

Prevalence of Antibiotic Resistance in *Pseudomonas Aeruginosa* Isolated From Clinical Samples

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Abstract: Prevalence of antibiotic resistance in *Pseudomonas aeruginosa* was studied and a total of 252 different clinical specimens were investigated with a yield of 110 *Pseudomonas aeruginosa* isolates. High resistance was recorded against Aminoglycoside antibiotics i.e. Gentamicin (77.27%) and Tobramycin (74.55%). Against Meropenem the resistance was 39.09% and Piperacillin/Tazobactam and Cefepime it was 31.82% and 25.45% respectively. Against Colistin almost all the isolates of *P. aeruginosa* were sensitive while only 3 (2.73%) isolates showed resistance.

Keywords: Resistance, Antibiotic, *Pseudomonas aeruginosa*, clinical samples.

1. INTRODUCTION

Pseudomonas aeruginosa is a potential opportunistic pathogen which is the leading cause of nosocomial infections because of its higher prevalence in hospital environments and intrinsic antimicrobial resistance. *Pseudomonas aeruginosa* shows incredible capability to defend antimicrobial agents either intrinsically or by acquiring resistance genes from outside. It is the major cause of infection-related mortality in critical patients and showed highest fatality rate amongst all gram-negative infections and hence received much attention (Mesaroz et al. 2007, Igbinsosa et al. 2011). However it may cause disease in healthy individuals but it is a major threat to hospitalized patients suffering from cystic fibrosis, tissue injury, burn wounds and immune-compromised patients (Brown et al. 2004). The present study was conducted to investigate the frequency of antibiotic resistant *Pseudomonas aeruginosa* strains from different clinical specimens.

2. MATERIALS AND METHODS

The present study was conducted at Medical microbiology laboratory of Postgraduate Teaching Department of Microbiology, Rasthrasant Tukadoji Maharaj Nagpur University, Nagpur. A total of 252 clinical samples were received from Indira Gandhi Government Medical College (IGGMC), Nagpur including Pus, Wound swab, Sputum, Ear swab and Urine. Samples were cultured on Blood agar (BA) and MacConkey agar and the plates were incubated at 37°C for 24hrs. After incubation cultural characteristics of isolates were studied and further identified using gram staining and various biochemical tests such as catalase test, oxidase test and citrate test (Cheesbrough M. 1984, Cowan ST. 1993). The antimicrobial susceptibility testing of the isolates was carried out by disc diffusion technique using Mueller-Hinton agar plates according to the Clinical and Laboratory Standards Institute (CLSI) guidelines (2013). Uniform lawn of the isolates was made and antibiotic discs were placed on Mueller-Hinton agar plates, incubated at 37°C for 18-24 hrs and the diameter of inhibition zone was measured in millimeters. Following antibiotic discs (Himedia) were used: Amikacin 30µg, Aztreonam 30µg, Ceftazidime 30µg, Ciprofloxacin 5µg, Colistin 10µg, Cefipime 30µg, Gentamicin 10µg, Meropenem 10µg, Netilmicin 30µg, Piperacillin/Tazobactam 100/10µg, Tobramycin 10µg.

3. RESULTS AND DISCUSSION

Overall 252 different clinical samples were processed in the current study for isolation of *Pseudomonas aeruginosa*. A total of 110 isolates of *Pseudomonas aeruginosa* were isolated and sample wise distribution is shown in **Table I**. From the table it is observed that of 110 *Pseudomonas aeruginosa* isolates, 45 (40.91%) were from Pus, 15 (13.64%) were from Wound swabs, 13 (11.82%) were from Sputum, 17 (15.45%) were from Ear swabs and 20 (18.18%) were from Urine.

Table.I: Specimen wise distribution of *Pseudomonas aeruginosa* (n=110)

Sr. No.	Clinical Specimen (no. of specimen)	No. of <i>P. aeruginosa</i> isolates	Percentage
1	Pus (93)	45	40.91%
2	Wound swabs (51)	15	13.64%
3	Sputum (28)	13	11.82%
4	Ear swabs (45)	17	15.45%
5	Urine (35)	20	18.18%
Total		110	100%

TableII represents antibiotic susceptibility pattern of *Pseudomonas aeruginosa* isolates (n=110) using different antibiotics. In the present research work *P. aeruginosa* showed high resistance against Aminoglycoside antibiotics i.e. Gentamicin (77.27%) and Tobramycin (74.55%), but was comparatively less against Amikacin (44.55%) and Netilmicin (38.18%). *P. aeruginosa* showed considerably high resistance against Ciprofloxacin (61.82%), Aztreonam (55.45%) and Ceftazidime (47.27%). Against Carbapenem antibiotic i.e. Meropenem the resistance was 39.09% and against Piperacillin/Tazobactam and Cefepime it was 31.82% and 25.45% respectively. Against Colistin almost all the isolates of *P. aeruginosa* were sensitive and only 2.73% isolates showed resistance.

Table.II: Antimicrobial susceptibility pattern of *P. aeruginosa* by disk diffusion method (n=110)

Sr. No.	Antibiotics	Sensitive	Intermediate	Resistant
		Number (%)	Number (%)	Number (%)
1	Amikacin	61 (55.45%)	--	49(44.55%)
2	Aztreonam	49 (44.55%)	--	61 (55.45%)
3	Cefipime	82 (74.55%)	--	28 (25.45%)
4	Ceftazidime	58 (52.73%)	--	52 (47.27%)
5	Ciprofloxacin	34 (30.91%)	08 (07.27%)	68 (61.82%)
6	Colistin	107 (97.27%)	--	03 (02.73%)
7	Gentamicin	20 (18.18%)	05 (04.55%)	85 (77.27%)
8	Meropenem	64 (58.18%)	3 (02.73%)	43 (39.09%)
9	Netilmicin	68 (61.82%)	--	42 (38.18%)
10	Piperacillin/Tazobactam	70 (63.63%)	5 (04.55%)	35 (31.82%)
11	Tobramycin	28 (25.45%)	--	82 (74.55%)

Antibiotic resistance is an increasing clinical problem and a serious issue for public health. Emerging antibiotic resistance in *P. aeruginosa* limits therapeutic choices and ultimately associated with increased rates of mortality and morbidity and increased cost of treatment (Carmeli et al. 1999, Harris et al. 1999). Amongst the Fluoroquinolone antibiotics Ciprofloxacin is the most used antibiotic against *P. aeruginosa* infections. In the present work the resistance against Ciprofloxacin was 61.82%. Various studies showed consistent results for Ciprofloxacin resistance by *Pseudomonas aeruginosa* as 77.1% reported by Chikwendu et al. (2010) while Paranjothi and Dheepa (2010) showed 87.5% resistance against Ciprofloxacin. In the present work, the resistance rate against Gentamicin was 77.27% which was in coordination with results as reported by Arora et al. (2011) i.e. 79.00% while Senad and Musaddiq (2011) reported 71.42% resistance. Goudarzi et al. (2013) and Mahmoud et al. (2013) showed that more than 80.00% of *Pseudomonas aeruginosa* isolates were resistant against Aztreonam, Ceftazidime, Cefepime and Piperacillin/Tazobactam each while in the present work the resistance rate against these antibiotics was in the range of 25-55% only.

4. CONCLUSION

As the problem of antibiotic resistance in *Pseudomonas aeruginosa* has increased to an alarming stage it is necessary to use antibiotics wisely in all fields and efforts should also been made towards early detection and prevention of emergence of antibiotic resistance in *Pseudomonas aeruginosa*.

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