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Original Research Article

Antimicrobial susceptibility of *P. aeruginosa* isolated from patients with respiratory tract infections

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Abstract

P. aeruginosa is a gram negative rod non-fermenter bacterium that commonly cause opportunistic hospital acquired infection. The antibiotic susceptibility of bacteria frequently changes over time and differs from place to place so regular surveillance of antibiotic susceptibility in institute is needed to treat the infection empirically and efficiently.

Objectives: 1) To determine frequency of respiratory tract infections by *P.aeruginosa* 2) To determine antimicrobial susceptibility of *P. aeruginosa* isolated from patients with respiratory tract infections 3) To determine antimicrobial susceptibility of *P. aeruginosa* isolates of respiratory tract infections in indoor versus outdoor patients 4) To determine antimicrobial susceptibility of *P. aeruginosa* isolates from patients with respiratory tract infections from various clinical departments. 5) To determine frequency of respiratory tract infections by multi drug resistant (MDR) *P. aeruginosa*

Material and Methods: A total of 66 *P. aeruginosa* isolated from clinical specimens from patients of respiratory tract infections were included in the presents study and antibiotic susceptibility of the isolates was determined by Clinical Laboratory and Standard Institute [CLSI] guidelines. Data including patient's age, gender, organism and antibiotic susceptibility results were collected, and analyzed using Microsoft Excel 2007, and Whonet 5.6.

Results: Prevalence of *P. aeruginosa in* respiratory tract infections is 26%. In present study, *P. aeruginosa* isolates showed highest sensitivity towards Colistin (100%), followed by Meropenem (98.4%), Piperacillin/Tazobactam (98.4%), Ciprofloxacin (98.4%), Ceftazidime (93.8%), Cefoperazone (94.8%), and Amikacin (92.2%), and lowest sensitivity towards to Piperacillin (90.6%) and Ticarcillin (87.5%) observed. *P. aeruginosa* from indoor patients showed higher resistance towards antipseudomonal drugs than isolated from outdoor patients. There is difference in antibiotic sensitivity of *P. aeruginosa* isolated from different clinical departments. Out of 66 *P. aeruginosa* isolates, 2 (3%) were MDR.

Conclusion: Difference of antibiotic sensitivity results in P. *aeruginosa* isolated from indoor/outdoor patients, and clinical departments like Pulmonary/Medicine/Casualty observed, therefore need to be review regularly the antimicrobial susceptibility pattern to have an opinion of clinical effect of different therapeutic drugs.

Keywords: *P. aeruginosa*, Antimicrobial susceptibility

Introduction

P. aeruginosa is a gram negative rod, aerobic, non-fermenter bacterium that commonly cause opportunistic hospital acquired infection.[1] Infections of *P. aeruginosa* in critical body organs, like lungs, and kidneys, lead to fatal infections.[2]

P. aeruginosa develops resistance against antibiotics by different mechanisms such as, efflux pumps, aminoglycoside modifying enzymes and mutations in genes. Frequent use of broad spectrum antibiotics and cross infection lead to rapid increase in the resistant strains.[3]

In spite of advance in health care and variety of antipseudomonal agents, critical infections caused by *P. aeruginosa* are one of the major health problems. Infections caused by Multidrug resistant (MDR) and Pan drug resistant (PDR) strains increases morbidity, mortality and increased burden on health care cost.[4]

The antimicrobial susceptibility profile of bacteria changes over time and varies from place to place[5] so regular surveillance of institute antimicrobial susceptibility profile is needed to treat the infection empirically and efficiently.[6,7]

Objectives

1. To determine frequency of respiratory tract infections by *P.aeruginosa*
2. To determine antimicrobial susceptibility of *P. aeruginosa* isolated from patients with respiratory tract infections
3. To determine antimicrobial susceptibility of *P. aeruginosa* isolates of respiratory tract infections in indoor versus outdoor patients
4. To determine antimicrobial susceptibility of *P. aeruginosa* isolates from patients with respiratory tract infections from various clinical departments.
5. To determine frequency of respiratory tract infections by multi drug resistant (MDR) *P. aeruginosa*

