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Antibiotic Susceptibility Patterns of Pseudomonas aeruginosa from Various Clinical Samples in Tertiary care centre of north India

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Abstract:
Objectives: *Pseudomonas aeruginosais an opportunistic pathogen and one of the most common causes of nosocomial infections that include surgical wound infections, burns, and urinary tract infections.To find the prevalence and resistance pattern of Pseudomonas aeruginosain different clinical isolates at tertiary care centre.*
Materials and Methods: *Isolates of P. aeruginosa obtained from different clinical samples were subjected to standard culture and biochemical tests for identificationThe antibacterial susceptibility testing was conducted against 11 antibiotics: Piperacillin, PiperacillinTazobactum, Ceftazidime, ceftriaxone, ciprofloxacin, gentamicin, Tobramycin, imipenemCefoperazoneSalbactum and Polymyxin-B. Norfloxacin only in urine isolates.The examination was carried out using agar diffusion method of Kirby-Bauer and following the standards from Clinical and Laboratory Standards Institute (CLSI).*
Results: *Out of 322 Isolates of Pseudomonas aeruginosahighest resistance was shown against Ceftazidime (70.19%) followed by ceftriaxone (69.57%) Resistance was low to combination drugs like cefoparazone +salbactum (30.12%) and Piperacillin + Tazobactum (22.67%). All the isolates showed 100% sensitive to Polymyxin B.**Conclusion:*** *Hence the study underlines the fact that surveillance programmes for prevalence and susceptibility pattern of multidrug resistant organisms are important and helpful in making antibiotic policy.*
Key Word*: Pseudomonas aeruginosa, Prevalence, Antibacterial susceptibility testing, Resistance*

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I. Introduction

Pseudomonas aeruginosa is a gram-negative, bacillus, and non-spore forming bacterium. It is widely distributed in nature including soil, water, and various types of vegetation throughout the world [1,2].

It causes community-acquired and nosocomial infections such as pneumonia, urinary tract infections, and bacteremia. The infections can be particularly important in patients who are immunocompromized, such as neutropenic or cancer patients [3, 4]Nowadays, the rates of morbidity and mortality have been increased because of multidrug-resistant P. aeruginosa strains [5.]

P. aeruginosa has an intrinsic and acquired resistance against many antibiotics. In addition, it can also gain resistance due to abusive or misuse of commonly used antibiotics [6.] The microorganism possesses a natural resistance to antibiotics including aminoglycosides, cephalosporins, fluoroquinolones, and penicillins[7]. This organism is the most common etiological agent of pneumonia, urinary tract infections, and in the bloodstream [8].

As the antibiotic resistance profiles of P. aeruginosa has change in years, prevalence studies must be carried out regularly. The aim of this study was to determine the antibiotic susceptibility of P. aeruginosa from clinical samples and to contribute the application of appropriate empiric therapy.

II. Material and Methods

The present study was conducted in the Department of Microbiology at Muzaffarnagar Medical College ,Muzaffarnagar,over a period from January 2014 toJuly 2015. All 322 isolates of *Pseudomonasaeruginosa*obtained from various clinicalsamples:pus , blood, urine, CSF, ascitic fluid, pleuralfluid etc. received in microbiology laboratory fromIPD &OPD were included in the study. The isolateswere identified as per the standard microbiological procedures[9].Antimicrobial sensitivity testing wasperformed on Mueller-Hinton agar plates withcommercially available disks(Himedia) by KirbyBauer disk diffusion method **Fig. 1**and interpreted as per CLSIguidelines[10]

The results of susceptibility test were divided into susceptible and resistant. The isolateswith intermediate susceptibility were included in resistant category

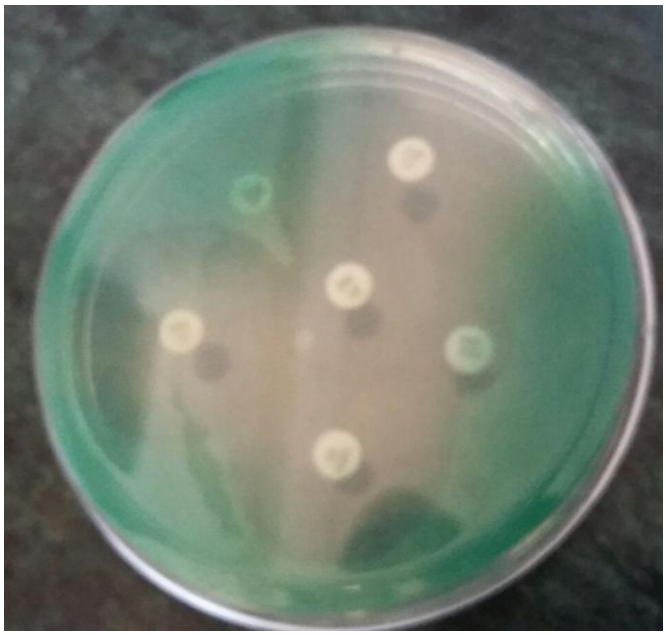


Fig. 1: Antibiotic Sensitivity Testing (Kirby bauer disc diffusion method)

