

## Study of Antimicrobial Susceptibility of *Pseudomonas Aeruginosa* Isolated From Wound Infection in Indian Population.



### Medical Science

**KEYWORDS :** Pus Samples, *P. aeruginosa*, antibiotics

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### ABSTRACT

*A total 201 isolates of P. aeruginosa were collected consecutively from different patients. The study was carried out by using (Kirby-Bauer method) to determine the Antimicrobial susceptibility pattern of P. aeruginosa isolates from in-patients and out-patients in the hospital.*

*The specific objective of this study was to isolate P. aeruginosa from pus samples and determine the antibiotic susceptibility and resistance patterns of P. aeruginosa.*

*The results of this study showed, highest resistance rate with Ceftazidime (46%), ticarcillin/clavulanic acid (44%), cefoperazone/sulbactam (42%), ciprofloxacin (28%), tobramycin (28%), Meropenem (26%), Aztreonam (20%), Amikacin (20%). The problem of increasing resistance to P. aeruginosa has limited the use of other classes of antibiotics like the fluoroquinolones, tetracycline, macrolides and chloramphenicol.*

*In fact, the irrational and inappropriate use of antibiotics is responsible for the development of resistance of pseudomonas species. In addition, regular antimicrobial susceptibility surveillance is essential for area wise monitoring of the resistance pattern.*

### Introduction

The genus *Pseudomonas* is free living Gram-negative, aerobic, and motile, rod shaped bacteria, it is found in most moist environments. It contains more than 140 species, most of which are saprophytic and more than 25 species are associated with humans. Most *Pseudomonads* are known to cause opportunistic infections.<sup>(1)</sup>

The *P. aeruginosa* had very minimal nutritional requirement that expedited its growth in hospital environment (Gilligan1995). Resistance to multiple antimicrobial agents is displayed by *P. aeruginosa* and only a few antibiotics are found to be effective against *P. Aeruginosa* (Carmeli et al. 1999).<sup>(2)</sup>

*P. aeruginosa* is the most frequently isolated troublesome pathogen causing life threatening respiratory tract infection (ventilator associated pneumonia), surgical site and Urinary tract infections in patients from intensive care units. Endocarditis and septicemia carry a high mortality rate, exceeding 70% in patients compromised by severe burns, cancer or drug addiction. It has significant role in causing chronic debilitating respiratory infections in cystic fibrosis patients due to mucoid strains which leads to fatality. This bacterium makes use of distinctive mechanisms to become resistant to virtually all the available antibiotics. Several mechanisms can contribute to acquire resistance in *P. aeruginosa*, including  $\beta$  lactamase production, the up regulation of efflux systems and decreased outer membrane permeability. However, acquired extended spectrum  $\beta$  lactamases (ESBL) and Metallo  $\beta$  lactamases (MBL) mediated resistance is important emerging resistance mechanisms in *P.aeruginosa*.<sup>(3)</sup>

Antibiotics likely to be most effective are the aminoglycosides tobramycin and gentamycin in combination with antipseudomonal penicillin such as ticarcillin, or the ureido-pseudomonal, azlocillin and piperacillin. Newer agents with good activity include the carbapenems, imipenem and meropenem and the monobactams aztreonam. Of the cephalosporins, Ceftazidime has proved to be a useful non-toxic alternative to the aminoglycosides. Monotherapy with either Ceftazidime or imipenem/cilastatin has been shown to be safe and effective alternative to combination therapy for the treatment of serious hospital acquired infection due to *P. aeruginosa*. A particular ciprofloxacin has provided a major advance as the first highly active antipseu-

domonial agents effective by oral administration. Ongoing surveillance of *P.aeruginosa* resistance against antimicrobial agents is fundamental to monitor trends in susceptibility patterns and to appropriately guide the clinician in choosing empirical or directed therapy, especially when new antimicrobial agents may not be readily available in the near future. Therefore, the present study was undertaken to find out the antibiotic resistance patterns of pathogenic isolates of *P. aeruginosa* from various specimen in NIMS Hospital.<sup>(4)</sup> Using ceftriaxone (30) mg, Ceftazidime 30 mg, gentamicin (10) mg, tobramycin 10 mg, amikacin 30 mg, netilmycin(30) mg, ciprofloxacin (5) mg, (Hi-Media, Mumbai, India) and cefoperazone/sulbactum 75/30 mg (Pfizer, India).<sup>(5)</sup>

### Material and Method

This study was conducted in department of Microbiology in NIMS Medical College&Hospital Jaipur. A total of 201 isolates of *P.aeruginosa* were collected consecutively. The study was carried out by using (Kirby-Bauer method) to determine the Antimicrobial susceptibility pattern of pseudomonas aeruginosa isolates from in-patients and out-patients in the hospital.<sup>(6)</sup>

Clinical specimens used for the study were pus and wound swabs. Information regarding patients age, sex, and type of specimen taken were also recorded.<sup>(7)</sup> All the isolates were identified using colony morphology on blood agar, MacConkey agar, Nutrient agar, Gram stain characteristics, motility detection, and positive reaction to oxidase, citrate utilization, Urease test and Triple sugar iron test done.<sup>(8)</sup>

### Results

A total of 201 isolates of *P.aeruginosa* were collected consecutively from male and female patients. One forty nine patients (73%) were male and Fifty two patients (27%) were Female.

