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Research Article

**A STUDY ON THE EAR INFECTION AND THE OCCURRENCE
OF RESISTANCE OF ANTIBIOTICS OF BACTERIAL
ISOLATES**¹Dr Rabia Nazir, ¹Dr Saba Bashir, ²Dr Muhammad Awais¹DHQ Hospital Rawalpindi ²Jinnah Hospital Lahore.**Article Received:** March 2019**Accepted:** April 2019**Published:** May 2019**Abstract:**

Objective: The aim of this research is to determine the infections of ear in adults and children's, and also the antibiotics which are available for the treatment of the sensitivity of bacterial isolates.

Methodology: The design of this research was retrospective study and the research was carried out in 12 months from January 2018 to December 2018. 197 patients were the part of this research work, and the ear swabs of those subjects with in infection of ear were send to the different labs branches in the city area. Kirby bauer agar disc diffusion method was used to determine the sensitivity of 24 antibiotics were identified initially from the isolates of the ear discharge.

Results: in our study there was total 197 patients in which 97 were males and 100 were females; the infections were found more in children's than the adult's whose ages are from 1 to 10 years. Among these 10 types of bacteria were isolated mostly which are staphylococcus aureus and pseudomonas aeruginosa. The infections which are frequently grown in the ears of the females are klebsiella pneumonia. Fosfomycin, Imipenam Sulbactam, piperacillin, Cefoperazone and Tazobactam are the most effective antibiotics for these infections. And also Amoxyclav (36.2%) and ciprofloxacin (57.7%) are also to be use, maximum isolates were different to Polymyxin B, Cotrimoxazole, and Lincomycin Doxycyclines.

Conclusion: In this study we have found out that the bacteria's which have a strong resistance are present in our environment to encourage the different antibiotics the C/S of specimen prior in order to decrease the chances of failure of the treatment and the resistance of the amplified antibiotics prior to prescription of the drugs. When unavoidable, however, a selection of drugs is offered for empirical preference.

Keywords: Ciprofloxacin, Antibiotics, Bacteria, Antimicrobial Substances, Flora, Microbes.

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INTRODUCTION:

A persistent challenge for the otologists to treat, is the suppurative diseases which are in the middle of the ear. The accurate data about this disease is not available in most of the developing countries. The infection of microbes could be certainly comprising in different areas of the ears, due to lateral movement of debris and keratin the external auditory canal occurred less frequently because of the irritation of the skin appendages and squamous epithelium, development of wax and low pH which comprises of a different sorts of antimicrobial substances.

According to the research of Farhan Essa Abdullah. Otitis media, although it is normal infection in the middle ear cleft, generally found in newborns at the age of 6-36 months, mostly in boys, the ear drum might be red, misty and bulgy. the CSOM affect the ear drum and also the adjacent part of the ear. The microbes enter in to the middle of the ear through the Eustachian tube and in the result the infection will swell the middle of the ear and due to that swelling the tube of the ear will be block. And due to that blockage the formation of the fluid will be buildup and due to that the patient will face a severe pain and temporarily loss he hearing. Unimpeded, the fluid buildup will be increases and it will reach to the level at which it will pressurize the ear drum and damage it so it is very necessary that to use such type of antibiotics to reduce the pain and also fluid buildup, the antibiotics which should be use are decongestants, analgesics and myringotomy (surgical incision into the eardrum to relieve pressure or release pus from the middle ear)

The occurrence of otalgia in the ear a foul smell will be come out at also a blood stained pus are the sign of increasing the complication which will be present in the shape of Furuncle due to the staphylococcus aureus, and also due to mycoplasma pneumonia bacteria the tympanic membrane affected by bullous myringitis. A several studies have been conducted on the flora of microbial which is related to the infection of the ear in the world and also in Pakistan, also frequent studies has been carried out. According to the opinions of the authors a treatment is acceptable for this diseases but this is only for few cases, but the patients which have the Chronic suppurative otitis media (CSOM) should get a complete antimicrobial treatment to reduce the mastoid pathologies. An effective drug will be selected for the bacteria's, whereas in the non-availability the discharge culture analysis, depends on the regional prevalent microflora. According to the study, gram negative bacteria such E. coli and pseudomonas are very speedily growing isolates from the discharge of the ear in our environment; it is also showed in the study that these microbial are increasing and gaining

the resistance due to the several antibiotics which are prescribed by the clinician frequently. Therefore, in our study we suggested that the use of the effective antibiotics on the microbial which are grown from the infection of the ears of the patients, and due to that we determine that which drug is effective and which is partially effective and also which drug should be use and which should be restricted or adjusted the dose prescription.