III.Result

In this study we obtained 1738 cultures positive samples, out of this we obtained 322 (18.25%) samples positive for *Pseudomonas aeruginosa*.Out of 322 *pseudomonas aeruginosa* samples 69.25% were of male patients and 30.75% were from female patientsChart- 1. Out of 322 *pseudomonas aeruginosa* positive isolates obtained, maximum number of *pseudomonas aeruginosa* isolated were from In Patient Department (IPD) 265 (82%) and only 57 (18%) samples where of OPD patientsChart- 2. we isolated *P.aeruginosa* from different type of samples ,out of which maximum number were of pus and swabs 138(42.86%) followed by Endotracheal aspirates 52 (16.15%) , urine 51(15.84%), sputum 33(10.25%) ,drain tip 21 (6.52%),blood 15 (4.66%), high vaginal swabs 5 (1.55%) cerebrospinal fluid 4 (1.24%) & tissue 3 (0.93%) .Chart-3

Out of 322 total samples of *pseudomonas aeruginosa* maximum sample received from surgery 107 (33.23%) followed by medicine 70 (21.74%) ,orthopaedics 42 (13.04%),ICU 38 (11.80%), obs . &gynae 24 (7.45%), chest & TB 19 (5.90%), paediatrics& PICU 11(3.42%) & ENT 11(3.42%) respectively. Table4

Chart- 1.Sex wise distribution of *pseudomonas aeruginosa*positive isolates:

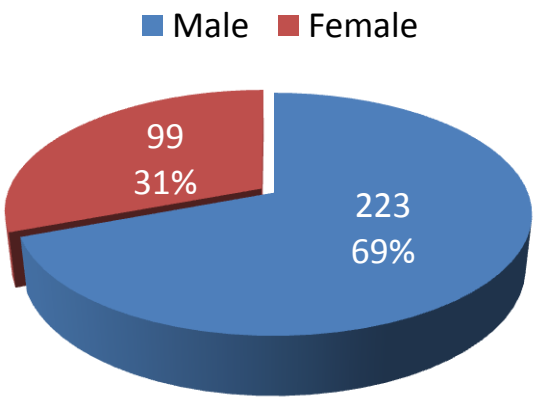


Chart- 2 Source wise distribution of *pseudomonas aeruginosa*producers

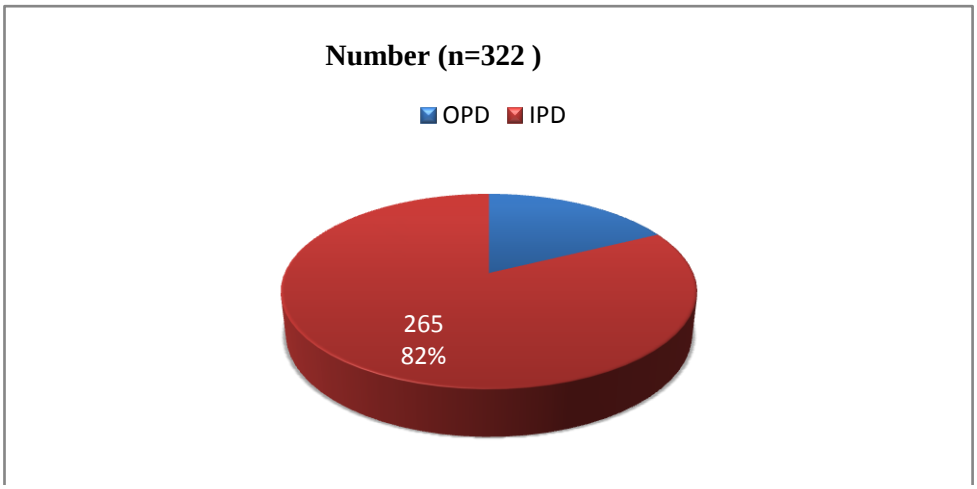
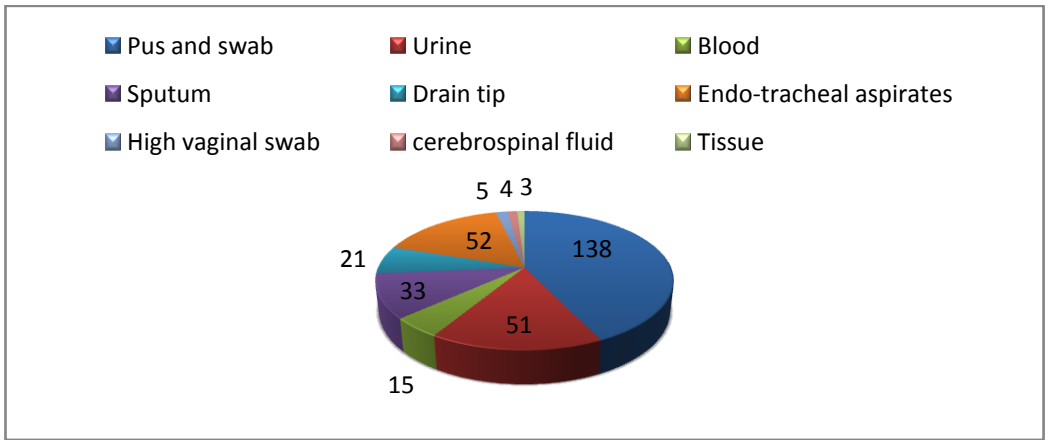


