



ANTIBIOTIC SUSCEPTIBILITY PATTERN OF PSEUDOMONAS AERUGINOSA ISOLATED FROM PATIENTS OF LOWER RESPIRATORY TRACT INFECTION : A STUDY FROM TERTIARY CARE MEDICAL COLLEGE AND HOSPITAL IN NORTH INDIA

Dr. Aditya Rana*

JR, Department of Microbiology, DRPGMC, Kangra at Tanda.
*Corresponding Author

Dr. Subhash Chand Jaryal

Professor and Head of Department, Department of Microbiology, DRPGMC, Kangra at Tanda.

ABSTRACT

Background: Among Gram negative nonfermenter pathogens *Pseudomonas aeruginosa* considered as the most challenging pathogen. The development of resistance of *P. aeruginosa* to antibiotics is increasing globally due to the overuse of antibiotics. **Materials and method:** This retrospective study was conducted at the department of Microbiology, DRPGMC Kangra at Tanda. 1314 samples of lower respiratory tract infection were received at Microbiology laboratory for duration of one year from November 2019 to October 2020. Samples were processed on Blood agar, MacConkey agar and Chocolate agar. Culture plates were incubated for 18-24 hours at 37°C. Identification of *Pseudomonas aeruginosa* was done by morphology, gram staining biochemical reactions and AST was performed using Kirby Bauer disc diffusion method. **Result:** *Pseudomonas aeruginosa* isolates were 184 (14.03%) out of 1314 various lower respiratory tract infections samples. Males were 77 (41.8%) and females were 107 (58.2%). *Pseudomonas aeruginosa* was isolated from sputum 153 (83.2%), endotracheal aspirate 21 (11.4%) & BAL 10 (5.4%). Sensitivity was maximum for Cefotaxime and cefepime with least sensitivity for levofloxacin. **Conclusion:** Antimicrobial resistance is continuously increasing. *Pseudomonas aeruginosa* shows progressive antimicrobial resistance, continuously updated data on antimicrobial susceptibility with careful consideration for monitoring and optimization of antimicrobial use in order to reduce occurrence and spread of antimicrobial resistant pathogens.

KEYWORDS : Antibiotic susceptibility, *Pseudomonas aeruginosa*, lower respiratory tract infection.

INTRODUCTION:

Respiratory tract infections are one of the most common infections encountered by human beings [1]. Worldwide lower Respiratory Tract Infections (LRTIs) are the most commonly reported infection in humans. [2]. LRTIs are responsible for 4.4% of all hospital admissions and 6% of all general practitioner consultations [3].

Pseudomonas is aerobic, Gram-negative bacilli bacteria belonging to the family Pseudomonadaceae [4]. *Pseudomonas aeruginosa* has substantial aptness to a wide range of the environment habitats and can also colonize and invade a human host to cause serious infections [5,6]. This pathogen is one of the leading causes of pneumonia [7,8]. A high resistance pattern of *Pseudomonas aeruginosa* is measured as the cause of higher mortality rate by *Pseudomonas* infections [9]. In this study we aimed to determine the prevalence of *Pseudomonas aeruginosa* in lower respiratory tract infection patients and their antibiotic susceptibility pattern.

MATERIAL AND METHOD:

This was a retrospective study of *Pseudomonas aeruginosa*, their antibiotic susceptibility pattern in various lower respiratory tract samples for all ages and gender received in the department of Microbiology, DRPGMC Kangra at Tanda. Sputum, BAL and endotracheal aspirates samples were included in the study. The duration of the study was from November 2019 to October 2020.

The samples on receiving were processed on Blood agar, MacConkey agar and Chocolate agar and then incubated at 37°C for 18- 24 hours [10]. Identification was done by morphology, gram staining and biochemical reactions. AST was performed by the Kirby Bauer disk diffusion method on Mueller-Hinton agar medium. Drugs included were piperacillin/ tazobactam 110 mcg, amikacin 30 mcg, ceftazidime 30 mcg, imipenem 10 mcg, levofloxacin 5 mcg, cefepime 30 mcg, gentamicin 10 mcg respectively and incubated at 37°C for 24 hours.

RESULTS:

Total of 1314 samples of lower respiratory tract infection were

received in the Department of Microbiology, DRPGMC Kangra at Tanda. In lower respiratory tract samples sputum endotracheal aspirates and BAL samples were taken. Females were predominant in our study with male to female ratio of 1:1.2.

