Section: Microbiology

Original Research Article

CHANGING TRENDS IN THE ANTIBIOTIC SUSCEPTIBILITY PATTERN OF PSEUDOMONAS AERUGINOSA IN A TERTIARY CARE HOSPITAL IN PATHANAMTHITTA

Chandana Padmakumar N[1], Harshan K H[2]

[1]Assistant Professor, Department of Microbiology, Mount Zion Medical College, Adoor, Pathanamthitta, Kerala, India.
[2]Professor, Department of Microbiology, Mount Zion Medical College, Adoor, Pathanamthitta, Kerala, India.

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Corresponding Author:
Dr. Chandana Padmakumar N
Assistant Professor, Department of Microbiology, Mount Zion Medical College, Adoor, Pathanamthitta, Kerala, India.
Email: lekshmi842@gmail.com

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ABSTRACT

Pseudomonas aeruginosa is a non-fermenting gram-negative bacilli (NF-GNB) which is straight or slightly curved rods, motile by one or more polar flagella. They are strict non-sporing, and non-acid fast aerobes. They grow over a wide range of temperatures 300C-410C and most species grow well below pH 4.5 1,2. In recent years due to empirical use of antibiotics, Pseudomonas aeruginosa has emerged as major healthcare-associated pathogen. They frequently exhibit multidrug resistance and harbour multidrug resistant gene. The present study was conducted to know the prevalence of Pseudomonas aeruginosa and antimicrobial sensitivity pattern among the patients visiting to a tertiary care hospital. This study has been conducted over a 12 months period from Januvary 2025 to December 2025. Pseudomonas aeruginosa was isolated and identified from clinical specimens by standard procedure and antibiotic susceptibility test was performed. Pseudomonas aeruginosa was the most common isolate (59.8%) among NF-GNBs. Pseudomonas aeruginosa was susceptible to Ceftazidime, Cefepime, cefoperazone- sulbactam, gentamicin, Piperacillin-tazobactam and carbapenems. For multidrug-resistant (MDR) cases colistin was found to be effective. Fluroquinolones showed increased resistance.

Keywords: Pseudomonas aeruginosa; Antibiotic Susceptibility.

INTRODUCTION

Pseudomonas aeruginosa is catalase and oxidase positive. Pseudomonas aeruginosa is associated with a disease spectrum ranging from superficial skin infection to fulminant sepsis. Superficial skin infection associated with Pseudomonas are folliculitis, infection of the ear canal-"swimmer's ear" and ocular infections in contact lens users.[3] They are associated with bacterial endocarditis requiring valve replacement, osteomyelitis and urinary tract infection secondary to catheterization.[4,5,6]

Pseudomonas is the 4th most common cause of hospital acquired infections especially ventilator associated pneumonia and constituted the highest number isolated from ICUs with mortality 40-50%.[6,7,8] Source of isolates is from lungs and intravascular devices. This organism is commonly device-related and spreads from patient to patient from hands of medical personnel.[3]

Inherent resistance of these bacterial agents to commonly used disinfectants and their tendency to colonize various surfaces have been pivotal in their emergence as important nosocomial Pathogens.[9] Due to rampant use of antibiotics most of these organisms are now resistant to many routinely used antibiotics causing prescription failure.[10] Hence, this study was undertaken to isolate and identify pseudomonas aeruginosa and also to do the antibiotic susceptibility at a tertiary care teaching hospital.

MATERIALS AND METHODS

Present study was conducted at the Department of Microbiology, Mount Zion Medical College over a

12 months period from Januvary 2025 to December 2025.

All the samples received in bacteriology section of laboratory were inoculated on blood agar, MacConkey agar and incubated at 37°C for 48 hrs. The isolates which were non-lactose fermenting were further processed according to standard protocol. The test conducted included Gram stain for morphology, hanging drop for motility, oxidase test, catalase test, indole, methyl red, Voges–Proskauer, citrate utilization, urease production, oxidative fermentative test (Hugh-Leifson medium) for glucose, lysine and ornithine decarboxylation, arginine dihydrolase test, and growth at 42°C and 44°C.[11,12]

All the strains were confirmed by Vitek-2 test. The sensitivity test was performed by Kirby-Bauer disc diffusion method using commercially available discs (Himedia). The results were interpreted as per the CLSI 2025 guideline.[13]

RESULTS

Among 117 NF-GNBs, Pseudomonas aeruginosa was isolated from 70 samples accounting for an isolation rate of 59.8%. Majority of isolate was from the pus and body fluids (58.5%) (41 samples) and followed by urinary tract infection (UTI) (21.4%, 15 samples), respiratory tract infection (RTI) (12.8%, 9 samples), and septicemia (7.3%, 5 samples).

