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ANTIMICROBIAL SUSCEPTIBILITY PATTERNS OF *PSEUDOMONAS AERUGINOSA* AT TERTIARY CARE HOSPITAL IN CENTRAL INDIA

Microbiology

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ABSTRACT

Introduction :- *Pseudomonas aeruginosa* is one of the most prevalent bacterial species, especially in the adult population. It is an ubiquitous and versatile human opportunistic pathogen and has implications on morbidity, mortality and healthcare costs both in hospitals and in the community.[2]

Objective :-Current studies was antimicrobial sensitivity profiles of P.aeruginosa are essential to find out the susceptibilities of this pathogen against commonly prescribed antibiotics in any health care facility.

Methods :- 150 strains of P.aeruginosa were isolated from different clinical specimens and fully characterized by standard bacteriological procedures. Antimicrobial susceptibility patterns of each isolate was carried out by the Kirby- Bauer disk diffusion method as per guidelines of CLSI.

Results: Majority of isolates of P.aeruginosa 102 (68.00%) were obtained from specimens of pus followed by wound swab and urine. The isolated pathogens showed 100% sensitive to Polymyxin –B and Colistin. Least sensitive to ciprofloxacin (12.5%).

Conclusion: The results confirmed the occurrence of drug resistant strains of P.aeruginosa. The encouraging finding was its sensitivity to Polymyxin-B and Colistin as an effective antibiotic for the treatment. It therefore calls for a very judicious, rational treatment regimens prescription by the physicians to limit the further spread of antimicrobial resistance among the P.aeruginosa strains.

KEYWORDS

Pseudomonas aeruginosa, antimicrobial sensitivity, opportunistic pathogen.

Introduction

Pseudomonas aeruginosa is one of the most prevalent bacterial species, especially in the adult population. It is well known for its genetic plasticity and capacity to accumulate resistance mechanisms, including acquisition of foreign genetic material.[1] Antimicrobial agents have been the only easily and widely used therapeutic option available to counter the infections caused by diverse microbial agents. *Pseudomonas aeruginosa* is an ubiquitous and versatile human opportunistic pathogen and has implications on morbidity, mortality and healthcare costs both in hospitals and in the community.[2] Increase in the frequency of multi-drug resistant (MDR) strains of *P.aeruginosa* has severely limited the availability of therapeutic options.[3] Current studies was antimicrobial sensitivity profiles of *P.aeruginosa* are essential to find out the susceptibilities of this pathogen against commonly prescribed antibiotics in any health care facility. This would help the physicians to optimize the current therapeutic treatment options. So this study was therefore designed to find out the current antimicrobial susceptibility patterns of *P.aeruginosa.*

MATERIALAND METHOD

The present prospective cross-sectional study was conducted in the Department of Microbiology, Jawaharlal Nehru Medical College and Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe), Wardha, for the period of one year. All the admitted patients from medical, surgical wards and ICU, with various infectious with *Pseudomonas aeruginosa* as isolates were included in the study. The samples like pus swab, wound swab, blood sample, sputum, endotracheal secretion, ascetic fluid, pleural fluid, urine and catheter tip were collected. Total no. of 150 isolates from various patients was included in the present study. All collected were inoculated on routine culture media like Nutrient agar, MacConkey's agar and blood agar. A battery of tests were performed that included Gram's staining, colony morphology, motility tests, sugar fermentation tests and biochemical tests such as oxidase test, urease and Phenyl puruvic acid test and IMViC (indole, methyl red, Voges-Proskauer and citrate) tests for the identification of *pseudomonas* species.