METHODOLOGY:

197 patients were the part of this research work and the swabs which were used for the collection of the ear discharge was sterile calcium alginate which was presented in the different labs of the city area. The duration of this research work was from January 2018 to December 2018. Details were noted about all samples either dry or wet, containing pus or stains of blood and also recorded the complete history and time duration of the ears pain, dizziness or ringing of ears. The samples were quickly wiped on EMB agar, KLED medium, chocolate agar and blood agar plates. In case of hemophilic influenza was concerned a one chocolate blood agar with BVX factor was placed in a candle jar and also a plate of swab sabouraud dextrose was kept for seven days at room temperature. Gram-stained slide preparations were routinely made to observe association of bacteria with leucocytes. Resultant microbial growth after 24 hours' incubation at 37°C were identified on the basis of customary characteristics and their sensitivity to 24 antibiotics were determined using Sensitivity agar (Oxoid) and the classical Kirby Bauer Agar Disk Diffusion Method. The antibiotic discs included Cephalosporin's (n=7), Penicillin's (n=4), 5-Fluoroquinolones (n=4), Aminoglycosides (n=2) and one each of a Carbapenem, Tetracycline, Phenicol, and Lincosamide.

RESULTS:

The finding of our study that after the examination of the 197 patients ear swabs, the most common type of isolates was Staph aureus (38.26%) present in the year of 2018 in Rawalpindi which was almost 54% resistant to the Methicillin, moreover the pseudomonas aeruginosa ratio was 36.73%, klebsiella pneumonia was 9.69%, percentage of proteus mirabilis is 7.14% , E.coli is 4.08% and the Enterrobacter is 2.55%; and at the end the minimum common were the gram positive which were Diphtheroids, Enterococci and pneumococci (shown in Table-1). The presence of Otomycosis was in two males; and also the presence of Aspergillus was grown in both the subjects but the data of that bacteria is removed from this study. The presence of Staphylococci in the ears of the females are 36 and in the males are 39, the presence of the

pseudomonas in the female was 34 and 38 was in male patients, proposing a slight majority in the males.

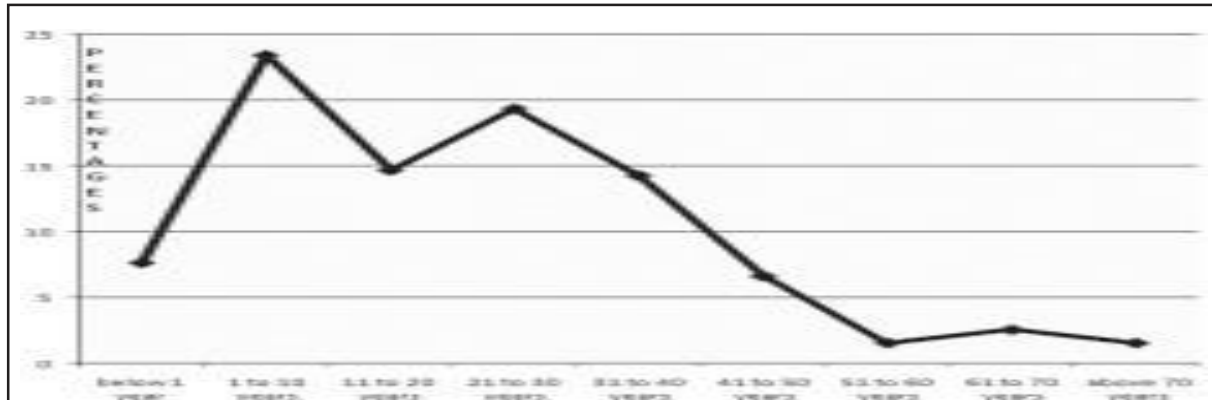


Fig-1: Graphical representation of association of ear infection with age.

Whereas the Klebsiella isolates were found in the ear swabs of the 13 females was (68.42%) and found only in the six male infected ears was (31.58%). The Diphtheroids were found only in the female's samples, whereas the presence of the pneumococci and enterococci were found only in one male patient each. The outcomes of our study shows that the pseudomonas and staphylococci were more frequent in the discharges of the male ears whereas the presence of the Proteus, klebsiella, enterobacter and diphtheroids were more in the female's ear pus. Overall ratio of the ear discharge of male and females are slightly different from each other, the ratio of the males are 49.23% and the females are 50.77%.

The association of age with otitis media is shown in the Figure-1. The rate of prevalence of this infection in the children is very high at the age of 1 to 10 years which is 23.46%, the occurrence of this infection is at the peak level at the age group of 21 to 30 years and then at the age of 70 years or above it became reduced to 1.53%. according to the study, maximum cases which reported to the hospitals between the age of 1 to 40 years with ear infections approximately 71.82%.

