ISSN: 2394-0026 (P)
ISSN: 2394-0034 (O)

Original Research Article

Clinical correlation of *Pseudomonas aeruginosa* isolated from clinical settings at Civil Hospital, Ahmedabad

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How to cite this article: Rakesh M. Rajat, Nilesh D. Patel, Urmila N. Pateliya, Rajesh S. Katara. Clinical correlation of *Pseudomonas aeruginosa* isolated from clinical settings at Civil Hospital, Ahmedabad. IAIM, 2015; 2(5): 5-9.

Available online at www.iaimjournal.com

Received on: 01-04-2015 **Accepted on:** 16-04-2015

Abstract

Introduction: *Pseudomonas aeruginosa* species can be dangerous opportunistic pathogen because of its tolerance to physical, chemical, and antibacterial compounds. In hospitals, *P. aeruginosa* is a formidable opportunistic pathogen, and therefore, the medical concern with infection of immunologically compromised patients in burns and neonatal units, is well justified.

Material and methods: Total 1583 samples like swab, urine, sputum, pus, pleural fluid, bronchoalveolar lavage (BAL), ascitic fluid and blood samples from different clinical departments were tested at Clinical Microbiology Department of B. J. Medical College and Civil Hospital, Ahmedabad, Gujarat during April 2009 to April 2010.

Results: Out of 1583 samples, 807 samples turned culture positive. Out of 807 culture positive samples, 100 were culture positive for *P. aeruginosa*. The maximum number (68%) of *P. aeruginosa* isolates were obtained from swab samples. The highest number of such isolates (48%) belonged to surgical ward. *P. aeruginosa* showed highest sensitivity against Cefepime – Tazobactam (97%).

Conclusion: This study showed that *P. aeruginosa* is acquiring resistance to commonly used antibiotics as well as newer antibiotics. The antimicrobial agents are losing their efficacy because of spread of the resistant organism, indiscriminate use of antibiotics, and unhygienic condition. It is the need of the time that antibiotic policies should be formulated and implemented to resist and overcome this serious problem.

Key words

Clinical correlation, Clinical samples, *Pseudomonas aeruginosa.*

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Introduction

The aerobic pseudomonades are rod-shaped, gram-negative bacteria, motile by means of one or more polar flagella. They can grow normally using simple sources of carbon and nitrogen. Many of them are saprophytic, but some are plant pathogens and others are opportunistic pathogens of humans and animals. *Pseudomonas aeruginosa* species is the most outstanding species. The importance of this species derives from the widespread distribution of its strains in nature, their resistance too many antibacterial compounds, and the number of pathogenicity factors that they can produce. The aerobic pseudomonades can be found in many different materials. They can be dangerous opportunistic pathogens because of their tolerance to physical, chemical, and antibacterial compounds. The species of Pseudomonas are the most formidable opportunistic pathogens causing infections in hospitalized patients. In hospitals, among the species, the most common is a formidable opportunistic pathogen, *P. aeruginosa*, and therefore, the medical concern with infection of immunologically compromised patients in burns and neonatal units, and in acquired immune deficiency syndrome (AIDS) and cancer wards, is well justified indeed [1]. Multidrug resistant *P. aeruginosa* is defined as resistance to three or more of the following antimicrobial agents: aztreonam; cefepime; ciprofloxacin; imipenem; gentamicin; and piperacillin/tazobactam (TZP) [2].

Material and methods

This study was conducted at Clinical Microbiology Department of B. J. Medical College and Civil Hospital, Ahmedabad, Gujarat. It is tertiary care center, referral and teaching hospital. This study was conducted during April 2009 to April 2010. Total 1583 samples like swab, urine, sputum, pus, pleural fluid, bronchoalveolar lavage (BAL), ascitic fluid and blood samples from different clinical departments were tested.

Clinical sample processing

The clinical samples like swab, urine, sputum, pus, pleural fluid, BAL, ascitic fluid and blood were inoculated on Nutrient agar plate, MacConkey agar plate, and processed further as per standard protocol. Antibiotic sensitivity pattern was tested by using Kirby Bauer disk diffusion method. *P. aeruginosa* ATCC 27853 was used as the control strain.

Results

Total 1583 patients were tested by taking clinical samples like swab, urine, sputum, pus, pleural fluid, BAL, ascitic fluid and blood, out of whom 100 patients (6.31%) were infected with *P. aeruginosa*. Isolation pattern of *P. aeruginosa* from various clinical samples was as per **Table - 1**. The maximum number (68%) of *P. aeruginosa* isolates were obtained from swab samples. Isolation of *P. aeruginosa* from different wards was as per **Table - 2**. The highest number of such isolates (48%) belonged to surgical ward, followed by (23%) pediatric ward. Sensitivity pattern of *P. aeruginosa* against commonly used antibiotics was as per **Table - 3**. *P. aeruginosa* showed highest sensitivity against Cefepime – Tazobactam (97%), followed by Piperacillin – Tazobactam (96%). It exhibited high resistance against Tobramycin (68%), and Gentamicin (63%).

