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Original Research Article

Antibiotic Profile of *Pseudomonas aeruginosa* in a Tertiary Care Hospital

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Abstract:

Pseudomonas aeruginosa is an important opportunistic pathogen responsible for both hospital-acquired and community-acquired infections. Its intrinsic and acquired resistance to multiple antibiotics poses significant therapeutic challenges. This study aimed to evaluate the prevalence and antibiogram of *P. aeruginosa* isolates in a tertiary care hospital. A total of 503 clinical samples were processed, out of which 32 isolates of *P. aeruginosa* were identified, giving a prevalence rate of 6.38%. Antibiotic susceptibility testing revealed variable resistance patterns, with all isolates remaining sensitive to colistin. A considerable proportion (27%) of isolates were multidrug-resistant. Continuous surveillance and rational antibiotic use are essential to control infections caused by this organism.

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Introduction

Pseudomonas aeruginosa is a major cause of healthcare-associated infections, particularly in hospitalized patients, intensive care units, and surgical wards. It is known for its remarkable ability to survive in diverse environments and develop resistance to multiple classes of antibiotics. The widespread and often inappropriate use of antimicrobial agents has led to the emergence of multidrug-resistant (MDR) strains, making treatment increasingly difficult.

Understanding the local antibiogram pattern is crucial for guiding empirical therapy and implementing effective infection control strategies.

Aim and Objectives

- To determine the prevalence of *Pseudomonas aeruginosa* in clinical samples.
- To evaluate the antibiotic susceptibility pattern of the isolates.
- To assess the occurrence of multidrug resistance among isolates.

Materials and Methods

This study was conducted in the bacteriology laboratory of PCMS & RC, Bhopal, from October 1, 2024, to December 31, 2024.

A total of 503 clinical samples including pus, urine, sputum, blood, endotracheal secretions, and ear swabs were collected from various departments. The samples were cultured on blood agar and MacConkey agar. Identification of isolates was based on colony morphology, Gram staining, oxidase test, and standard biochemical tests.

Antibiotic susceptibility testing was performed using the Kirby-Bauer disk diffusion method on Mueller-Hinton agar, following CLSI 2024 guidelines. The antibiotics tested included:

- Imipenem
- Piperacillin-tazobactam
- Meropenem
- Ceftazidime
- Ciprofloxacin
- Amikacin
- Cefepime
- Aztreonam
- Levofloxacin
- Tobramycin

Colistin susceptibility was determined using E-test. *P. aeruginosa* ATCC 27853 was used as the control strain.

Results

Out of 503 samples, 32 isolates of *P. aeruginosa* were obtained, resulting in a prevalence rate of 6.38%.

Demographic Distribution

- Males: 17 (54.05%)
- Females: 15 (45.9%)

Sample-wise Distribution

- Pus/Wound: 16 (50%)
- Urine: 5 (15.6%)
- Sputum: 5 (15.6%)
- Blood: 4 (12.5%)
- Endotracheal secretion: 1 (3.1%)
- Ear swab: 1 (3.1%)

Department-wise Distribution

Highest isolation was observed in:

- General Surgery: 31.2%
- Urology: 15.6%
- ICU: 12.5%

Antibiotic Resistance Pattern

Resistance rates observed:

- Ceftazidime: 29.7%
- Ciprofloxacin: 27%
- Meropenem: 24.3%
- Cefepime: 24.3%
- Amikacin: 21.6%
- Piperacillin-tazobactam: 16.2%
- Tobramycin: 16.2%
- Imipenem: 16.2%
- Aztreonam: 13.5%

All isolates were sensitive to colistin.

Multidrug Resistance

- 27% of isolates were identified as multidrug-resistant.

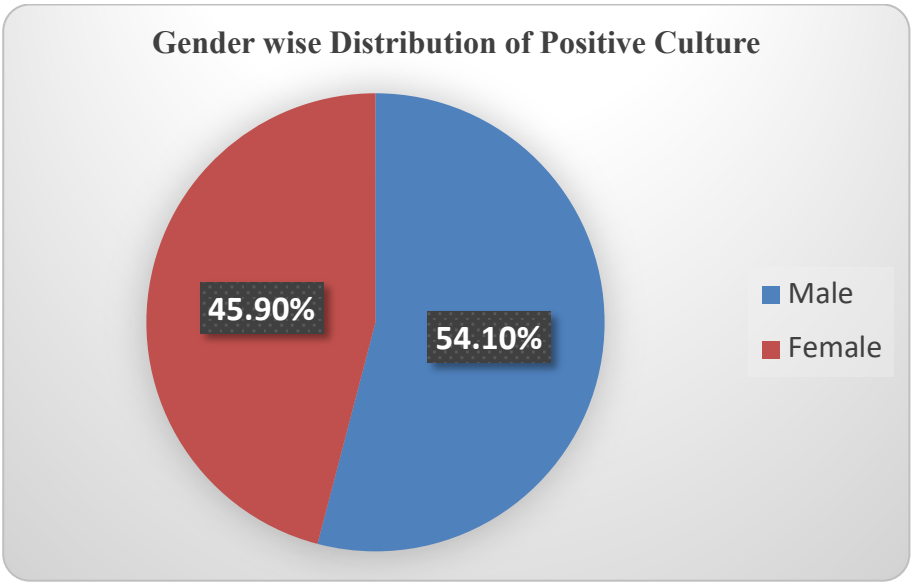
Discussion

The study highlights that *P. aeruginosa* remains a significant pathogen in hospital settings, especially among inpatients and surgical ward cases. The higher prevalence in pus samples suggests its strong association with wound infections, particularly postoperative infections.

The observed resistance patterns indicate a growing concern, especially against commonly used antibiotics like cephalosporins and fluoroquinolones. Carbapenem resistance, although moderate, is alarming as these drugs are often considered last-resort treatments.

The complete sensitivity to colistin suggests its continued effectiveness; however, its use should be restricted to prevent the emergence of resistance.

The higher infection rate in males and inpatients may be attributed to prolonged hospital stay, invasive procedures, and increased exposure to healthcare environments.



Graph 1: Gender wise Distribution of Positive Culture

Conclusion

Pseudomonas aeruginosa is a significant cause of healthcare-associated infections with notable multidrug resistance. The study emphasizes:

- Increasing prevalence in hospitalized patients
- High resistance to commonly used antibiotics
- Continued effectiveness of colistin as a last-resort drug
- Need for strict antibiotic stewardship programs
- Importance of regular surveillance and antibiogram updates

Timely identification and appropriate antibiotic therapy, along with effective infection control measures, are essential to reduce morbidity and mortality associated with *P. aeruginosa* infections.

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