Table 1: samples from which p aeruginosa isolated

Sample from which P. aeruginosa isolated	Number of samples	Percentage of samples
Pus and body fluids	41	58.5%
Urine	15	21.4%
Sputum	9	12.8%
Blood	5	7.3%

Table 2: Table Antibiotic susceptibility pattern of Pseudomonas aeruginosa

	CRO	CAZ	CT	CPM	CS	TC	PT	Dori	IMI	Mero	AK	G	CIPRO	LEVO	Coli
R%	98.6	27.1	98.6	24.3	21.4	41.4	25.7	21.4	24.3	22.9	24.3	20	31.4	34.3	6.1
S%	1.4	72.9	1.4	73.6	78.6	58.6	74.3	78.6	75.7	77.1	75.7	80	68.6	65.7	93.9

The antibacterial sensitivity pattern showed that 93.9% of P. aeruginosa were sensitive to colistin. Imipenem 75.7% and Meropenam 77.1% Doripenem 78.6%, 74.3% were sensitive to Piperacillin tazobactum, 78.6% were sensitive to Cefoperazone sulbactam and 58.6% sensitive to Ticarcillin-clavulanate, 75.7 % were sensitive to Amikacin, 80% for Gentamicin 68.6% sensitive to ciprofloxacin and 65.7% sensitive to levofloxacin, 72.9% sensitive to ceftazidime and 73.6% sensitive to cefepime.

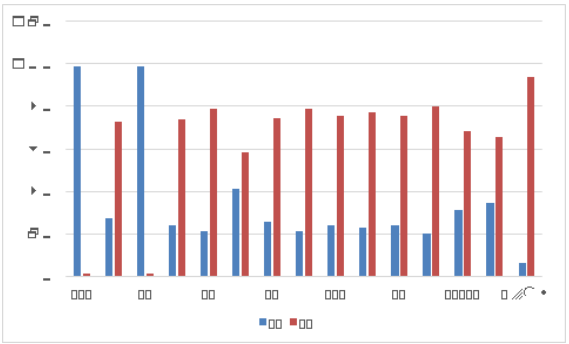

Figure 1: Showing Antibiotic susceptibility pattern of Pseudomonas aeruginosa

DISCUSSION

Initially NF-GNBs were considered contaminants and commensal but their continuous isolation and association with clinical disease shows their pathogenic potential.[3] NF-GNBs have emerged as important opportunistic pathogens in the increasing population of patients who are immunocompromised by their disease or medical/surgical treatments.[19]

In our study P. areuginosa susceptiblity is colistin 93.9%, aminoglycosides 79.7%. carbapenems 78.6%, 77.1%, βL-βLI 78.6%, cephalosporins 72.6%, fluroquinolones 68.6%. The sensitivity to imipenem is similar to study conducted by Mohammad Rahbar 20 2010 where it was 78.8%, and 94.1% in a study by Malini et al,[16] in the year 2009 2. This result was similar with a study conducted in 2013 by Juyal,[17] where the highest sensitivity was observed with amikacin (72.5%).

Resistance to antimicrobials has increased over the years among NF-GNB and number of strains are now resistant nearly too all commonly used antibiotics. Multi drug resistance among these organisms makes the treatment of infections caused by them difficult and expensive.[9]

NF-GNB are innately resistant to many antibiotics and are known to produce extended spectrum betalactamase and metallo-beta-lactamase.[16]

In study done by Radhika et al, it was observed that P. aeruginosa isolates were sensitive to most of the antibiotics as Imipenem and Meropenem at 95%were found to be the most sensitive antibiotic which is concordance with Malini et al,[16] and Benachinmardi et al.[10]

CONCLUSION

Isolation of non-fermenters and their antibiotic susceptibility pattern should be regarded with all seriousness in clinical practice and clinical epidemiology because by being resistant to multiple

antibiotics, their prevalence not only limits the treatment options but also act as a reservoir of drug resistance genes. They are an emerging pathogen and every effort needs to be undertaken to prevent its spread and control its infection. There is a slight decrease in the isolation or burden of Pseudomonas aeruginosa in this study compared to previous studies. Colistin resistance has increased in the recent years and isolated a few XDR Pseudomonas aeruginosa. Ceftazidime found to be effective compared to other 3rd generation cephalosporins. Carbapenems was effective and cefoperaxone sulbactum among BL-BLIs. Gentamicin showed more sensitivity than Amikacin. There is an increase in resistance of fluroquinolones in recent years may be due to liberal use of antibiotics that emerged resistance in Pseudomonas species.

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