



Research Paper

Prevalence and resistance pattern of *Pseudomonas aeruginosa* among various clinical samples in our tertiary care hospital.

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Abstract

Background: *Pseudomonas aeruginosa* is a Gram-negative bacterium that continues to be a leading cause of nosocomial infections. The rapid increase in drug resistance in clinical isolates of this pathogen is a worldwide concern. The aim of this study was to investigate the prevalence rate and resistance patterns of *P. aeruginosa* in clinical specimens. **Aim:** To assess the prevalence and resistance pattern of *P. aeruginosa* in our tertiary care hospital. **Materials & method:** Various clinical samples were collected from patients and processed as per standard protocol. **Results :** In our study, the prevalence rate of *Pseudomonas aeruginosa* in various clinical sample is 7.2 % (57/ 791). Male (61%) were commonly affected than female (39%). Pus (65%) was the predominant sample of isolation in our study which is followed by sputum sample (22%). 82 % of *Pseudomonas aeruginosa* isolates were resistant to Ceftazidime, Amoxycillin & 78% to piperacillin. **Conclusion :** In our study, all our isolates were sensitive to colistin (100%) and minimal resistance were noted with Tigecycline (19%) & Imipenem (12%). Beta lactams when combined with beta-lactam inhibitors are more effective than alone. Highest resistance were noted to Ceftazidime, Amoxycillin & piperacillin.

Keywords: antibiotics, multi-drug resistance, nosocomial infection

Received 01 Oct., 2022; Revised 08 Oct., 2022; Accepted 11 Oct., 2022 © The author(s) 2022.

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I. Introduction

Pseudomonas spp is a gram negative rod-like bacteria belonging to the family Pseudomonaceae, responsible for a host of infectious disease *Pseudomonas aeruginosa* is an aerobic, non-fermenting gram-negative bacilli, widespread in nature & saprophytic. (Trinainet *al*). Now it is emerged as a lethal superbug, has become a major cause nosocomial and opportunistic pathogen in the last few decades, due to its capacity to survive on inert materials & wide variety of physical conditions, minimal nutritional need and its intrinsically resistant to many antibiotics and disinfectants, contributes to its ecological success and its role as an effective opportunistic pathogen. (Gales *et al.*, 2001).

It is the fifth common agent among pathogenic hospital microorganisms and responsible for 10% of all hospital acquired infections. (Pathiet *al*).

P aeruginosa causes infections in respiratory tract, ear, skeletal system, urinary tract, surgical infections & severe burns, etc. and also frequently isolated from patients undergoing chemotherapy for malignancies. (Renugaet *al.*)

This opportunistic pathogen has innate resistance to multiple antibiotics and plasmid mediated acquired resistance to various β -lactamase enzymes in the nosocomial setting, jeopardising the selection of appropriate treatment. Many studies have reported the reduced susceptibility of *P aeruginosa* to currently used antipseudomonal agents. The carbapenems, imipenem and meropenem are usually active against multidrug-resistant (MDR) isolates of *P aeruginosa*.

Resistance to antibiotics has become a growing therapeutic problem. So, we have taken this study to investigate the susceptibility pattern of P aeruginosa among various clinical samples in our hospital.

II. Materials and method

This study was conducted at microbiology department, Villupuram Medical College, Villupuram. Study period was from August 2019- April2019. Various clinical samples (blood, pus, body fluids, urine, sputum, wound swab, ear swab and endotracheal tube) were included in the present study. The samples were inoculated on Nutrient agar, Blood agar plates and MacConkey agar and the plates were inspected for growth after overnight incubation. MacConkey agar showing non lactose fermenting colonies were picked up and subjected to Gram staining, oxidase test and other Biochemical tests to identify Pseudomonas species. All the isolates were subjected for antibiotic susceptibility testing as per CLSI guidelines. The following antibiotics were used: Piperacillin, Ceftazidime, Amoxicillin, Piperacillin-tazobactam, Amoxiclav, Gentamicin, Amikacin, Ciprofloxacin, levofloxacin, Tigecycline. Imipenem, Aztreonam, colistin. For urine samples Norfloxacin, nalidixic acid, nitrofurantoin (30ug) were included in panel. The size of zone of inhibition was measured and susceptibility is interpreted according to CSLI guidelines (Murray, Bailey, CLSI)