Discussion

Pseudomonas aeruginosa is an important pathogen which is responsible for the nosocomial infection that is one of the important causes of morbidity among hospitalized patients. The pre-eminent of *P. aeruginosa* in hospital infections is due to its resistance to common antibiotics and

ISSN: 2394-0026 (P)
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antiseptics, and its ability to establish itself widely in hospitals [3].

Table - 1: Isolation of *P. aeruginosa* from different clinical samples.

Type of sample	*P. aeruginosa* Isolates	
	Number (n)	Percentage (%)
Swab	68	68
Urine	16	16
Sputum	12	12
Pus	3	3
Stool	1	1
Total	100	100

Table - 2: Isolation of *P. aeruginosa* from different wards.

Ward	*P. aeruginosa* Isolates	
	Number (n)	Percentage (%)
Surgical ward	48	48
Pediatric ward	23	23
Medical ward	17	17
Gynecology and Obstetrics ward	07	07
Orthopedic ward	03	03
ICU	01	01
ENT ward	01	01
Total	100	100

In this study, total 1583 patients were tested by taking clinical samples like swab, urine, sputum, pus, pleural fluid, BAL, ascitic fluid and blood. Out of whom 100 patients (6.31%) were infected with *P. aeruginosa*, at the organism was isolated at the rate of 6.31% (100/1583) [4, 5, 6, 7, 8, 9, 10].

In present study, the highest number (48%) of *P. aeruginosa* isolates was obtained from the surgical wards. It is routine observation to find occurrence of infection at higher incidence in surgical wards, which is confirmed in the form of the maximum isolates cultured from pus/swab samples from surgical wards.

Table - 3: Antibiogram of *P. aeruginosa* isolates.

Antibiotic	Sensitivity (%)	Resistance (%)
Cefepime - Tazobactam	97	03
Piperacillin - Tazobactam	96	04
Imipenem	86	14
Levofloxacin	75	25
Cefoperazone	67	33
Netilmycin	64	36
Aztreonam	61	39
Ceftazidime	57	43
Ciprofloxacin	51	49
Piperacillin	50	50
Gentamicin	37	63
Tobramycin	32	68

P. aeruginosa showed highest sensitivity against Cefepime – Tazobactam (97%), followed by Piperacillin – Tazobactam (96%). Pardo Serrano FJ, et al. [11], Master RN, et al. [2], Platsouka E, et al. [12], and Tripathi P, et al. [13], in their studies reported 96%, 94%, 90%, and 89% sensitivity to Piperacillin – Tazobactam.

P. aeruginosa exhibited high resistance against Tobramycin (68%), and Gentamicin (63%) which was also observed in other studies [7, 14, 15, 16, 17, 18].

In present study, it was evident as per **Table - 4** that there are distinct differences in the sensitivity pattern of *P. aeruginosa* isolated from different clinical sites. Similar findings had been cited by Ravichandran PH, et al. [19], Syed A, et al. [7], and Parmar H, el al. [20].

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This indicates that the *P. aeruginosa* sensitivity pattern differs between hospitals and populations. It also indicates the importance of local antibiogram, as emphasized by various international authorities. Every hospital should have its individual antibiotic sensitivity pattern to treat pyogenic conditions [7, 15, 16, 21, 22].

Table - 4: Sample-wise antibiotic sensitivity pattern of *P. aeruginosa*.

Antibiotic	Sensitivity (%)			
	Pus	Sputum	Swab	Urine
Cefepime - Tazobactam	98	100	96	99
Piperacillin - Tazobactam	99	97	95	93
Imipenem	92	79	91	81
Levofloxacin	72	98	78	49
Cefoperazone	66	79	63	61
Netilmycin	100	91	57	62
Aztreonam	66	83	54	68
Ceftazidime	33	83	50	69
Ciprofloxacin	67	83	51	19
Piperacillin	33	75	47	43
Gentamicin	67	83	30	18
Tobramycin	35	39	26	24

Conclusion

Piperacillin – Tazobactam, since its introduction in late nineties, is losing its sensitivity over a period of time. This study showed that *P. aeruginosa* is acquiring resistance to commonly used antibiotics as well as newer antibiotics. The antimicrobial agents are losing their efficacy because of spread of the resistant organism, indiscriminate use of antibiotics, and unhygienic condition. It is the need of the time that antibiotic policies should be formulated and implemented to resist and overcome this serious problem. Every effort should be made to prevent spread of resistant organism. Frequent hand washing to prevent spread of organisms should be encouraged.

Acknowledgements

The authors are grateful to the staff of B. J. Medical College and Civil Hospital, Ahmedabad, Gujarat.

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Source of support: Nil **Conflict of interest:** None declared.