According to results which were found from in vitro agar dissemination examination shown in Table-II, the antibiotics which are very effective for covering the majority of ear pus isolates are included, piperacillin and Tazobactam 9.4%, sulbactam and Cefoperazone 96.6% and Imipenam 95.7%, all these antibiotics are available in injectable form only. The other antibiotic which is available in the syrup, capsule and also in injectable form is Fosfomycin 79.6%. the antibiotics

which are less effective against the microbes or the drugs whose resistance power is less than others are Gentamicin 34.2%, chloramphenicol 30%, Amoxicillin 22.2%, Cotrimoxazole 15.1% and Cefixime 15%. Whereas there are few drugs which are resistant significantly to Polymyxin B 98.3%, Doxycycline 92% and Lincomycin 85.7%.

DISCUSSION:

We have concluded from our research study that the bacteria's which are grown up from the pus of the infected ears like diphtherias, staphylococci and pneumococci are originated from the throat; the bacteria which is present at the same time everywhere in the ear pus is staph. Usually the bacteria can enter into the middle ear in contaminated water or normally we use hair pins and car keys for the cleaning of the ears and the like beyond the cerumen and its associated antimicrobial factors in the outer ear. In most of the discharge cases because of the inflammation of the ears must have quick attention to stop the prevalence of the infection to the deafness and subsequent mastoid antrum. in our analysis we have noted and also include by the etiological agent, proteus (7.14%) and pseudomonas (36.73%), and also the main pathogens which we have seen in the reports of the chronic otitis are enteric bacilli, such as Enterobacter (2.55%) and E. coli (4.08%). The results which we show here is not the confirm results because after the thorough rinsing of hands with water and soap the fingers can carry fecal flora.

In CSOM the pus will be cumulated and lastly will be rapidly discharge from the ear drum, a minor surgery is

will be made in the ear drum rather than a ragged tear, a requirement resorted to much less frequently since the advent of effective chemotherapy. However, the era of antibiotics has not only initiated the continuing introduction of a variety of antimicrobial agents, but has done so at a price: the propagation of an increasing number of resistant organisms at the expense of sensitive strains as has been seen for instance in the resistance of pseudomonas and E. coli to ciprofloxacin, and the cocci to many drugs in our study.

Indeed, a serious outbreak of infectious diseases caused by resistant organisms to multiple antibiotics has occurred in many developing countries. According to the studies which shows that every year 10 million antibiotics are prescribes for the ear infection but in which 8.5 to 9.5 million did not help in treatment of the infections.

Table -I: Specimens from 197 Patients Association and Isolates

Organism	Male patients	Female patients	Total	Percentage
Staph. Aureus	39	36	75	38.26
Ps. aeruginosa	38	34	72	36.73
Kleb. Pbeumoniae	6	13	19	9.69
Pr. Mirabilis	6	8	14	7.14
E. coli	4	4	8	4.08
Enter. Aerogenes	2	3	5	2.55
Diphtheroids	0	2	2	1.02
Enterococci	1	0	1	
Pneumococci	1	0	1	
Total	97 (49.23%)	100 (50.77%)	197	

Table-II: Antibiotics Used Percentage and Sensitivity of Isolates

Antibiotics	Sensitivity %	Resistance %
Tazobactam + Piperacillin	97.4	2.6
Sulbactam + Cefoperazone	96.6	3.4
Imipenam	95.7	4.3
Fosfomycin	79.6	20.4
Ceftazidine	76.7	23.3
Cefotaxime	76.6	23.4
Ceftriaxone	70.6	29.4
Sparfloxacin	70.37	29.6
Ofloxacin	65.8	34.2
Enoxacin	60.5	39.5
Ciprofloxacin	57.7	42.3
Cefuroxime	48.1	51.9
Cephadrine	41.2	58.8
Penicillin	38.0	62.0
Amoxyclac	36.2	63.8
Tobramycin	34.4	65.6
Gentamicin	34.02	65.9
Chloramphenicol	30.0	70.0
Amoxicillin	22.2	77.8
Cotrimoxazole	15.1	84.9

Cefixime	15.0	85.0
Lincomycin	14.3	85.7
Doxycycline	8.0	92.0
Polymyxin	1.7	98.3

According to a rough survey only 80% patients with this disease will clear without the medication but at the same time if the children are not get treated properly than they will prone to get chronic infected ears. In Oguntibeju study it is reported that 75% children's have otitis media in the first 3 years of their life at least 3 to 4 times. Similarly, in our study we also noted that the disease of ear infection is also very common in the children's at the age of 1 to 10 years, and the occurrence of this is possibly because the Eustachian tube in the children's in short in length and more in horizontal angle than the adults. According to different studies the disease of ear infections is equally common in both sexes (Male and Females). According to the study done in 2000, the occurrence of ear infections was 56.8% in males and 43.2% in females; the other study which is conducted in 2008, according to that study the percentage of patients with otitis media in females was 46% and in males was 54%, whereas another study conducted in 2009 the percentage of that disease was 52.77% in males and 47.22% in females, these results are very similar to the results which we have occurred from our study among 197 patients which were 49.5% in males and 50.5% in females.