III. Results

Table-1 : sex distribution

N= 57	Number of isolates	Percentage
Male	35	61
Female	22	39

Table-2: sample wise distribution

N= 57	Number of isolates	Percentage
Pus	37	65
Sputum	12	22
Urine	3	5
Blood	2	3
Others	3	5
	57	100 %

Table 3: Antibiotic resistant pattern

N= 57	Number of isolates	Percentage
Ceftazidime	47	82
Piperacillin	45	78
Amoxicillin	47	82
Amoxiclav	35	41
Piperacillin- Tazobactam	31	39
Gentamycin	19	33
Amikacin	15	27
Ciprofloxacin	21	37
Levofloxacin	18	31
Tigecycline	11	19
Aztreonam	16	28
Imipenem	7	12
Colistin	0	0
Norfloxacin (urine)	15	27
Nalidixic acid (urine)	20	37
Nitrofurantoin (urine)	16	28

IV. Discussion

P. aeruginosa is a Gram-negative bacterium, which cause healthcare associated infections and increasingly recognized as an emerging opportunistic pathogen of clinical relevance. It is a very notorious organism which is very difficult to control using antimicrobials or disinfectants. The increasing frequency of antibiotic resistance in Pseudomonas aeruginosa is an alarming concern because they are very difficult to eradicate and associated with increased mortality and morbidity.

In our study, the prevalence rate of Pseudomonas aeruginosa in various clinical sample is 7.2 % (57/ 791). The similar range of observation has been reported by Janshaidet al, Ramalakshmi et al, Pathiet al, Trinanaiet al. Their observations were 6.6%, 6.8%, 8.4% & 8.6% respectively. The prevalence rate reported with various studies in India were 10.5% to 30%.

Among the 7.2% of isolates, 61% were Male and 39% of patients were female. Male preponderance were reported with the studies of Janshaidet al, Saradaet al, Usha et al & Binduet al.

Infections of wound and respiratory tract are the predominant infections by *Pseudomonas*, according to various studies. Shenoy *et al*, Chanderet *al*, Ranjanet *al*.

In our study also, Pus (65%) was the predominant sample of isolation which is followed by sputum sample (22%).

In contrast to this, other samples like blood, urine were predominant sample of isolation of *Pseudomonas aeruginosa* in the studies of Javiyaet *al*& Aroraet *al*.

The variation with sample predominance could be due to target population, sample size, study time & area, duration of stay in hospital and infection control practices.

In our study, 82 % of *Pseudomonas aeruginosa* isolates exhibited resistance to Ceftazidime, Amoxicillin & 78% to piperacillin.

41% & 39% of resistance noted for combination drugs, Amoxiclav, Piperacillin-tazobactam

Beta lactams when combined with beta-lactam inhibitors are more effective than alone. Rajat *et al* observed the same findings

Moderate resistance were observed with Gentamicin, Amikacin, Ciprofloxacin, levofloxacin, Aztreonam which is 33 %, 27%, 37%, 31 % 28 % respectively. As antibiotic resistance varies with various place for aminoglycosides & fluoroquinolones, these drugs should be used judiciously.

For urine samples, the resistance noted for norfloxacin, nalidixic acid & nitrofurantoin were 27%, 37% & 28% respectively.

In our study, all our isolates were sensitive to colistin (100%) and minimal resistance were noted with Tigecycline (19%) & Imipenem (12%). These drugs must be used for reserve.

P. aeruginosa is becoming resistant to antimicrobials due to injudicious consumption which exerting selective pressure on bacteria and makes them resistant to it and infections with such resistant isolates may result in untoward clinical outcomes which lead to increased morbidity, mortality and economic burden. To minimize the resistance, clinician should follow the antibiotic susceptibility pattern of bacterial pathogens and to prevent the spread of the resistant bacteria important to have strict antibiotic policies, reduced hospital stay and strict adherence to infection control practices.

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