



## **Antibiotic Sensitivity Pattern Of Pseudomonas Aeruginosa Strains Isolated From Various Clinical Specimens At Civil Hospital, Rajkot, Gujarat, India**

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### **Abstract:**

*Pseudomonas aeruginosa is one of the most common gram-negative microorganisms identified in the clinical specimens of hospital admitted patients. This was a retrospective study done among the patients attending P.D.U. Medical College Hospital, Rajkot during August 2011 to January 2012. A total 1500 samples were tested out of which 103 strains of P. aeruginosa were isolated. Some of the isolates were from males 54 (52.42%) while 49 (47.57%) from females. Majority of the patients 26 (25.3%) were aged between 20-29 years and least 3 (2.9%) were between 50-59 years. A significant proportion 50 (48.5%) of the patients were from Pus specimen followed by Sputum 31 (30%) and Urine 8 (7.7%). Three of the clinical specimens including pus, Sputum and urine comprised of 89 (84%) of the total samples. The bacteria isolated were identified by colony morphology, microscopy and relevant biochemical tests. Antimicrobial sensitivity pattern was tested using standard guidelines. Antibiotic susceptibility pattern shows that P. aeruginosa is highly sensitive to Meropenem (87.6%), Cefepime (78.6%), Piperacillin (77.6%), Amikacin (74.71%), Ciprofloxacin (54.63%), Tobramycin (50.8%), Gentamicin (50%). The result of the study shows that Meropenem is the most effective drug against P. aeruginosa, followed by cefepime, Piperacillin and Amikacin.*

**Key words:** *Pseudomonas aeruginosa, Antimicrobial Resistance.*

### **Introduction**

In the second half of the last century, *Pseudomonas aeruginosa* has become an important hospital pathogen.<sup>1</sup> It needs minimal nutritional requirements for growth. It is a commensal of human microflora in healthy people. This rate of commensalism increases gradually with the increased duration of hospital stay.<sup>2</sup> This bacteria is frequently isolated as an opportunistic pathogen in recurrent infections of hospitalized patients and has been isolated from a number of sites in the hospital environment.<sup>3,4</sup> *P. aeruginosa* is the most important, resistant and dangerous organism infecting the burn patients.<sup>5</sup> It is the fifth common pathogen among hospital microorganisms and causes 10% of all hospital acquired infections.<sup>6</sup> In Bangladesh, it ranks third and causes a wide range of infections.<sup>7</sup> Recently this bacteria has become increasingly resistant to various antimicrobial agents.<sup>8,9</sup> With the widespread use of quinolones, both in the hospital and in the community setting, drug-resistant *P. aeruginosa* isolates has emerged and continues to escalate rapidly.<sup>10</sup> Over a period of time, we observed an increase in number of *P. aeruginosa* among our laboratory isolates. So, we decided to carry out a retrospective study to see infections caused by *P. aeruginosa* and susceptibility pattern of the organism isolated from different clinical specimens at Department of Microbiology, P.D.U. Medical College, Rajkot.

### **Materials And Methods**

The study was conducted over a period of six months (August 2011 to January 2012) at P.D.U. Medical College Hospital, Rajkot. The various specimens obtained were Pus, Sputum, urine, Ear swab, Catheter swab, Vaginal swab and exudates from any lesion which was present (e.g. Burn wound, non-healing ulcer, post-operative wounds). A total of 1500 samples were obtained from different sources out of which 103 were *Pseudomonas aeruginosa*. These specimens were inoculated onto the primary isolation media like blood agar, MacConkey and other selective differential media. Colorless colonies, characteristic of *pseudomonas*, were transferred to triple sugar iron (TSI) agar slants for presumptive identification. *Pseudomonas aeruginosa*, a glucose non-fermenting gram-negative rod produced an alkaline red slant and alkaline red or no change in the butt indicator after 24 hours of incubation. A grape-like odor of the growing colonies was also recognized. An isolate presumptively identified in TSI as glucose Non-fermenter was confirmed by inoculating to oxidative fermentative glucose medium, which yielded

positive results and Kovac's method. A total of 103 samples of pseudomonas were obtained from various sources. Pseudomonas aeruginosa ATCC 27853 was used as the control strain. i.e cefepime, amikacin, gentamicin, ciprofloxacin, piperacillin and Meropenem. The Kirby Bauer Method using the disc diffusion technique was the procedure of choice for antibiotic sensitivity testing. A sensitive result is defined as a zone of inhibition that meets the interpretive standards recommended by the American Society for Testing and Materials. For inoculation Mueller Hinton Agar was done using the standard method.

*Statistics* : Cross-sectional study.

### **Results**

A total 1500 samples were tested among the patients attending P.D.U. Medical College Hospital, Rajkot during August 2011 to January 2012. Out of which 103 strains of P. aeruginosa were isolated.

