International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 11; Issue 07 (B); July 2022; Page No.1267-1269
DOI: http://dx.doi.org/10.24327/ijcar.2022.1269.0282

Research Article

IDENTIFICATION AND ANTIMICROBIAL RESISTANCE IN *PSEUDOMONAS AERUGINOSA*

Sheetal Sharma[1] and Vipin Kathuria[2]

[1]Department of Microbiology, GMC Rajouri
[2]Department of Pathology, AFSMS & RC Faridabad

A R T I C L E I N F O

Article History:

Received 4th April, 2022
Received in revised form 25th May, 2022
Accepted 18th June, 2022
Published online 28th July, 2022

Keywords:

Pseudomonas aeruginosa, Pus samples, Antimicrobial resistance.

A B S T R A C T

Introduction: *Pseudomonas aeruginosa is* a gram negative bacterium that continues to be a major cause of opportunistic nosocomial infections, causing around 9-10% of hospital infections. It is hard to treat because of intrinsic resistance of the species and its resistance to multiple groups of antibiotics including β-lactams, aminoglycosides and fluoroquinolones. This study was undertaken to determine the prevalence of *P. aeruginosa* and its susceptibility pattern isolated from pus samples.

Material and Methods: In this study a total of 57 *P.aeruginosa* isolates were obtained out of 254 pus samples between a period of one year(Feb 2015 to Jan 2016). The isolates were selected on the basis of their growth characteristics on Blood agar, MacConkey agar and Nutrient agar medium. Colonies were subjected to battery of biochemical tests to identify species. Antimicrobial susceptibility testing of all confirmed *P. aeruginosa* isolates was performed by Kirby –Bauer disc diffusion method and results were interpreted according to CLSIs guidelines.

Results: The prevalence of this pathogen was 22.4% and most of the isolates were found to be highly sensitive to Colistin (95.4%), Polymyxin B (95%), Levofloxacin (83.3%), Imipenam (70%), Netilmycin (66%) and Piperacillin+ Tazobactum (64.5%). However, they showed resistance towards Ofloxacin (65%), Piperacillin (64%), Ceftazidime (56.3%), Cefoprazone (58%), Cefpime (55%), Aztreonam (53%), Cefaprazone + sulbactum (46%) and Gentamicin (45%). Fourteen (24%). *P. aeruginosa* isolates were Multidrug resistant (MDR) as they were totally resistant to Cephalosporins, aminoglycosides, fluoroquinolones and carbapenems.

Conclusion: High prevalence of *P. aeruginosa* as an opportunistic pathogen has been on the increase with resistance to antimicrobial agents and thus becoming a threat.

INTRODUCTION

Pseudomonas aeruginosa is one of the most common gram-negative microorganisms identified in the clinical specimens of hospital admitted patients. It is a commensal of human microform in healthy people and is frequently isolated as an opportunistic pathogen in recurrent infections of hospitalized patients.[1] It can infect almost any external site or organ, and therefore, can be isolated from various body fluids such as sputum, urine, wounds, eye or ear swabs and from blood.[2] This organism is often hard to treat because of both the intrinsic resistance and acquired resistance i.e. mutations in chromosomal genes, to multiple groups of antimicrobial agents, including β-lactams, aminoglycosides and fluoroquinolones.[3] An increased resistance of *P.aeruginosa* to β-lactam drugs is because of production of metallo-beta-lactamases i.e. enzymes that effciently hydrolyze all β-lactams.[4] The implication of these emerging resistance is in the successful treatment of infections caused by this bacteria cannot be overemphasized.[5] It causes infections in hospitalized patients particularly in burns, orthopaedic related infections, respiratory diseases, catheterized and even immunosuppressed patients. Inherent resistance to many antimicrobial agents, contributes substantially to wound related morbidity and mortality worldwide.[6] Keeping in view the occurrence of *Pseudomonas* spp. in different habitat, its pathology and resistance to antibiotics, this study was aimed to isolate *P.aeruginosa* from pus samples and to determine its antibiotic susceptibility profile.

******Corresponding author:* **Sheetal Sharma**
Department of Microbiology, GMC Rajouri

MATERIAL AND METHODS

The present study was conducted in the Microbiology Laboratory, Nuvjeeevan Nursing Home Rajouri. All pus samples received were processed for isolation and identification of *P. aeruginosa* was made according to the Standard microbiological techniques. Blood agar, MacConkey agar and Nutrient agar were used as growth media for the culturing of samples.[7] The plates were then incubated at 37°C

for 24 hours to get the growth and were then processed further for identification using standard procedures. *P.aeruginosa* was identified by Gram staining, motility test and biochemical tests like- oxidase test, O/F test, and growth at 420 C.[8] Antibiotic sensitivity pattern of *P. aeruginosa* isolates to Gentamicin (10 mcg), Ciprofloxacin (5 mcg), Cefotaxime (30 mcg), Ceftazidime (30 mcg), Amikacin (30 mcg), Imipenem (10 mcg), Meropenem (10 mcg), Cefoperazone/ Sulbactum (75/30 mcg), Cefpirome (30 mcg), Aztreonam (50 mcg), Ceftazidime / Clavulanic acid (30/10 mcg), Piperacillin/Tazobactum (100/10 mcg), Piperacillin (100 mcg), Polymyxin (300 u), Colistin (10mcg) was investigated by Kirby-Bauer method on Mueller Hinton Agar (MHA). The fnal bacterium inoculation conc. was approx 108 cfu/ml that was equal to 0.5 McFarland. MHA plates were incubated overnight at 370, and the diameter of each inhibition zone was measured with special scale supplied by Himedia.

