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ORIGINAL RESEARCH

Assessment Of Prevalence Of P. Aeruginosa And Antibiotic Sensitivity From Respiratory Samples

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ABSTRACT

Background: To assess prevalence of P. aeruginosa and antibiotic sensitivity from respiratory samples.

Materials and Methods: One hundred twenty respiratory samples of both genders were taken for study.

All samples were processed and Pseudomonas aeruginosa was identified by various biochemical test. Antimicrobial susceptibility testing was done by disk diffusion method as per CLSI.

Results: Out of 120 patients, males were 70 (58.3%) and females were 50 (41.7%). Out of 120 respiratory samples, 30 (25%) had P. aeruginosa. Antibiotic sensitivity pattern of Pseudomonas isolates was seen 74% to Ciprofloxacin, 86% to Ofloxacin, 57% to Ceftriaxone, 65% to Ceftazidime, 84% to Amikacin, 85% to Meropenem and 63% to Imipenem. The difference was significant (P< 0.05).

Conclusion: There is high prevalence of Pseudomonas aeruginosa in respiratory samples. Increasing resistance of Pseudomonas aeruginosa needs constant surveillance of antimicrobial resistance trends and administration of appropriate antibiotics.

Keywords: Pseudomonas aeruginosa, respiratory samples, antimicrobial resistance.

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INTRODUCTION

Pseudomonas aeruginosa respiratory infections are causing high morbidity and mortality due to the bacteria's capacity to rapidly develop antibiotic resistance, especially during antibiotic treatment of patients. The organism can carry a variety of putative virulence factors, which are highly controlled by cell-to-cell signalling systems.[1]

Pseudomonas aeruginosa develops resistance against almost all antibiotics by several mechanisms like, multi-drug resistance efflux pumps, resistance genes, biofilm formation, aminoglycoside modifying enzymes and mutations in different chromosomal genes.[2] Furthermore, exposures to broad spectrum antibiotics and patient to patient spread have added to the rapid increase in the isolation of resistant strains. Despite advances in health care and wide variety of antipseudomonal agents, life threatening infections caused by Pseudomonas aeruginosa are still considered as one of the major health problems.[3]

Infections caused by multidrug-resistant (MDR) P. aeruginosa are difficult to treat and can be associated with high mortality especially in patients who are immunocompromised or who present with chronic lung diseases.[4] P. aeruginosa acquires resistance primarily through the

production of plasmid mediated AmpC β-lactamase, different types of extended-spectrum β-lactamases (ESBLs) and metallo-β-lactamases (MBLs).[5] Other potential virulence factors secreted by P. aeruginosa that are important in its pathogenicity include exotoxin A (toxA), which is the most toxic virulence factor detected in this organism.[6] We performed this study to assess prevalence of P. aeruginosa and antibiotic sensitivity from respiratory samples.

MATERIALS & METHODS

One hundred twenty respiratory samples of both genders were taken for study. Ethical clearance was obtained prior to the study from ethical clearance committee. Patients were well informed regarding the study and a valid written consent in vernacular language was obtained.

Demographic data was entered in case history file. All samples were processed and isolates were observed for colony morphology, microscopic examination and relevant biochemical tests. Colony morphology for size, shape and pigmentation on different culture media, colour of colonies on MacConkey agar, gram staining, motility, oxidase test and failure to ferment glucose were used to identify isolates as Pseudomonas species were performed. Pseudomonas aeruginosa was identified also by sensitivity to polymyxin-B. Antimicrobial susceptibility testing was done by disk diffusion method. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

Table I Patients distribution

Total- 120		
Gender	**Male**	**Female**
Number (%)	70 (58.3%)	50 (41.7%)

Out of 120 patients, males were 70 (58.3%) and females were 50 (41.7%) (Table I).

Table II Prevalence of P. aeruginosa

Total	Prevalence	Percentage
120	30	25%

Out of 120 respiratory samples, 30 (25%) had P. aeruginosa (Table II).

Table III Antibiotic sensitivity pattern of Pseudomonas isolates

Antimicrobial agents	Percentage	P value
Ciprofloxacin	74%	0.05
Ofloxacin	86%	
Ceftriaxone	57%	
Ceftazidime	65%	
Amikacin	84%	
Meropenem	85%	
Imipenem	63%	

Antibiotic sensitivity pattern of Pseudomonas isolates was seen 74% to Ciprofloxacin, 86% to Ofloxacin, 57% to Ceftriaxone, 65% to Ceftazidime, 84% to Amikacin, 85% to Meropenem and 63% to Imipenem. The difference was significant (P< 0.05) (Table III).