Ears infection with the pus discharge related to chronic CSOM will treated by antibiotic that will allow the infections of the ears to dry out slowly, the use of these antibiotics will help in the surgery, or if the surgery is inadvisable then considerably minimize the risk of damaging the adjacent parts. Use of antibiotics is very important in this disease because it will enter into the mucus membrane of the middle ear and will also start activity in the mastoid process to fight against the common pathogens. According to a report the proteus mirabilis, staph aureus, and pseudomonas aeruginosa are up to 70 to 90 % of the isolates implicated in the chronic otitis; and also according to the study of Anwar us Salam et al the ratio of the staphylococci and pseudomonas are accounted together of culture in the city of Rawalpindi is almost 70%, whereas in our study we have recorded that the ratio of the staphylococci together with the pseudomonas is 75%. Two injectable drugs, piperacillin and third generation cephalosporin Cefoperazone which were affected almost up to 97% on our isolates, it is because of that, because both were provided with improved activity due to the adding of beta-lactamase inhibitors Tazobactam and sulbactam

accordingly. And more interestingly a study carried out by Mirza et al conducted in 2008, according to that the study their isolates were approximately 100% sensitivity to Tazobactam and Piperacillin.

Another injectable Carbapenem which was also very effective and also which the cover the isolates up to 95.7% was Imipenam. Another drug which is called Fosfomycin, and which is easily available in the market in capsule and in injectable form and which recovered 79.6% of the bacteria from the ears of the patients, also known for highly affected action against gram-negative and obstinate enterococci. However, the usage popularity of the Fosfomycin is less because it has to be administered 6 hourly.

The three injectable which are less effective up to some extent which are Ceftriaxone 70.6%, Cefotaxime 76.6%, Ceftazidime 76.7% and 3rd generation Cephalosporin's 76.7%, but according to a study which was conducted in 2009 reported that the two injectable which gives maximum resistance to the isolates that are ceftriaxone and cefotaxime. In our study we also recorded that the cefixime (15%) which is a 3rd generation cephalosporin, which results was very poor and also was not much effective against the prevention of the gram positive pathogens. The next four drugs were also inhibited because of its poor performance that are ofloxacin 65.8%, enoxacin 60.5%, Fluoroquinolones Sparfloxacin 70.3% and Ciprofloxacin 57.7%. In all these four drugs the results of the ciprofloxacin were 57.7% which was very weak in comparison to the other three because it was over prescribes by the local physicians.

In 2003 Gentamicin was the most effective medicine, but according to our study the isolates got resistance to Gentamicin and Tobramycin, both these Aminoglycosides medicine are easily available in its topical form because of its long and regular use. And also according to the previous reason may also elucidate the poor actions of the low cost medicines, Polymyxin B (1.7%), Lincomycin (14.3%), Doxycycline (8%), Cotrimoxazole (15.1%) and Amoxicillin (22. %), all these medicines are using against a different class of microbial agents. All these drugs are not only using against the Pseudomonas

aeruginosa but it can also use against Methicillin-resistant staph aureus (MRSA), is responsible for mostly 54% of our staphylococci isolates. Another challenge to the clinician in the last 10 years is the increase in the population which acquired MRSA infections, particularly in the case of children's where they have limited or no chances of therapeutic treatment. In addition, the phenomenon of the transfer of immunity and the extensive repetitive use of the numerous antibiotics, when just one would be enough, have together evoked changes in the nature of infection; and in the process of pathology the gram-negative bacteria particularly overtaken the gram-positive species.

CONCLUSION:

An analytical study was presented in Rawalpindi on the 197 patients which had ear infections. In the selected 9 microbial classes there were only two major isolates selected which were *Pseudomonas aeruginosa* and *Staphylococcus*. The effectiveness of the 24 antimicrobial of the isolates are recorded and the record presented the options for the pragmatic treatment and also emphasizes the regular checkups and sensitivity process of the ear infection for the accurate drug selection.

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