Materials and Methods

Total of 430 samples were received from both out and in-patients suffering from respiratory tract infections. Culture

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that showed growth of *P. aeruginosa* was included in the study. Samples were inoculated on Blood agar and MacConkey agar and incubated at 37°C for 24hrs. The organisms were identified by standard guidelines. Antimicrobial susceptibility was determine by Kirby-Bauer disc diffusion method as per CLSI guidelines.[8]

The discs that were used to detect the antibiotic susceptibility pattern were as mentioned below: Meropenem (10 µg), Amikacin (30 µg), Ceftazidime (30 µg), Cefoperazone (75 µg), Ciprofloxacin (5 µg), Imipenem (10 µg), Piperacillin/Tazobactam (110 µg), Colistin µg, Piperacillin (100 µg), Ticarcillin µg, Ticarcillin/Clavulanic acid µg

Data including patient's age, gender, organism types and their antimicrobial susceptibility results were collected. The results obtained were arranged using Microsoft Excel 2007, and were evaluated using who net 5.6 and Microsoft Excel 2007. Multi Drug Resistance (MDR) was defined as non-susceptibility to at least one agent in three or more antimicrobial categories.[9]

Results

A total of 256 sputum and tracheal aspirate cultures showed positive growth and a total of 66 (26%) *P. aeruginosa* strains were isolated. Prevalence of *P. aeruginosa in* respiratory tract infections is 25.78%