RESULTS

A total of 57 *P. aeruginosa* strains were isolated from 254 pus samples received. Prevalence of *P.aeruginosa* was 22.41%. The highest percentage of isolates was from males (71.9%) and of age group 41-50,61-70 (21%) years each (Table-1). Most of the isolates were found to be highly sensitive to Colistin (95.4%), Polymyxin B (95%), Levofloxacin (83.3%), Imipenam (70%), Netilmicin (66%) and Piperacillin + Tazobactum (64.5%). However, they showed resistance towards Ofloxacin (65%), Piperacillin (64%), Ceftazidime (56.3%), Cefoprazone (58%), Cefpime (55%), Aztreonam (53%), Cefaprazone + sulbactum (46%) and Gentamicin (45%) (Table-2). As the bacterial strains that show resistance to three or more categories of antibiotics are defined as multidrug resistanct (MDR) strains, MDR strains of *P.aeruginosa* isolated in this study were 24%. Fourteen *P. aeruginosa* isolates were totally resistant to Cephalosporins, Aminogycoside, Fluoroquinolones and Carbapenems, showing Multidrug resistance (MDR).

Table 1 Age wise distribution of Pseudomonas aeruginosa isolates

Age group(in years)	No. of isolates (N=57)	Percentage %
<20	07	12.3
21 – 30	11	19.3
31 – 40	05	8.8
41 – 50	12	21.0
51 – 60	04	7.0
61 – 70	12	21.0
> 70	06	10.6

Table 2 Antimicrobial sensitivity pattern of Pseudomonas aeruginosa

Antibiotics	Sensitivity (%)	Resistant (%)
Ceftazidime	43.7	56.3
Cefperazone	42.0	58.0
Cefipime	45.0	55.0
Ceftazidime+clavulinic acid	34.0	66.0
Piperacillin+Tazobactum	64.5	33.5
Cefperazone+sulbactum	54.0	46.0
Piperacillin	36.0	64.0
Azetreonam	47.0	53.0
Imipenem	70.0	30.0
Meropenem	50.0	50.0
Gentamicin	55.0	45.0
Amikacin	58.0	42.0
Netilmicin	66.0	34.0
Polymyxin B	95.5	5.0
Colistin	95.4	4.6
Ciprofloxacin	59.0	41.0
Ofloxacin	35.0	65.0
Levofloxacin	83.3	16.7

DISCUSSION

P.aeruginosa presents a serious therapeutic challenge for treatment of both community acquired and nosocomial infections. Infections caused by *P.aeruginosa* are notoriously diffcult to treat due to its intrinsic ability to resist many classes of antibiotics as well as its ability to acquire resistance. Our study measures the rate of isolation of *P.aeruginosa* (22.44%) as which is quite similar to previous studies as by Tadvi et al.[9] (22.67%), Viren et al10 (26.79%), and Ruhil et al11(27.70%). The occurrence of *P.aeruginosa* is found to be higher in males, inpatients in age group >60,41 years and in surgery department, which is same as reported by Viren et. al[10], Ali Hussein et al12, Shampa et al13 and Rakesh et al.14 Most of isolates were found to be highly sensitive to Colistin (95.4%), Polymyxin B (95%), Levofloxacin (83.3%), Imipenem (70%), Netilmicin (66%) and Piperacillin + Tazobactum (64.5%), Sensitivity pattern of *P.aeruginosa* nearly coincides with that of Viren et al., Tadvi et al9., Ruhil et al.[11], and Aggarwal et al.[14] *P.aeruginosa* showed resistance towards Ofloxacin (65%), Piperacillin (64%), Ceftazidime (56.3%), Cefoprazone (58%), Cefpime (55%), Aztreonam (53%), Cefaprazone + sulbactum (46%) and Gentamycin (45%), which was comparable with previous studies done in India as by Arora et al.16, Jamshaid et al [7] and Bhatt et al.[17] In present study prevalence of MDR *P.aeruginosa* was 24.56% which is very much close to the study by Chander et al[18] (20.69%) and Shampa et al.[13] (18.00%).

