EVALUATION OF MULTIPLE DRUG RESISTANCE (MDR) AND PAN DRUG RESISTANCE (PDR) AMONG PSEUDOMONAS AERUGINOSA ISOLATES AT TALEGHANI AND GOLESTAN HOSPITALS AHVAZ, IRAN BY USING DISC DIFFUSION METHOD

Ali Mohammadian1, Azar Dokht Khosravi 23, Fariba Kavosh 4, Ahmad Taghavi Moghadam 4, Sattar Mohammadian1 and Soudeh Mohtadaeefar 4

1 Arvand International Division, Ahvaz Jundishapour University of Medical Sciences, Ahvaz, Iran.
2 Health Research Institute, Infectious and Tropical Diseases Research Center & 3 Department of Microbiology, School of Medicine, Ahvaz Jundishapour University of Medical Sciences, Ahvaz, Iran.
4 Ahvaz Razi Research Vaccine and Serum Institute, Iran.
e-mail: azarkhosravi69@gmail.com; ali_mohammadian@ajums.ac.ir
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ABSTRACT: Since Pseudomonas aeruginosa is the highly resistant to many antimicrobial agents, in addition to the intrinsic resistance of bacteria to many antibiotics, it quickly becomes resistant to drug during treatment. Generally, these bacteria use multiple drug resistance mechanisms such as producing Beta-lactamase Enzyme, change in outer membrane permeability and expression of efflux pumps to develop resistance to drugs during treatment. Today, it has been shown that antibiotic resistance in bacteria is the result of, Synergism between membrane permeability and multi drug resistance Efflux pumps. The aim of this study is to evaluate multiple drug resistance (MDR) and pan drug resistance (PDR) in P. aeruginosa using the Agar Disk Diffusion Test at Taleghani and Golestan hospitals Ahvaz. One hundreds fifty P. aeruginosa were isolated from burn and wound infections and Antibiotic resistance among them was evaluated using Agar Disk Diffusion Test. In this study, a total of 150 strains were taken, 99 strain (66%) of which showed multiple drug resistance (MDR) and 1 strain (0.67%) of those showed pan drug resistance (PDR) to these antibiotics. 46 (61.33%) of wound strains and 53 (70.66%) of burn strains were positive for MDR. Of the burn strains 1 (1.33%) resistance to PDR, while wound strains showed no resistance. In this study, finds that MDR of P. aeruginosa is increasing. Checking MDR in burn and wound samples, showed that this resistance in burn infections is more than wound infections. PDR was observed in burn samples; whereas, it was not observed in wound infections.

Key words: Multiple drugs resistance, Pan drugs resistance, Pseudomonas aeruginosa, Agar Disk Diffusion Test.

INTRODUCTION

Pseudomonas bacterium is a gram-negative, mobile, aerobic, and viable bacterium which normally forms small colonization in the intestine and skin’s flora. This bacterium acts as an opportunistic pathogen in the body of those suffering from immune system disorder, and thus causes severe infection in their bodies (Defeza et al, 2004). Today, the clinical importance of Pseudomonas aeruginosa is mostly related to its high resistance against antimicrobial drugs. That is, Pseudomonas aeruginosa, in addition to its intrinsic resistance against drugs, becomes quickly resistant against the drugs during the treatment. Its resistance against antibiotics causes many problems for the infected people (Tsutsui et al, 2011). The main antibiotics that have activity against Pseudomonas aeruginosa bacteria are: cephalosporins, carbapenems, monobactams, quinolons, aminoglycosids, and polymyxin. The antibiotic resistance against this type of bacteria occurs in the form of multiple drug resistance (MDR) and pan drug resistance (PDR) (Thong et al, 2004, Falagas et al, 2005). Several studies have shown that multiple resistances includes resistance against three types of anti-pseudomonas drugs (Thong et al, 2004, Falagas et al, 2006) and pan drug resistance takes place against all types of antibiotics (Falagas et al, 2005).

In general, this bacterium makes use of various mechanisms, including producing Beta Lactamase Enzyme, expression of efflux pumps, and change in the permeability of its cellular envelopes, to resistance against the drugs (Lambert et al, 2002). Today, it has been revealed that antibiotic resistance in this bacterium is the result of synergism between the membrane permeability and multiple resistances of efflux pumps (Marquez et al, 2005).
MATERIALS AND METHODS

For the purpose of the current study, 75 samples of wound infections and 75 samples of burn infections were collected from Golestan and Taleghani hospitals of Ahvaz. The standard strain was a *Pseudomonas aeruginosa* ATCC 27853.

**Strain identification**

using biochemical methods, including growth on Citrimide Agar environment, reaction to TSI environment, OF Test, Oxidization Test, Catalase, studying the movement and production of Indole in SIM environment, and growth of bacteria at 42 centigrade temperature, different strains of *Pseudomonas* were identified and distinguished (Forbes et al, 2002).