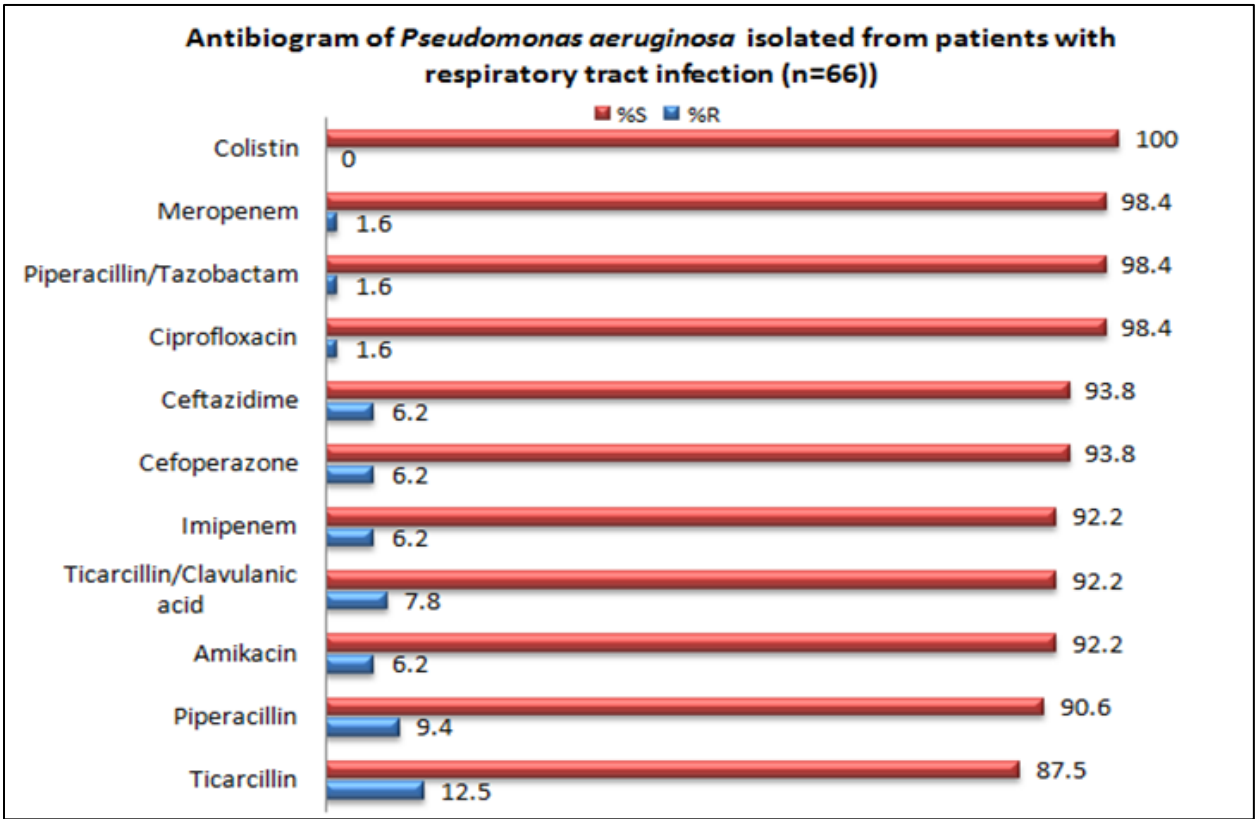

Fig. 1: Antibiogram of *P. aeruginosa* isolated from patients with respiratory tract infection (n=66)

Amongst all *P. aeruginosa* isolated, 100% were sensitive to Colistin, 98.4% to Meropenem, 98.4% to Piperacillin/Tazobactam,90.6% to Piperacillin and 87.5% to Ticarcillin obsereved. *P. aeruginosa* isolates showed higher sensitivity towards Colistin (100%), Meropenem (98.4%), Piperacillin/Tazobactam (98.4%) and lowest sensitivity towards Piperacillin (90.6%) and Ticarcillin (87.5%) observed.