Susceptibility test: *Pseudomonas aeruginosa* strains were subjected to antimicrobial susceptibility test by modified Kirby-Bauer disk diffusion method as per CLSI guidelines. A panel of anti-pseudomonal antimicrobials of standard strengths as follows: Gentamicin 10 µg/disc, Amikacin 30 µg/disc, Ciprofloxacin 5 µg/disc, Ceftazidime 30 µg/disc, Netillin 30µg/disc, Colistin 10µg/disc, Piperacillin-tazobactum 100/10 µg/disc, Nitrofurantion 300 µg/disc, Tetracycline 30µg/disc, Imipenem 10 mcg, Polymyxin-B 300 units/disc (Hi Media Laboratories Pvt. Ltd., Mumbai, India). *Pseudomonas aeruginosa ATCC* 27853 was used as control strain.

RESULTS:-

All these 150 patients included 92 males (61.33%) and 58 females (38.67%). So M/F ratio observed in the present study was **1.6:1**. As shown in table no. 1.

Table No.1 Showing Age and sex distribution of the patients (n=150)

Age group	Male	Female
7 days-10 Years	16 (17.39%)	12 (20.69%)
11- 20 Years	04 (4.35%)	07 (12.07%)
21-40 Years	27 (29.35%)	20 (34.48%)
41-60 Years	25 (27.17%)	12 (20.69%)
61- 80 Years	20 (21.74%)	07 (12.07%)
Total (n=150)	92 (61.33%)	58 (38.67%)

Amongst 92 males patients, Maximum no. of males patients 27 (29. 35%) were in the age group of 21 to 40 Years.

Amongst 58 females patients, Maximum no. of females patients 20 (34.48%) were in the age group of 21 to 40 Years.

Table no. 2 Showing Specimens collected from patients with infections (n=150)

S.No.	Type of Sample	No. of Samples (n=150)
1	Pus	64 (42.67%)
2	Sputum	27 (18%)
3	Urine	23 (15.33%)
4	Wound Swabs	22 (14.67%)
5	Blood	14 (9.33%)
Total (n= 150)		150 (100%)

Table no. 2 showing that in 150 samples 64 (42.67%) were pus followed by sputum 27 (18%), urine 23 (15.33%), wound swabs 22 (14.67%) and blood 14 (9.33%).

Maximum samples collected were pus samples 64 (42.67%).
Amongst 150 samples collected the isolated *Pseudomonas aeruginosa* from various specimens were studied.

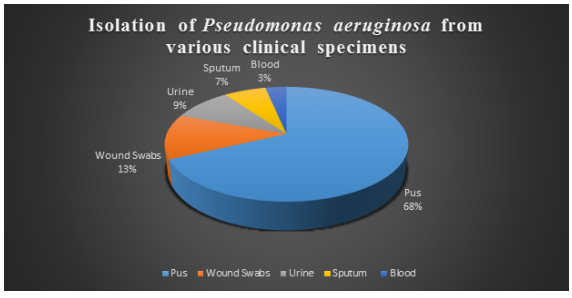
Table no. 3 Showing Isolated Pseudomonas aeruginosa from various specimens (n=150)

S.No.	Type of Sample	No. of Samples (n=150)
1	Pus	102 (68.00%)
2	Wound Swabs	19 (12.67%)
3	Urine	14 (09.33%)
4	Sputum	10 (06.67%)
5	Blood	05 (03.33%)
Total (n= 150)		150 (100%)

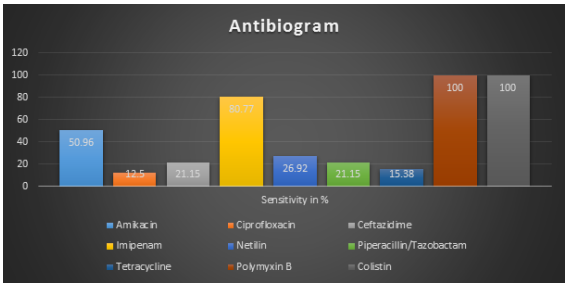
Table no. 3 and Graph no. 01 showing that *Pseudomonas aeruginosa* were most commonly isolated organisms in pus 102 samples (68.00%), wound swab 19 samples (12.67%), urine 14 samples (09.33%), sputum 10 samples (06.67%), and blood 05 samples (03.33%).

