured directly in the following media: Blood Agar, MacConkey Agar, and Chocolate Agar.

Swabs were moved near the border of the petridish, and then the streaks were distributed with a sterilized wire loop to achieve very well spread colony growth. After a 24-hour incubation period, the colonies were evaluated and classified based on form, color, border, diameter, and zone of hemolysis (Rapola *et al*,2001). Isolated Bacteria Diagnosis: Direct Smear Before and after statistics on the relationship of age with the occurrence of otitis media were released, direct smears were performed directly from the samples.

Other researchers studied the effects and sensitivity of drugs on bacterial pathogens. worked on antibiotics as a treatment for acute otitis media and reported significant results

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about the sensitivity of numerous types of bacteria, while (Paradise *et al*,1997) published a paper on the effects of several antibiotics used in the prevention of acute and chronic

suppurative otitis media. (Pukander *et al*,1985) investigated the risk variables associated with the usage of a pacifier. Other researchers focused on the prevalence and risk variables that occur during the first two years of life. The current study focused on bacterial etiology of otitis media, isolation, epidemiological distribution in the Thi-Qar / Iraq population, and antibiotic sensitivity of causative agents. After cultivating, use gram stain to distinguish between gram positive and gram negative microorganisms.

Biochemical tests include the IMVIC test, the Oxidase test, the TSI test, the Catalase test, and the Coagulase test / slide test. Antibiotic Sensitivity disc: The Kirby-Bauer disc was used to test anti-bacterial susceptibility. The following antibiotics and their amounts per disc (mg/disc) were used to test the sensitivity of bacteria.

Amikacin, , Ampicillin, Cefotriaxone, Cefotaxime , Chloramphenicol , Ciprofloxacin, Clindamycin, Imipenem,Vancomycin, Nitrofurontoin, Azithromycin, Gentamycin, Rifampin , Noroflaxcin, ,Tobramycin .

3. RESULTS AND DISCUSSION

The present study was revealed that out of 30 ear swabs from patients with otitis media from different regions of Thi-Qar province, 27(90%) of those gave positive result for bacterial infections, 2(6.7%) show no growth and 1(3.3%) reveled fungal infection.

The bacterial otitis media infections among females 15(93.8% from 16 female) were higher than males 12(85.7% from 14 male), with no significant differences (P≤0.01) (Table 3-1).

Table (3-1) : Bacterial Otitis Media infections relation to gender .

Gender	Total number	No. of infection
Males	14	**12(85.7%) [a]**

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Females	16	**15(93.8%) [a]**

X2 = 1.63 **n = 1**

The high percentage of infections in females in comparison with males may be related to sex hormones in the regulation of the immune system may also contribute to the reported sex differences in the incidence and severity of the various types of RTIs, especially in adolescents and adults.

The statistical analysis showed significant differences ($P \leq 0.01$) between infections depending on age grade. The infections percentage recorded was (100%) at age groups 1-15 and 16-30, flowed by age group 31-45 years which showed the percentage (66.7%) and 46-60 show the percentage (50%).(Table3-2).

Table (3-2) : Bacterial Otitis Media infections according to age group of patients.

Age group (years)	Total number	No. of infection
1- 15	**8**	**8(100%)**
16- 30	**15**	**15(100%)**
31- 45	**3**	**2(66.7%)**

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46- 60	**4**	**2 (50%)**

X2 = 0636 **df = 3**

Adults are more likely than children to appear with otitis media, ear discharge, impaired hearing, and a sore throat. Children and adults both experience opacity and redness of the tympanic membrane. Antibiotic guidelines for children and adults are the same. Tobacco use should be discouraged (Ramakrishnan, K., 2007).

Our results showed the types of Gram-negative and Gram-positive bacteria isolated from people with otitis media infections. It is clear from the table that *Ps. aeruginosa* is the most isolated species in cases, with a percentage of 48.14%, followed by *Proteus* at 25.92%, and *Staph.aureus*, which was isolated at a rate of 18.51%. The lowest percentage of infection was with *E. coli* 7.40%. A number of Gram-negative bacteria were isolated and diagnosed, including *Ps. aeruginosa, Proteus*, and *E. coli*, while the following types represented Gram-positive bacteria: *Staph. aureus.*

These species were chosen because of their spread and their responsibility for severe and diverse infections among patients, and they are also considered one of the important species that cause nosocomial infections, as well as It is resistant to many commonly used antibiotics, such as beta-lactam antibiotics, aminoglycosides, macrolides, and quinolones.