CONCLUSION

It is evident from the study that nowadays *P.aeruginosa* is becoming resistant to cephalosporins, aminoglycosides and even beta lactam (BL) –beta lactamase inhibitor (BLI) combinations. To prevent the spread of the resistant bacteria it is critically important to have strict antibiotic policies. It is desirable that the antibiotic susceptibility pattern of bacterial pathogens like *P.aeruginosa* in specialized clinical units should be continuously monitored so as to minimize the resistance to in use routine antibiotics.

References

1. Rashid A, Chowdhury A, Rehman SH, Begum SA, Muazzam N. Infections by Pseudomonas aeruginosa and Antibiotic Resistance Pattern of the Isolates from Dhaka Medical College Hospital. Bangladesh J. Med. Microbial. 2007;1:48-51.
2. Anjum F, Mir A. Susceptibility Pattern of Pseudomonas aeruginosa against various Antibiotics. Afri JMicrobiol. 2010;4:1005-1012.
3. Henrichfreise B, Wiegand I, Pfster W, Wiedemann B. Resistance Mechanisms of Multiresistant Pseudomonas aeruginosa Strains from Germany and Correlation with Hypermutation. Antimicrob agents chemoth. 2007;51: 4062-4070.
4. Kaleem F, Usman J, Hassan A, Khan A. Frequency and susceptibility pattern of metallo-beta-lactamase producers in a hospital in Pakistan. J Infect Dev Ctries. 2010;4:810-813.
5. Amadi E. Uzoaru P. Orji I. Nwaziri A. and Iroha I. Antibiotic resistance in clinical isolates of Pseudomonas

aeruginosa in Enugu and Abakaliki, Nigeria. The Internat J Infec Dis. 2009;7:23-30.
6. Prakash HR, Belodu R, Karangate N, Sonth S, Anitha MR, Vijayanath V. Antimicrobial susceptibility pattern of Pseudomonas aeruginosa strains isolated from clinical sources. J Pharma Biomed Sci. 2012;14:1-4.
7. Jamshaid S, Afsheen Z, Hussain M, Ali G, Ishaq M, Ullah S et al. Frequency and susceptibility pattern of Pseudomonas aeruginosa in pus samples.KJMS. 2013;6:155-156.
8. Srinivas B, lalitha devi D, Narasinga Rao B. A prospective study of Pseudomonas aeruginosa and its antibiogram in a teaching hospital of Rural setup. Journal of Pharmaceutical and Biomedical sciences. 2012;22:23-29.
9. Tadvi J, Javadekar TB, Bhavsar R, Garala N. Prevalence and antibiogram of Pseudomonas aeruginosa at S.S.G. Hospital, Baroda, Gujarat, India. J Res Med Den Sci. 2015; 3:204-207.
10. Javiya VA, Ghatak SB, Patel KR, Patel JA. Antibiotic susceptibility patterns of Pseudomonas aeruginosa at a tertiary care hospital in Gujarat, India. Indian J Pharmacol. 2008;40:230-4.
11. Ruhil K, Arora B, Adlakha H. Pseudomonas aeruginosa isolation of post-operative wound in a referral hospital in Haryana, India. J infect Dis Antimicrob Agents. 2009;26:43-48.
12. Al-Marzoqi1 A.H and Al Taee Z.M. Pseudomonas aeruginosa: Antibiotic resistance pattern to different isolates in Al-Hillah city, Iraq. Journal of Natural Sciences Research. 2013;3:23-30.
13. Anupurba, S., Battacharjee, A., Garg, A., Ranjansen, M. The antimicrobial susceptibility of Psuedomonas aeruginosa isolated from wound infections. Indian J. Dermatol. 2006;51:286 288.
14. Rakesh R.M,Ninama G. L., Mistry K., Parmar R, Patel K, Vegad M M. Antibiotic resistance pattern in Pseudomonas aeruginosa species isolated at a tertiary careHospital, Ahmadabad. National Journal Of Medical Research. 2012;2:156-58.
15. Agarwal G, Kapil A, Kabra S K, Das B K, Dwivedi S N. Characterization of Pseudomonas aeruginosa isolated from chronically infected children with cystic fibrosis in India. BMC Micrbigy. 2005;5:43.
16. Arora D, Jindal N, Kumar R, Romit. Emerging antibiotic resistance in Pseudomonas -A challenge.Int J Pharm PharmSci. 2011;3:82-84.
17. Bhatt P, Rathi KR, Hazra S, Sharma A, Shete V. Prevalence of multidrug resistant Pseudomonas aeruginosa infection in burn patients at a tertiary care centre. Indian J Burns. 2015; 23:56-59.
18. ChanderA, Shahid R M. Antimicrobial susceptibility patterns of Pseudomonas aeruginosa clinical isolates at a tertiary care hospital in Kathmandu, Nepal,Asian/ Pharm Clin Res. 2013;6:235-238

How to cite this article:

Sheetal Sharma and Vipin Kathuria (2022) 'Identification and Antimicrobial Resistance In Pseudomonas Aeruginosa', *International Journal of Current Advanced Research,* 11(07), pp. 1267-1269. DOI: http://dx.doi.org/10.24327/ijcar.2022.1269.0282

****