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Study of Antibiotic Resistance to Pseudomonas aeruginosa that Iisolate from Burns and Ggeneral Surgery from Al-Yarmouk Teaching Hospital

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Abstract

Pseudomonas aeruginosa is common gram negative rod – shaped bacterium, a species of considerable medical importance, P. aeruginosa is prototypical "multi drug resistant (MDR) Pathogen" that is recognised for its ubiquity, its intrinsically advanced antibiotic resistance mechanisms, and its associatation with serious illnesses – especially nosocomial infection such as ventilator – associated pneumonia and various sepsis syndromes. This study was conducted from March 2014 to July 2014, the patients were males and females. Total samples of 613 patients, selected from burns wards and general surgery wards, the samples were sending to teaching laboratories from the same hospital. The present study showed that the prevalence of sensitivity revealed that amikacin had the highest sensitivity (89,6%), followed by cefotaxime (66.2%), the optimal aminoglycosides in combination therapy with B-lactams was amikacin, followed by tobramycin and gentamycin, highest sensitivity rate showed that (95.2%) was found in the combination of amikacin with imipenem and piperacillin, (71.4%) were amikacin combination with cefotaxime ,(85.7%) were gentamycin with piperacillin , (71.4%) were gentamycin with cefotaxime, (95.2%) were tobramycin with piperacillin,(76.2%)were tobramycin with carbenicillin, resistance of bacterials associated with reduced aminoglycoside accumulation the current study indicated that *pseudomonas aeruginosa* was the most prevalent in burns and general surgery infection, these infections generally require treatment with a combination of antimicrobials inoder to achieve a greater baetericidal effect and reduce the levels of resistance.

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Introduction

pseudomonas aeruginosa is of type of species of its group which contains of the genome size of about 5.2 to 7 million base pairs, the core genome consists of a low level of necleotid divergene of 0.5% and a conserved synteny of genes, which means two or more genes, where they are linked or not are on the same chromosome, *pseudomonas aeruginosa* has a single and super coiled chromosome in the cytoplasm [1]. *pseudomonas aeruginosa* is a rod about 1-5μm long and 0.5 – 1.0 μm wide,and produce colonies with characteristic "grape –like" or "fresh – tortilla" [2]. Its optimum temperature for growth is 37 degrees, and its able to grow at temperature as high as 42 degrees [3]. It is found in soil, water, skin flora, and most man – made environments throughout the world. It thrives not only in normal atmosphere but also in hypoxicatmo spheres, thus has colonized many natural and artificial environments [4]. It uses a wide range of organic materials for food, in animals, it's versatility enables the organism to infect damaged tissues or those with reduced immunity [5]. The symptoms of such infection are generalized inflammation and sepsis. if such colonized occur in critical body organs, such as the lungs, the urinary tract, and kidneys, the results can be fatal, because it thrives in moist environments such as soild and water [6]. This bacterium is also found on and in medical equipment, including catheters causing crass – infection in hospitals and clinics. it is implicated in hot – tub rash [7]. It is able to decomposed hydrocarbons and has been used to break down tar balls and oil from oil spills [8]. P. aeruginosa is not extremely virulent in comparison with other major pathogenic bacteria species – for example staphylococcusareus and strepto coccus pyogenes, and does not fare especially well under subtimal atmospheric conditions for aggregate into enduing biofilms [9]. *P. aeruginosa* is among the gram- negative bacilli commonly isolated from patints with ear, urinary tract, skin, and gastrointestinal infection, the resistant of *P. aeruginosa* strains were capable of producing aminoglycoside – modifying enzymes and using efflux as mechanism of resistance [10]. Combination therapy should be reserved for patients presenting with severe sepsis or septic shock or for those with a high suspicion of resistant gram – negative infection, pending susceptibility testing and institution of appropriate β-lactam monotherapy [11].

Aim: Aim of this study is to determine the types of antibiotics resistance to *pseudomonas aeruginosa*.

Methods: Across –sectional survey was conducted at the Al-Yarmouk Teaching Hospital in Baghdad –Iraq from March 2014 to July 2014. total sample size was 613 patients selected was convenient sample.

The patients were males and females, collection of samples from burns wards and general surgical wards, all samples sending laboratories in the same hospital in order to determine the bacteria sensitivity to the antibiotics, isolation of *pseudomonas aeruginosa* by lab layoratory staffs with ordinary method by using API20E (Analytical profile index 20E), presented a biochemical panel for identification and differentiation of pseudomonas aeruginosa ,EPI20E Biochemical Test strip which contains dehydrated bacterial medial biochemical reagents in 20 separate compartments API20E Test strip is commercially available bacteria will react them and will give different colors which will help to identify bacteria to the species level and determine the resistance of bacteria to specific antimicrobial drags by using Kirby – bauer disc diffusion method , which contain antibiotics are placed on agar where bacteria are growing , and the antibiotics diffuse out into the agar , if an antibiotic stops the bacteria flow growing , one can see circular areas around the wafers where bacteria have not grown.

KB test results are reported as intermediate or resistant, based on the size of the zone of inhibition if the zone of inhibition is greater than or equal to the size of the standard zone, the

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microorganism is considered to be sensitive to the antibiotic, of the zone of inhibition is smaller than the standard size, the micro organism is considered to be resistant.