**Determining the resistance pattern, using quality method**

The resistance pattern of the strains against antibiotics, including Ofloxacin antibiotic discs (2 micrograms), Amikacin (30 micrograms), Gentamicin (10 micrograms), Ciprofloxacin (5 micrograms), Piperacillin (100 micrograms), Aztreonam (30 microgram), Polymyxin B (300 units), Carbenicillin (100 micrograms), Ceftazidime (30 microgram), Imipenem (10 microgram), Meropenem (10 microgram), Ticarcilin (75 microgram), Cefepime (30 microgram), Tetracycline (30 microgram) (British Company MAST), was studied by using Agar Disk Diffusion Test. In applying the test, the CLSI standard instructions were observed (Mendoza et al, 1998, Cormican et al, 2005).

**RESULTS**

In the present study, the resistance of strains to the antibiotics was as follows: Ofloxacin (73.33%), Amikacin (55.33%), Gentamicin (68.66%), Ciprofloxacin (70.67%), Piperacillin (45.33%), Aztreonam (66.67%), Polymyxin B (4%), Carbenicillin (71.34%), Ceftazidime (68%), Imipenem (62%), Meropenem (62%), Ticarclin (70.67%), Ceftriaxone (70%), Cefotaxime (72.67%), Ceftepime (79.33%), Tetracycline (93.33%). In total, from among the 150 strains, 99 strains (66%) were multiple drugs resistance and 1 strain (0.67%) were pan drug resistance against the antibiotics. About 46 (61.33%) of the wound strains and 53 (70.66%) of burn wound strains were MDR positive. Wound infections had no pan drug resistance but 1 strain (1.33%) of burn infections had pan drug resistance against antibiotics.

**DISCUSSION**

*Pseudomonas aeruginosa* is one of the hospital-acquired infection agents in the body of people having weakened immune system, such as cancer, fibrocystic,
and burn wounds. One of the main health problems in many countries of the world is the infection resulted from injury or burn wounds. People having injury and burn wounds are more likely to suffer from hospital-acquired infections because the injury wounds act like beds for the opportunistic bacteria to grow. The most important characteristics of *Pseudomonas aeruginosa* is its resistance against all types of common antibiotics (Khosravi et al., 2008).

In the current research, 150 strains of *Pseudomonas aeruginosa* of injury wound and burn wound were identified by using Agar Diffusion Disk Test. From among 150 strains, ninety-nine strains were multiple drugs resistant and from among this 99 strains, one of them was pan drug resistant. In a study done by Rastegar and his colleagues on accident section of Tehran’s Tohid hospital from 1997 to 2000, the resistance levels of isolated strains to Amikacin and Gentamicin were 90% and 98%, respectively (Rastegar et al., 2000). In the current research, the resistance levels of the strains against Amikacin and Gentamicin were 55.33% and 68.66%, respectively, which indicate a big difference with those of the Rastegar et al. (2000) study. In Shakibaie et al. (2001) study which was carried out in burn wounds section of Kerman’s hospital, the resistance level of the strains against Amikacin was reported to be 85%. But, for the current study, this percentage number is different (Shakibaie et al., 2001).

While the percentage of multiple drug resistant strains against antibiotics in the research done by Pellegrino et al. in 1999–2000 in Brazil was 40 (Pellegrino et al., 2002), this percentage was 66 for the current research. In Karsa Kermanshahi et al. research in 1381 in Isfahan on the injury and burn and wound samples, the level of resistance against Carbenicilin and Piperacillin was 84% and 63% (Shakibaie et al., 2001), which to some extent is similar to the current research results, 71.34% and 45.33%. In Fazeli et al research in Isfahan, the researchers separated people who had injury wounds infected with *Pseudomonas aeruginosa* from those who had burn wounds infected with the same bacteria. These people were brought to the hospital in the time period of 1998 to 2009. Then, the researchers administered Agar Disk Diffusion Test on the wounds. All the strains were resistant against Ceftazidime, Ticarclin. More than 94% of strains were resistant against Imipenem, Piperacillin and Ciprofloxacin (Khosravi et al., 2008). That’s while for the current research, except for the Piperacillin resistance level which was 45.33%, the resistance level of other antibiotics such as Ceftazidime (68%), Ticarclin (70.76%), Imipenem (62%), Ciprofloxacin (70.67%) were comparable to those of the Fazeli et al’s study.
Hsauch et al (2005) studied in Taiwan from 1999 to 2002, 16 patients infected by Pseudomonas aeruginosa (2 patients in 1999, 4 in 2000, 5 in 2001, and 5 in 2002) became pan drug resistant to the antibiotics. The results of Hsauch et al’s study are similar to those obtained from the current study.

CONCLUSION

In the present study, it has been shown that multiple resistance of Pseudomonas aeruginosa against antibiotics is increasing. Evaluating MDR and PDR of injury and burn wound infections against antibiotic shows that MDR is more in the infection resulted from burn wounds than the infection resulted from injury wounds. Even pan drug resistance (PDR) was seen in the patients who were burn wound infected, while no such resistance was seen in the patients who were injury wound infected. In general, considering the significant value of P>0.05, the Pseudomonas aeruginosa strains of burn infections, in comparison with strains of wound infections, are more resistant against antibiotics such as Cefepime and Piperacilin. However, with regard to the resistance against antibiotics among the strains, there was no significant difference between the strains of wound and burn infections.

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