Hence it was observed that maximum no. of *Pseudomonas aeruginosa* were isolated in pus 102 samples (68.00%).

Graph 01 :- Isolation of *Pseudomonas aeruginosa* from various clinical specimens



Graph 02 :- Antibiotic Sensitivity pattern of isolated *Pseudomonas aeruginosa* from various specimens (n=150)



Graph no. 02 showing that antimicrobial sensitivity pattern of Pseudomonas aeruginosa here the Colistin and Polymyxin B were 100% sensitive followed by Imipenam (80.77%) and least sensitive to Ciprofloxacin (12.5%).

DISCUSSION

In this study, a total of 150 isolates of *P.aeruginosa* were isolated and identified from various clinical sources, from the hospitalized patients and their antimicrobial susceptibility patterns were determined. Amongst 150 patients studied 92 (61.33%) were males and 58 (38.67%) were females and male to female ratio was 1.6:1. Siau *et al* (1999)[4] in their prospective study of 18 hospitalized patients reported Male/Female ratio 1.5:1, Prashanth *et al* (2006)[5] in a study of 43 hospitalized patients reported Male/Female ratio 1.4:1 is comparable to the studies.

In the present study maximum no. of male 27 (29.35%) were in the age group of 21 to 40 Years and females patients 20 (34.48%) were in the age group of 21 to 40 Years. It is comparable to the Lakum S *et al* (2016)[6] reported 32% in the age group 21 to 40 years. Shobha *et al* (2011)[7] reported age group of 25 to 35 years (38.3%).

In present studied maximum no. of *Pseudomonas aeruginosa* were isolated from pus samples 102 (68%). It is comparable with Chander *et al* (2013)[8] were reported in 40 (27.60%) pus/wound samples out of 145 samples. Bose *et al* (2013)[9] reported in their study of 320 samples isolated in 84 pus samples (26.25%), Lakum S *et al* (2016)[6] also report maximum no of *Pseudomonas aeruginosa* in pus sample 49%.

Pseudomonas aeruginosa were maximum sensitive to polymxin-B and colistin respectively (100%) followed by imipenam (80.77%) and amikacin (50.96%) and lest sensitive to ciprofloxacin (12.5%) followed by tetracycline (15.38%), ceftazidime and piperacillin/ tazobactam respectively (21.15%) and netillin (26.92%). Rahbar *et al.* (2010)[10] reported *Pseudomonas aeruginosa* was 78.9% sensitive to imipenem, 61.5% sensitive to amikacin, 65.5% sensitive to ceftazidime and 68.5% Sensitive to ciprofloxacin. Bose *et al* (2013)[9] reported *Pseudomonas aeruginosa* was 100% sensitive to polymyxin-B, colistin, 44.79% sensitive to imipenem and 21.87% sensitive to amikacin, 5.72% sensitive to ceftazidime and 10.93% sensitive to ciprofloxacin.

In the present study *Pseudomonas aeruginosa* were maximum sensitive to polymxin-B and colistin respectively (100%) followed by imipenam (80.77%).This finding correlates with studied of Rahbar *et al.* (2010)[10] reported *Pseudomonas aeruginosa* was 78.9% sensitive to imipenem and Bose *et al* (2013)[9] reported *Pseudomonas aeruginosa* was 100% sensitive to polymyxin-B, colistin.

CONCLUSION

Results of the present study clearly demonstrated the occurrence of resistance to various antipseudomonal agents among the *P. aeruginosa* isolates. Polymyxin-B and colistin was the only anti-pseudomonal drug against which all isolates of *P. aeruginosa* were fully sensitive. We suggest a more restricted and a more rational use of this drug in this hospital setting. In addition, regular antimicrobial surveillance is essential for monitoring of the resistance patterns.

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