From observing the results, we find that the bacteria *Ps. aeruginosa* has a dominant role in middle ear infections, and these results are consistent with the findings of Al-Jourani (2001), while Miro (2000) indicated that the bacteria causing this infection are *Ps. aeruginosa, Staph. aureus, Proteus spp.*, and *Klebsiella pneumoniae*. (Parry & Roland, 2002) found *Staph. aureus* is the second most common microorganism isolated from otitis media, with an estimated infection rate of 15–30% with this bacteria.

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The rate of infection of the respiratory system, including the middle ear, with *Staph aureus* is high for two reasons:

The first is high resistance to antibiotics, while the other reason *is Staph. aureus* bacteria may be present naturally and is considered an opportunistic pathogen that causes disease if the body's immunity decreases for some reason (Mashe and Etkin, 1998). It has been noted that the strains

of *Pseudomonas* bacteria that cause otitis media differ from other strains of the same type as they are characterized by their high ability to adhere to the lining epithelial cells. For the auditory canal. (Song *et al.*, 2016) also found that the rate of recurrent infection with *Ps.aeruginosa* was 22.69% (98 cases out of 432 cases), and the bacterial resistance to the antibiotics amikacin, ciprofloxacin, and levofloxacin changed significantly after recurrent infection.

Table (3-3): Types of pathogenic Bactria in Otitis Media patients

Type of bacteria	Percentage %
Ps.aeruginosa	13(48.14%)
Proteus	7(25.92%)
Staph. Aureus	5(18.51%)
E.coli	2 (7.40%)

X2= 3.423 df = 3

In the Gram-positive bacteria, *Staph* occupied the bacteria. As for the antibiotics (Ampicillin) belonging to the beta-lactam group, the resistance rate was (29, 97.88, and 96%), respectively. It was noted that the Gram-positive bacteria, Staph *aureus*, recorded a high resistance rate of 100%, while the Gram-negative bacteria, *Ps aeruginosa,* recorded the highest resistance rate, reaching 100%.

As for the antibiotics from the group of macrolides (azithromycin), the results showed the rate of resistance to them as follows (78.3%) according to the sequence of all isolates of Gram-positive bacteria. The highest rate of resistance to the antibiotic Erythromycin was recorded by *Staph. aureus* bacteria (83.8%).

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The results of the antibiotic susceptibility test indicated that most of the bacterial isolates were resistant to most of the antibiotics used. The results showed that all isolates of *Staph. aureus* were resistant to ampicillin, and this result was similar to what was obtained by Al-Gharib (2000), who found that *Staph. aureus* bacteria were resistant to ampicillin by 100%. Guirgis (2006) also indicated the presence of high resistance to *Staph. aureus* which reached 80%. This result is consistent with our results as well as with the results of Saif Al-Jundi (2005), where the resistance rate of *Staph. aureus* to the anti-amoxilin was 85%, and in a study by Al-Ghazi

(2008), it was found that the rate of resistance of these bacteria to the amoxilin was 93%, while in the study of Safaa (2007. As for the cefotaxime, its resistance rate was (69.23%), which is close to the result of Al-Ghazi (2008) and the result of Safaa (2007), where the rate was (79.49%, 66%). It did not agree with the study of Al-Aboudi (2001), where all isolates showed a symbol for the antibiotic cefotaxime, a percentage of 100%, and in the study of Al-Nadawi (2005), the percentage of bacteria resistance was 21%, and Safaa (2007) found that the percentage of *Staph aureus* bacteria for the antibiotic cefotaxime was 83%. We also find that Asghar & Momenah (2006) have half the rate (85%). The result obtained by Al-Ghazi (2008) coincided with the results of our study, as it indicated a high rate of resistance to this before *Staph. aureus.*