A significant proportion of the isolates were from Pus specimen 50 (48.5%) followed by Sputum 31 (30%) and Urine 8 (7.7%) [Table I]. Three of the clinical specimens including pus, Sputum and urine comprised of 89 (84%) of the total samples.

Out of the total 103 isolates 54 (52.42%) were from males while 49 (47.57%) from females. Majority of the patients 26 (25.3%) were aged between 20-29 years and least 3 (2.9%) were between 50-59 years [Table II].

The bacteria isolated were identified by colony morphology, microscopy and relevant biochemical tests. Antimicrobial sensitivity pattern was tested using standard guidelines. Antibiotic susceptibility pattern shows that P. aeruginosa is highly sensitive to Meropenem (87.6%), Cefepime (78.6%), Piperacillin (77.6%), Amikacin (74.71%), Ciprofloxacin (54.63%), Tobramycin (50.8%), Gentamicin (50%) [Table III]. The result of the study shows that Meropenem is the most effective drug against P. aeruginosa, followed by cefepime and Piperacillin.



Sources of the specimen	Total Number	Percentage
Pus	50	48.5
Sputum	31	30
Urine	8	7.7
Ear swab	8	7.7
Catheter Tip	5	4.8
High Vaginal swab	1	0.9
Total	103	100

Isolates

Table I: Distribution of specimens of *Pseudomonas aeruginosa*

Age Groups (Years)	Males (%)	Females (%)	Total (%)
<10	8 (7.8)	10 (9.7)	18 (17.5)
10-19	4 (3.9)	4 (3.8)	8 (7.7)
20-29	6 (5.8)	20 (19.4)	26 (25.3)
30-39	14 (13.8)	8 (7.7)	22 (21.4)
40-49	12 (11.7)	2 (1.9)	14 (13.6)
50-59	2 (1.9)	1 (0.9)	3 (2.9)
>60	8 (7.8)	4 (3.8)	12 (11.6)
Total	54 (52.8)	49 (47.2)	103 (100)

Table II: Age and Gender distribution of cases

Antibiotics	Sensitive no. (%)	Resistant no. (%)
Meropenem	90 (87.6)	13 (12.6)
Cefepime	81 (78.6)	22 (21.4)
Piperacillin	80 (77.6)	23 (22.4)
Ticarcilin	50 (48.5)	53 (51.5)
Amikacin	77 (74.7)	26 (25.3)
Ciprofloxacin	56 (54.3)	47 (45.7)
Levofloxacin	52 (50.4)	51 (49.6)
Tobramicin	52 (50.4)	51 (49.6)
Gentamicin	49 (47.5)	54 (52.5)
Aztreonam	51 (49.5)	52 (50.5)

Table III: Antimicrobial sensitivity pattern of *pseudomonas aeruginosa*

**Discussion**

*Pseudomonas aeruginosa* is a major cause of nosocomial infection. Despite advances in sanitation facilities and the introduction of a wide variety of antimicrobial agents with antipseudomonal activities, life threatening infections caused by *Pseudomonas aeruginosa* continue to be hospital infections. A critical factor in the survival of *Pseudomonas aeruginosa* in an unfavorable environment is its ability to transform from a mobile "swarmer" cell to a glycocalyx enclosed micro colony which serves to protect the organisms against the active phagocytes, surfactants, enzymes and high levels of specific antibodies. Nowadays, the prevalence of *Pseudomonas aeruginosa* and the new resistant strains continue in both community-acquired pathogens and hospital originated infections.<sup>11</sup> Our study shows that *P. aeruginosa* is highly sensitive to Meropenem (87.6%), Cefepime (78.6%), Piperacillin (77.6%), Amikacin (74.71%), Ciprofloxacin (54.63%), Tobramycin (50.8%), Gentamicin (50%) while in study done by Javiya et al<sup>12</sup> shows that *P. aeruginosa* is highly sensitive to Meropenem (62.1%), Amikacin (61.6%) and Cefepime (58.6%) while in other study done by Arora et al<sup>13</sup> *P. aeruginosa* is highly sensitive to Imipenem (96.3%), Amikacin (58.5%), Piperacillin (56%).

**Conclusion**

Antibiotic sensitivity pattern revealed that *P. aeruginosa* strains were highly resistant to most anti-*psudomonal* antibiotics. When we account for sensitivity, Costs, and Side effects Amikacin was found to be most suitable for routine use followed by other drugs. *Pseudomonas aeruginosa* is one of the most important bacterial pathogens seriously contributing to the problem of hospital infection, Drug resistance to *Pseudomonas aeruginosa* is rapidly increasing. Irrational and inappropriate use of antibiotics is responsible for the development of resistance of *Pseudomonas* species to antibiotic monotherapy. Hence, there is a need to emphasize the rational use of antimicrobials and strictly adhere to the concept of "reserve drugs" to minimize the misuse of available antimicrobials. In addition, regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. An effective national and state level antibiotic policy and draft guidelines should be introduced to preserve the effectiveness of antibiotics and for better patient management.

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