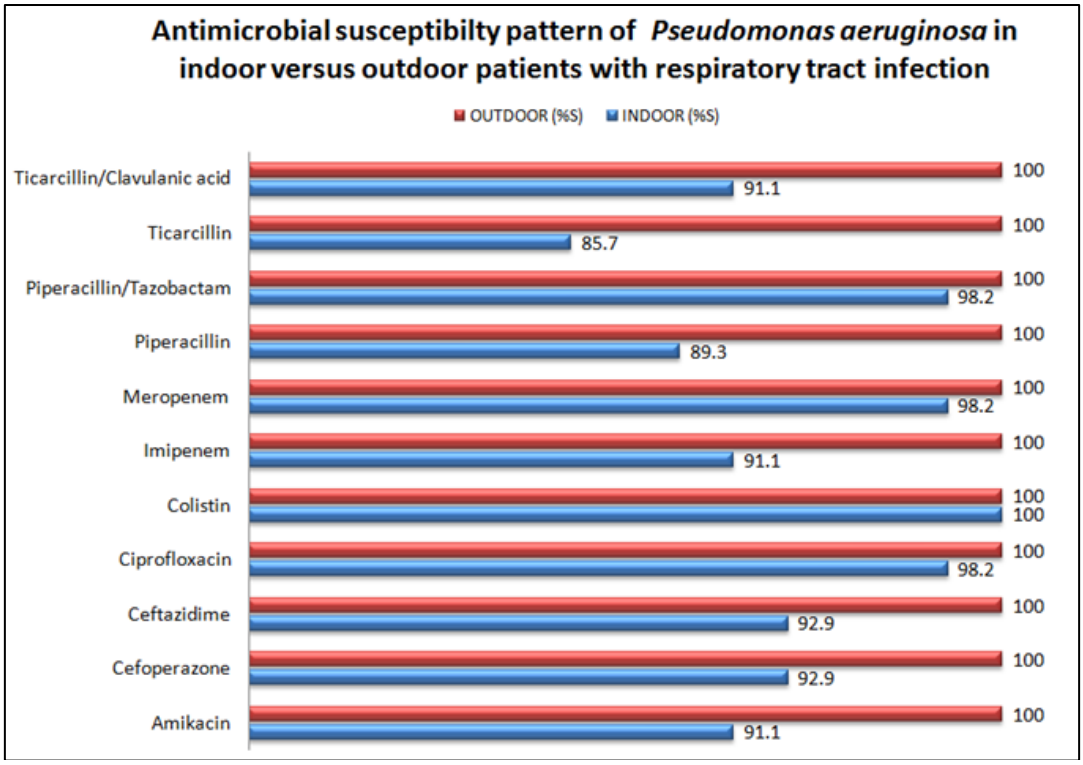

Fig. 2: Antimicrobial susceptibility of *P. aeruginosa* in indoor versus outdoor patients with lower respiratory tract infection (n=66)

Out of 66 *P. aeruginosa isolates*, 8 (12.12%) were from outdoor patients and 58 (87.87%) were from indoor patients isolated. *P. aeruginosa* isolates from Outdoor patients showed 100% sensitivity towards antipseudomonal drugs whereas isolates from indoor patients were 100% sensitive to Colistin, 98.2% to Meropenem, 98.2% to Piperacillin/Tazobactam, 89.3% to Piperacillin and 85.7% to Ticarcillin observed.

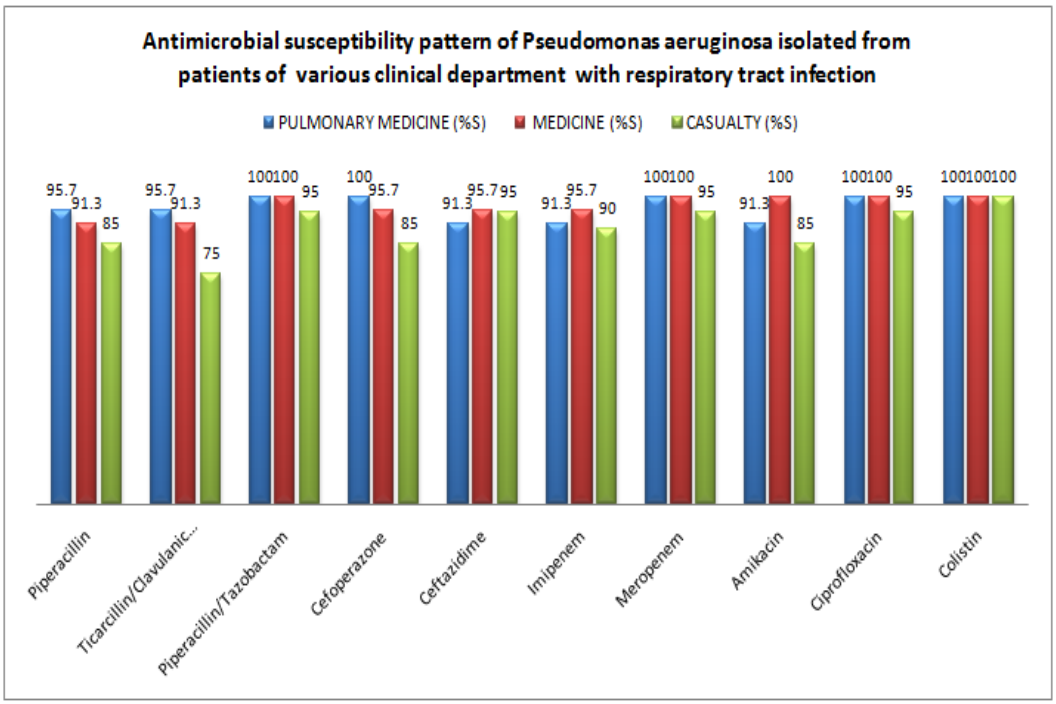

Fig. 3: Antimicrobial susceptibility pattern of *P. aeruginosa* isolated from patients with respiratory tract infection of various clinical department (n=66)

P. aeruginosa isolates from Pulmonary medicine department were 100% sensitive to Colistin, 100% to Meropenem, 100% to Piperacillin/Tazobactam, 100% sensitive to Ciprofloxacin, 100% to Cefoperazone, 91.3% to Amikacin, and 95.7% to Piperacillin.