(Madigan *et al.,* 2003; Ryan & George Ray, 2004) have indicated that there are three important mechanisms through which *Staph.* bacteria can resist beta-lactam antibiotics, in addition to producing beta-lactamase enzymes. Bacteria are also able to generate internal resistance by reducing the affinity or quantity of penicillin-binding proteins (PBPs), as well as their ability to withstand the lethal effects of these antibiotics. As for Al-Nasiri's study (2004), *Staph aureus* isolates have a rate of resistance to the antibiotic ciprofloxacin (37.7%),.which does not agree with the results of Al-Obaidi (2006), as its isolates showed resistance to this antibiotic (9.5%), and in the study of Al-Nadawi (2005), the resistance rate was 10.5%.

The reason may be that these antibiotics were not widely used in treatment, so none of the isolates showed resistance to these antibiotics. Resistance to these antibiotics is attributed to the resistant bacteria possessing a permeability barrier, thus inhibiting the entry of the antibiotic into the bacterial cell (Winokur *et al*., 2001).

The results of resistance to the anticonulants Ciprofloxacin gave a rate of (76.92%). This percentage was close to what was found in a study conducted in India, where it was found that the rate of resistance by *Staph. aureus* reached 68.4% (Muthur *et al*., 1994), and in the study of Al-Ghazi (2008), the resistant percentage was 42.31%, and in the study of Al-Nasiri (2004), it gave *Staph. aureus* isolates resistance to the antibiotic ciprofloxacin (37.7%), which does not

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agree with the results of Al-Obaidi (2006), as its isolates showed resistance to this antibiotic (9.5%). In Al-Nadawi's study (2005), the resistance rate was 10.5%.

When studying the resistance of isolates to anti-aminoglycosides, the percentage was (, (80%) for gentamicin, and (42.85%) for amikacin. As for the antibiotics Gentamicin and Amikacin, our results differed from the findings of other studies conducted by Najm (2009) and Al-Shaibani (2004). The percentage of resistance to the antibiotics amikacin ranged (0–8.8%) and Gentamicin (10.5-26%), and in other studies, other recorded bacteria, *Ps. aeruginosa*, had a resistance rate to

the antibiotic Amikacin (55.1-38%) (Kalari *et al.*, 2005; Shahid & Abid-Malik, 2005). It was also found in a study conducted by Girgis (2006) that the rate of resistance to this antibiotic was 20%, while in a study Al-Abdul (2006) showed a resistance rate of 16.6% to amikacin and 21.4% to gentamycin among *Ps. aeruginosa* isolates.

The reason for resistance to *Ps. aeruginosa* to aminoglycoside antibiotics may be the result of a chromosomal mutation that causes a weakening of the ribosomal receptor, or due to the bacteria secreting enzymes that destroy these treatments, as the genes encoding these enzymes are carried on a transmissible plasmid, or to the lack of permeability to the antigen molecule and the loss of effective transport (Active Transport) to the bacterial cell (Books *et al*., 2004).

Conclusions:-

By looking at the most prominent results that emerged from the current study, the following conclusions can be reached:

• The results showed the dominance of *Ps. aeruginosa* and *Staph. aureus* bacteria is among the aerobic bacteria that causes middle ear infections.

• The bacteria were Gram negative, especially *Ps. aeruginosa* is more resistant to antibiotics, while *Staph. aureus* is highly resistant to many types of antibiotics compared to other isolates of Gram-positive bacteria.

Recommendations:-

Based on the above, the following recommendations can be made:

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1. The importance of early detection of bacteria causing inflammation to prevent incorrect diagnosis and inappropriate treatment with antibiotics and to diagnose pathogens that are difficult to detect by traditional methods using modern genetic engineering techniques such as polymerase chain reaction

2. Paying attention to the role of therapeutic drugs, especially antibiotics, and conducting further studies on them, and determining the use of antibiotics to which bacteria show a high percentage of resistance in treating infections to avoid the emergence of new resistant strains.

3. Conduct a molecular and genetic study to determine the relationship between genetic and environmental factors and bacterial resistance to antibiotics and try to find a solution at the molecular level for bacteria to limit the spread of this resistance because it causes a difficult problem in treating many infections.

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