Detection of combination effects of aminoglycoside –beta-lactam showed infrequent synergistic or enhanced killing , more effective treatment of patients with severe infection , the aminoglycoside (amikacin , gentamycin, tobramycin) β-lactam (ceftazidime , cefotaxime , carbenicillin , imipenen , piperacillin) , the concentration of amikacin 5µg/ml , 5µ/ml for tobrenycin , 5µg/ml for gentamycin, the concentration of β- lactam is 30µg/ml for cefotaxime , ceftazidin , carbencillin , piperacillin , 10µg/ml for impenim, that kit for USA, oxid UK.were incubated in plasma (3days) , 37 degrees, samples taken at 12 hr intervals were analysed for both aminoglycosides (radio immunoassay) and β-lactam(high pressure liquid chromatograply).degradation of all antibiotics were by first – order reactions, incubation mixture of two antibiotics , the effect of the interaction in vivo was examined by computer simulation the minimum inhibitory concentrations of aminoglycoside determined before and after combination with β-lactam , the fraction al inhibitory concentrations calculated as MIC of drugs aminoglycoside in combination / MIC of drug s alone , MIC of drug β-lactam alone , synergism as an fractional inhibitory concentration less than 0.5-1 additive fractional inhibitory concentration of 0.5-4 , antagonism, as an FIC index more than 4.

Result

Total samples of 613 patients were from burns section 462 (75.3%) patients and 151 patients (24.6%) the demographic features of the present study were shows in table (1), the results were expressed as two groups of patients were 144 (23.5%) females and 318 (51.8%) males, in the burns section and 62 (10.1%) females and 89(14.5%)males from surgery section table (2) shows the positive sample isolates from burns section were 38(31.14%) were females and 84(68.8%) males .From the surgery section was 5(38.4%) females and 8(61.5%) males . Table (3) shows that the resistant of the *pseudomonas aeruginosa* in standard antibiotics revealed that amikacin (89.6%) that highest resistant followed by cefotaxime (66.2%) from the burns and surgery section in table (4) shows that the combination of aminoglycoside with β-lactam were highest sensitivity of amikacin with ampenim and piperacillin (95.2%), the lowest sensitivity with cefotaxime (71.4%). the gentamycine combination with piperacillin (85.7%), (71.4%) with cefotaxime. the tobramycin combination with piperacillin (95.2%) and (76.2%) with carbenicillin.

Discussion

Infection by *pseudomonas aeruginosa* facilitated by the use of outer membrane components including secretary toxins such as lipo polysaccharides [9] The present study shows that the amikacin had the highest resistant (89.6%) to the *pseudomonas aeruginosa* in patients with burns and surgical section, due to decrease in cell permeability, these findings are similar to the study done by [12] that amikacin highest resistant to *pseudomonx aeruginosa*. also the results show that cefotaxime had the lowest resistant (66.2%) to the *pseudomon aeruginosa* due to alteration at the ribosomal binding sites. The results of the present study show that the combination therapy of aminoglycoside with β-lactam that amikacin with impenim and piperacillin (95.2%) were synergism. The gentamycin with piperacillin (85.7%) were synergism. the tobramycin with piperacillin (95.2%) were synergism. combination therapy has been suggested to have a beneficial effect in delaying or preventing the development of antimicrobial resistance.

Conclusion

More administration of antibiotics as randomly used without prescription of doctor, in the using more antibiotics result to formation of bacterial states which are resistance to antibiotics, many *pseudomonas aeruginosa* infections are becoming more difficult to treat *pseudomonas aeruginosa* infections.

Table (1): Distribution of the study population by place and sex.

Place	Female	Male	Total
Burns section	144	318	462
Surgery section	62	89	151

Table (2): Distribution of the study population by positive sample.

Place	Female	Male	Totel
Burns section	Total positive sample isolates 38(31.14%)	Total positive sample isolates 84(68.85%)	122 (26.4%)
Surgery section	Total positive sample isolates 5(38.46%)	Total positive sample isolates 8(61.53%)	13(8.6%)

Table (3): percentage of susceptibility pattern of *pseudomonas aeruginos* in standard antibiotics

Antibiotics							
Section	Amikacin	Cefotaxime	Ciprofloxacin	Gentamycin	Impenim	Piperacillin	Carbencillin
Burns (122)	89.4%	66.1%	76.6%	78.9%	85.6%	84.4%	74.4%
Surgery (13)	90.5%	66.7%	71.4%	81.0%	85.7%	81.0%	76.2%
Total 135	89.6%	66.2%	76.1%	79.1%	85.6%	84.1%	74.6%

Table (4): combination antibiogram of *pseudomonas aeruginosa* percent distribution of drug combination

Aminoglycosides	β-lactams				
	Cabenicillin	Cefotaxime	Ceftazidime	Impenim	Piperacillin
Amikacin	81.0%	71.4%	90.5%	95.2%	95.2%
Gentamycin	81.0%	71.4%	85.6%	81.0%	85.7%
Tobramycin	76.2%	90.5%	88.0%	85.7%	95.2%

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