P. aeruginosa isolates from Medicine department were 100% sensitive to Colistin, 100% to Meropenem, 100% to Piperacillin/Tazobactam,100% sensitive to Amikacin, 95.7% to Cefoperazone, and 91.3% to Piperacillin.

P. aeruginosa isolates from Casualty department were 100% sensitive to Colistin, 95% to Meropenem, 95% to Piperacillin/Tazobactam, 85% sensitive to Amikacin, 85% to Cefoperazone, and 85% to Piperacillin.

Out of 66 *P. aeruginosa* isolates, 2(3%) were MDR.

Discussions

In present study, prevalence of *P. aeruginosa* in patients with respiratory tract infections was 25.78% whereas Viren Javiya et at study done in Ahmedabad, Gujarat reported 41%.[10] Another study done in India, Iqbal Singh et al study reported 5.05% prevalence in india.[11] which is showed lower prevalence than present study. In Iran by Anvari et al. in 2014 reported 25% isolation from patients with respiratory tract infections.[12]

In present study, *P. aeruginosa* isolates showed highest sensitivity towards Colistin (100%), followed by Meropenem (98.4%), Piperacillin/Tazobactam (98.4%), Ciprofloxacin (98.4%), Ceftazidime (93.8%), Cefoperazone (93.8%), and Amikacin (92.2%). In present study, *P. aeruginosa* isolates showed lowest sensitivity towards Piperacillin (90.6%) and Ticarcillin (87.5%) observed. Abdul samad et al study reported highest sensitivity towards Amikacin (92.96%), followed by Meropenem (91.55%). Abdul samad et al study reported sensitivity to Piperacillin/Tazobactam was 33.80%. Sensitivity to Ceftazidime and Ciprofloxacin was seen to be 71.01% and 66.20% respectively.[13] There is variation in antimicrobial sensitivity pattern of *P. aeruginosa* isolates from respiratory tract observed.

P. aeruginosa isolates from respiratory tract infections of Outdoor patients showed 100% sensitivity towards antipseudomonal drugs whereas isolates from indoor patients were 100% sensitive to Colistin, 98.2% to Meropenem, 98.2% to Piperacillin/Tazobactam, 89.3% to Piperacillin and 85.7% to Ticarcillin observed. *P. aeruginosa* isolates from respiratory tract infections of indoor patients showed higher resistance towards antipseudomonal drugs than isolated from outdoor patients.

All *P. aeruginosa* isolates from pulmonary medicine, Medicine, and Casualty showed higher sensitivity towards Colistin, Meropenem, and Piperacillin/Tazobactam. Amikacin sensitivity (%S) of *P. aeruginosa* isolates from Pulmonary medicine, Medicine, and Casualty department were respectively 91.3%, 100% and 85% observed. Cefoperazone sensitivity (%S) of *P. aeruginosa* isolates from pulmonary medicine, Medicine, and Casualty department were respectively 100%, 95.7% and 85% observed.

The frequency of MDR *Pseudomonas* in present study was 3.03%. Abdul samad et al study reported 39.44% MDR isolation While another study done in Canada by Walkty et al. in 2013 showed isolation of MDR to be 6.5%.[14]

Abdul samad et al study reported highest sensitivity towards Amikacin (92.96%)[13] while present study showed higher sensitivity to Colistin (100%), Meropenem (98.4%), and Piperacillin/Tazobactam (98.4%), Amikacin (92.2%) observed. Appropriate antibiotic administration is necessary for the management of severe *Pseudomonas* infections. There is variation of sensitivity profile of *P. aeruginosa* isolates from indoor/outdoor patients, and clinical departments like Pulmonary/Medicine/Casualty observed, therefore need to be review regularly the antimicrobial susceptibility pattern to have an obvious opinion of clinical effect of different antibiotics.

Source of Funding

None.

Conflict of Interest

None.

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