Chart No.-3 Percentage distribution of *pseudomonas aeruginosa* producers in various clinical samples:



All *Pseudomonas aeruginosa* isolates showed highest resistance to Ceftazidime 226 (70.19%) followed by ceftriaxone 224 (69.57%) ,piperacillin 216 (67.08%), ciprofloxacin 204 (63.35%), Gentamicin 198 (61.49%) and tobramycin 154 (47.83%). Resistance was low to combination drugs like cefoparazone +salbactum 97 (30.12%) andpiperacillin + Tazobactum 73(22.67%). These strains also showed resistance to carbapenems like Imipenem 57 (17.70 %), which were found to be the precious weapon against *Pseudomonas aeruginosa* infections and this is an alarming sign. All the isolates showed 100% sensitive to Polymyxin B. [Table4]P.*aeruginosa* isolates from urine samples showed (41.18%%) resistance to Norfloxacin

Table-4. Drug resistance pattern of *pseudomonas aeruginosa* (n=322):

S.No.	Drug	No. of Resistance sample	Percentage
1	Piperacillin (75µg),	**2**16	67.08
2	Piperacillin-Tazobactam(100/10 µg)	**73**	22.67
3	Ceftazidime (30 µg)	**226**	70.19
4	Ceftriaxone (30 µg)	**224**	69.57
5	Imipenem (10 µg)	**57**	17.70
6	Gentamicin(10 µg),	**198**	61.49
7	Norfloxacin (10 µg),	**21/52**	41.18
8	Ciprofloxacin (5 µg),	**204**	63.35
9	Cefaperazone-Salbactum(75/10 µg)	**97**	30.12
10	Tobramycin (10 µg),	**154**	47.83
11	Polymyxin B (300U)	**00**	0.00

IV. Discussion

Prevalence of *P.aeruginosa* in our study was found to be 18.52% which was similar to other studies like study done in Delhi in byBehera et al.[11] (22%),in Ahmedabad by Rajat et al.[12]A slight male predominance was found in our study, out of 322P.aeruginosa isolates, 223 (69.25%) isolates were obtained from male patients and 99 (30.74%) were obtained from female patients. This is comparable with study of Javiya et al.[13], and Rashid et al.(2007)[14]. In contrast Chander et al.[15]reported female predominance. In the present study, the rate of isolation of *P. aeruginosa* was higher in indoor patients [80.30%] as compared to that in the outdoor patients [17.70 %]. A similar observation was made by ShampaAnupurba et al[16]and Prashant et al.[17] They expressed their view that the duration of the hospital stay was directly proportional to a higher prevalence of the infection Pus (42.85%) was the main source of P.*aeruginosa* followed by Endotraceal aspirate (16.15%), urine (15.83%),Similar results had been obtained in different studies in India reported by Mohanasoundaram[18] and Arora etal.[19]In our study resistance to third generationcephalosporinswas very high similar rate was observed by Srinivas et al[20]and Vasundhara*et al.*[21] on other handLower rates of resistance were observed by Sadhana et al[22] 33% (2008) and Rajat et al.[12] We found that 63 % isolates were sensitive to Ciprofloxacin in our study, similar to other studies by Sharma et al.[23] and Javiya etal.[13]The Piperacillin/Tazobactam andCefoperazone/Sulbactumcombination was very effective which is comparable to that of Javiya et al.[13] and Kumar et al.[24]Resistance toImipenem was seen in 18% of isolates in our study, Agarwal et al [25]reported 8.05% , Javiya et al[13]21%.Madhu Sharma et al[3] reported high drug resistance i.e. 37.9 % to Imipenem in their studyPolymyxin B showed no resistance ,all isolates were sensitive to it.Result was similar to other studies done by Sunil et al[4].

V. Conclusion

The present study shows that, *P. aeruginosa* is a gigantic problem in the hospital setup. *P. aeruginosa* infections are likely to affect critically ill patients who require prolonged hospitalization. Infections with *P. aeruginosa* are also associated with adverse clinical outcome. Judicial use of antibiotics should be emphasized in order to prevent the spread of drug resistance in *P. aeruginosa* infections. Regular antimicrobial susceptibility monitoring is essential for local,reginal and national level isolates. To prevent the spread of the resistant bacteria, it is critically important to have strict antibiotic policies and infection control procedures need to be implemented.This study would help to limit and prevent drug resistance.

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