Out of 1314 samples 184 (14.03%) samples showed growth of *Pseudomonas aeruginosa*. Males were 77 (41.8%) and females were 107 (58.2%). (Figure 1)

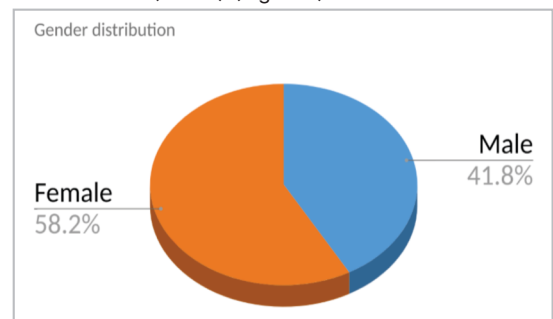


Figure 1: Gender wise distribution

Pseudomonas aeruginosa was isolated in majority from sputum 153 (83.2%) followed by endotracheal aspirate 21 (11.4%) & BAL 10 (5.4%) samples. (Figure 2)

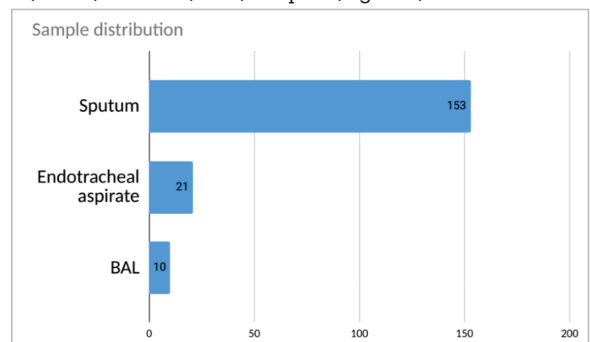


Figure 2: Sample wise distribution of isolates with *P. aeruginosa* growth.

Antibiotic susceptibility patterns for *Pseudomonas* isolated from various lower respiratory tract samples showed maximum susceptibility for Ceftazidime and cefepime with least sensitivity for Imipenem. (Table 1)

Table 1: Antibiotic susceptibility pattern of *Pseudomonas aeruginosa* isolates.

Antibiotic	Sensitive(%)	Intermediate(%)	Resistance (%)
Ceftazidime	140 (76.1%)	13 (7.1%)	31 (16.84%)
Amikacin	129 (70.1%)	13(7.1%)	42 (22.8%)
Levofloxacin	113 (61.4%)	22 (11.9%)	49 (26.6%)
Cefepime	136 (73.9%)	9 (4.89%)	39 (21.1%)
Imipenem	119 (64.6%)	21 (11.5%)	44 (23.9%)
Piperacillin/tazobactam	121 (65.7%)	17 (9.3%)	46 (25%)
Gentamicin	126 (68.4%)	25 (13.6%)	33 (17.9%)

DISCUSSION:

The increasing resistance to antibiotics by respiratory pathogens has complicated the use of empirical treatment with traditional agents.[11] and a definitive bacteriological diagnosis and susceptibility testing would, therefore, be required for effective management of LRTI [12]. The predominance of *Pseudomonas aeruginosa* resistance is considered a serious problem in many countries.

Majority of the *Pseudomonas aeruginosa* isolates were obtained from sputum samples followed by endotracheal aspirates and least from BAL samples. This could be due to easy accessibility of lower respiratory samples without invasive procedures.

Females were in majority to males in our study comparable results were seen in study from Tripathi et al which also showed female predominance.[13]

In our study we found maximum susceptibility towards third generation cephalosporins. 76.1% were sensitive for ceftazidime and 73.9% sensitivity was shown by cefepime. Sensitivity for ceftazidime was seen nearly similar to a study by Yayan et al which showed sensitivity of 76%. [14] In contrast to our study result, Tripathi et al showed high resistance to cefepime with sensitivity of 36.27% only. [13]

Gentamicin and amikacin show resistance in 17.9% and 22.8% respectively. Imipenem and piperacillin/tazobactam show nearly equal susceptibility patterns in the study. Study by Fatima et al in their study showed maximum sensitivity to imipenem and piperacillin/tazobactam showed sensitivity similar to our study. [15]

Pseudomonas aeruginosa showed maximum resistance to levofloxacin 54.4% in our study. Similarly in study by Sader et al in their study showed increased resistance to levofloxacin. [16]

With increasing resistance in *Pseudomonas aeruginosa* towards the common first line drugs it is very important to consider the antibiotic susceptibility pattern. Judicious use of antibiotics is required to halt the progress of increasing resistance and threat of MDR.

CONCLUSION:

The results of this study emphasize the challenge of optimizing empirical antimicrobial therapy for *Pseudomonas aeruginosa* in lower respiratory tract infection. Further studies should be carried out periodically to focus on the changing trend of one of the most common bacterial infections of the lower respiratory tract. Better administration of the existing antibiotic policies, along with antimicrobial stewardship programs should be fully imposed.

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