Out of the total 201 samples, 140 were wound swabs samples (70%), 61 were pus samples (30%).The highest sensitivity rate was found for Amikacin (80%), and Aztreonam (76%), Meropenem (74%), Tobramycin (70%). In our study Amikacin showed the highest (80%) sensitivity followed by Aztreonam against *P.aeruginosa*, which is in corroboration with an earlier report published from India.

The results of this study showed, highest resistance rate with

Ceftazidime (46%), ticarcillin/clavulanic acid (44%), cefoperazone/sulbactam (42%), ciprofloxacin (28%), tobramycin (28%), Meropenem (26%), Aztreonam (20%), Amikacin (20%) The problem of increasing resistance to *P. aeruginosa* has limited the use of other classes of antibiotics like the fluoroquinolones, tetracycline, macrolides and chloramphenicol

### Discussion

The present study was conducted to determine the antibiotic sensitivity pattern of *P. aeruginosa* isolated from ear swabs and pus samples. In the present study, the maximum clinical isolates of *P. aeruginosa* were isolated from pus samples. The study was similar to a study by Jamshaid A K et al Pak J Pharm Sci and 32 other studies.(9)

In the present study sex wise prevalence of clinical isolates shows that infections caused by *Pseudomonas aeruginosa* are more common in males (73%) compared to females (27%). This

is comparable with study of Javia et al tertiary care hospital in Gujarat, India. Indian J Pharmacol., Jamshaid Ali Khan et al Pak J Pharm Sci and Rashid et al.(10) In our study amikacin showed highest sensitivity (80%) and (20%) resistance against *pseudomonas aeruginosa*. while in another study done by Siva Gowri et al. in UMBI Malaysia amikacin showed the (80.6%) sensitivity against *pseudomonas* and resistance rate was (19.4%). (11) In our study aztreonam showed (76%) sensitivity against *pseudomonas* and the resistance rate was (20%),(4%). while in another study done by S.Meenakumari et al. in SRM University Kattankulathur, INDIA showed the (100%) sensitivity of aztreonam against *pseudomonas*.(12)

## REFERENCE

1. Shampa Annapurna, Amitabh Bhattacharjee, Arul Garg et al "Antimicrobial Susceptibility pattern of *pseudomonas aeruginosa* isolated from wound infection". Department of microbiology Varanasi, Indian journal of dermatology. 2006; 51(4):286-288. | 2. Prashanth HV, Shenoy S, Saldanha DR, Baliga S. Antibiotic sensitivity patterns of *Pseudomonas aeruginosa* strains isolated from various clinical specimens. Ind J Med Sci.2002; 56: 427-430. | 3. Kalaivani R., Shashikala P., Sheela Devi C., Prashanth K., Saranathan R. Phenotypic assays for detection of ESBL and MBL producers among the clinical isolates of multidrug resistant *Paeruginosa* From tertiary care hospital. IJCRR. 2013; 5(17): 28-35. | 4. Forozesh Fard M, Irajian G, Moslehi Takantape Z, Fazeli H, Salehi M, Rezanian S. Drug resistance pattern of *Pseudomonas aeruginosa* strains isolated from cystic fibrosis patients at Isfahan AL Zahra hospital, Iran(2009-2010). Iran J Microbiol 2012;4(2):94-7. | 5. NCCLS. Performance standards for antimicrobial disc susceptibility tests. NCCLS: Wayne PA; 1997. M2-A6. Back to cited text no. 6 | 6. Dundar D, Otkun M. In-Vitro Efficacy of Synergistic Antibiotic Combinations in Multidrug Resistant *Pseudomonas Aeruginosa* Strains. Yonsei Med J 2010; 51(1):111-6. | 7. Miles, ES and Amyes, GB (1996): Antimicrobial sensitivity tests. In: Collee, J.G.; Fraser, A.G.; Marmion, B.P. and Simmons, A.(eds). Mackie and MacCarthey Practical Medical Microbiology, 14th ed., Vol., I, pp: 131-149. Churchill Livingstone, New York. | 8. Savaş L, Duran N, Savaş N, Önlen Y, Ocak S. The prevalence and resistance patterns of *Pseudomonas aeruginosa* in intensive care units in a University hospital. Turkish Journal of Medical Science 2005; 35:317-322. | 9. Jamshaid Ali Khan, Zafar Iqbal, Saeed Ur Rahman, Kalsoom Farzana, Abbas Khan. Prevalence and resistance pattern of *Pseudomonas aeruginosa* against various antibiotics. Pak J Pharm Sci 2008;21(3):311-315. | 10. Javiya V A (2008) Antibiotic susceptibility pattern of *pseudomonas aeruginosa* at a tertiary care hospital in Gujarat India J Pharmacol. 40(5): 230-234. | 11. Siva Gowri R, Nor Azura S, and Ramelah M. Antimicrobial susceptibility of clinical isolates of *Pseudomonas aeruginosa* from a Malaysian Hospital. Malaysian J Med Sci 2009; 16: 2-9 | 12. S. Meena kumari, Shikha Verma Anam Absar et al Antimicrobial susceptibility pattern of *pseudomonas aeruginosa* in an Indian cardiac hospital. Department of biotechnology, SRM University Kattankulathur, India ISSN.2011;3(9):7117-7124. |