DISCUSSION

Pseudomonas aeruginosa accounts for nearly 10% of all hospital acquired infections and are considered the fifth most common pathogen among microbes prevailing in hospital environments.[7] This bacterium is frequently isolated as an opportunistic pathogen in recurrent infections of hospitalized and immune-compromised patients.[8] The capability of surviving a variety of environmental conditions makes it a ubiquitous pathogen allowing it to persist on numerous living and non-living surfaces due to minimal nutritional requirements.[9,10] We performed this study to assess prevalence of P. aeruginosa and antibiotic sensitivity from respiratory samples.

Our results showed that out of 120 patients, males were 70 (58.3%) and females were 50 (41.7%). Samad et al[11] determined the prevalence and susceptibility pattern of Pseudomonas aeruginosa and multidrug-resistant (MDR) isolates in patients suffering from respiratory tract infection. Out of 615 sputum samples, 354 (57.56%) were culture positive. Out of these a total of 71 (20.05%) strains of Pseudomonas were isolated, where 54.93% was from males and 45.07% were from females (Mean age was 44.29 ± 22.72). Highest sensitivity was seen to Amikacin (92.86%) followed by Meropenem (91.55%) while lowest sensitivity was seen to Cefoperazone + Sulbactam (16.9%). There were 39.44% MDR strains, out of which 25% were Extensively Drug Resistant (XDR) and 10.71% were Pan Drug Resistant (PDR). In vitro susceptibility of MDR isolates showed highest sensitivity to Amikacin (82.14%) followed by Carbapenems (78.57%). All MDR isolates were resistant to Cefoperazone + Sulbactam. Resistance to Piperacillin + Tazobactam was 96.43%.

Out of 120 respiratory samples, 30 (25%) had P. aeruginosa. Tam et al[12] received a total of 3530 pus samples, out of which 775 (22%) showed positive growth on bacteriological culture. Among the positive cultures, 71 (9.16%) isolates were identified as Pseudomonas aeruginosa, out of which 29 (40.84%) were cultured from pus samples received from out-patient department and 42 (59.16%) from pus samples of in-patient department. About 47 patients (66.19%) were males and 24 patients (33.80%) were females. Most of the patients (50.70%) were aged between 25-45 years, while about 42.25% of the patients were below 25 years and 7.05% were above 45 years. Thirty- seven isolates of Pseudomonas aeruginosa (52.11%) were isolated from wound swabs only, among which 16.21% samples were received from out-patient department including surgical OPD and the rest 35.90% isolates were cultured from wound swabs of in-patient department. The IPD samples included around 20% samples from casualty wards, 8% from medicine wards and the rest (9%) from other units (burn unit etc). Other samples included were 18 aural swabs (25.35%), 8 tracheal aspirates (11.26%), 5 sputum samples (7.04%) and 3 others (4.22%) like bed sores, pleural fluid etc. All the ear swabs were collected from out-patient departments.

Antibiotic sensitivity pattern of Pseudomonas isolates was sensitive 74% to Ciprofloxacin, 86% to Ofloxacin, 57% to Ceftriaxone, 65% to Ceftazidime, 84% to Amikacin, 85% to Meropenem and 63% to Imipenem. Gregson et al[13] investigated the prevalence of Pseudomonas aeruginosa (PA) in patients with complex neuro-disability. One hundred sixty-two patients with a primary diagnosis of neuromuscular disease (NMD) or severe cerebral palsy (CP). Twenty-five (15%) had one or more PA isolate in respiratory samples. There was a significant association between PA in respiratory samples and tracheostomy ($p<0.05$). In 52% samples, multiple pathogens co-existed. There was no significant association between choice of antibiotic and clinical outcome but when antibiotics were changed to specific PA

antibiotics during the course of the illness, all resulted in clinical improvement. Twenty-six episodes involving 8 patients with recurrent admissions involved PA organisms that were resistant to one or more antibiotics.

CONCLUSION

There is high prevalence of Pseudomonas aeruginosa in respiratory samples. Increasing resistance of Pseudomonas aeruginosa need constant surveillance of antimicrobial resistance trends and administration of appropriate antibiotics.

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