Journal of Advances in Microbiology

21(5): 45-49, 2021; Article no.JAMB.68494
ISSN: 2456-7116

Prevalence of Extended-Spectrum β-Lactamase and Antimicrobial Susceptibility Pattern of Clinical Isolates of Pseudomonas in Tertiary Care Centre of Kutch

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Authors' contributions

This work was carried out in collaboration between both authors. Author KK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author DS managed the analyses of the study. Author KK managed the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMB/2021/v21i530350
Editor(s):
(1) Dr. C. Graciela Castro Escarpulli, Instituto Politecnico Nacional, Mexico.
Reviewers:
(1) Muhammad Akram, Beijing Institute of Technology, China.
(2) Mbehang Nguema Pierre Philippe, nstitut de Recherche en Écologie Tropicale (IRET), Gabon.
Complete Peer review History: http://www.sdiarticle4.com/review-history/68494

Original Research Article

Received 20 March 2021
Accepted 24 May 2021
Published 02 June 2021

ABSTRACT

Aim: The current research was performed with an aim to discover the prevalence of ESBL producing *P. aeruginosa* and also to provide as a direct for doctors administration subjects by executing suitable infection control events as well as inventing an efficient antibiotic policy.
Materials and Methods: The current research was performed in the Department of Microbiology at Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat over a period for one year. All 250 isolates of *Pseudomonas aeruginosa* acquired from different clinical samples established in microbiology laboratory from IPD & OPD were incorporated in the research. Different clinical specimens established in our laboratory were coursed and *Pseudomonas aeruginosa* was recognized as apiece normal microbiological method. All isolates were subjected for ESBL screening test. Antimicrobial susceptibility test was performed by Kirby.
Results: Highest samples established from middle age group (30- 50). Out of 250 isolates, 177 (70.7%) isolates of *Pseudomonas aeruginosa* demonstrated zone of inhibition≤ 22 mm for

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Ceftazidime. All ESBL positive *Pseudomonas aeruginosa* isolates demonstrated elevated confrontation to ciprofloxacin 43 (91.04%), Gentamicin 34 (72.3%) and tobramycin 33 (70.21%).
Conclusion: The majority of isolates were from hospitalized subjects which point out additional probability of their nosocomial predominance.

Keywords: Antimicrobials; cephalosporins; ciprofloxacin; Pseudomonas aeruginosa.

1. INTRODUCTION

Confrontation to antimicrobials is frequent and has augmented over the years amid *Pseudomonas aeruginosa* (*P. aeruginosa*) and *Acinetobacter baumannii* (*A. baumannii*) as a amount of strains are now resistant almost to all usually ustilized antibiotics [1]. Most *P. aeruginosa* infections take place in hospitalized patients, mainly those who have neutropenia or who are harmed. HIV-infected subjects, predominantly those in higher stages and subject with cystic fibrosis are at danger of community-acquired *P. aeruginosa* infections. Pseudomonas infections can expand in numerous anatomic sites, with skin, subcutaneous tissue, bone, ears, eyes, urinary tract, lungs, and heart valves.

According to Obritsch et al. [2], Pseudomonas is in the 3rd rank to grounds UTIs and dermatitis, otitis, soft tissue, bone, and joint infections are too frequently origins by these species [3] Researches performed on HIV-infected subjects accounted a progressive augment of gram-negative bacilli, with Pseudomonas spp [1-4]. With a mixture of mechanisms of resistance, ß-lactamase creation is the mainly significant, resistance mechanism amid *P. aeruginosa*. ESBLs go frequently to class A of the Ambler classification scheme and group 2 be as per Bush-Jacoby-Medeiros functional scheme [5,6]. ESBLs in *P. aeruginosa* comprises the, SHV, TEM, PER, VEB and IBS/GES types 4 premature and precise recognition of ESBL producing *P. aeruginosa* is significant for best possible management of seriously ill and hospitalized patients and also, to manage the extend of confrontation [3,4,7].

The present study was performed with an aim to locate the prevalence of ESBL producing *P. aeruginosa* and also to provide as a channel for doctors managing subjects by executing appropriate infection control events as well as create an effectual antibiotic strategy.

2. MATERIALS AND METHODS

The present study was performed in the Department of Microbiology at Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat over a period for one year. All 250 isolates of *Pseudomonas aeruginosa* acquired from different clinical samples established in microbiology laboratory from IPD & OPD were incorporated in the study. These incorporated urine, pus, blood, ear swabs, high vaginal swabs, sputum, endotracheal secretions, tracheal aspirate, and various body fuids. Antimicrobial sensitivity testing was executed on Mueller-Hinton agar plates with commercially accessible disks by Kirby Bauer disk diffusion method and take as per CLSI guidelines [8]. The findings of susceptibility test were separated into susceptible and resistant. The isolates with intermediate susceptibility were included in resistant category. Isolates resistant to cefazidime and/or cefepime were tested for ESBL making by disc potentiation test. A disc of cefazidime (30 μg/10 μg) and cefazidime clavulanic acid (30 μg /10 μg) was placed 20 mm apart, centre to centre on Mueller Hinton agar plate, and was incubated overnight at 37◦C. A zone diference greater than or equal to 5 mm around cefazidime and cefazidime + clavulanic acid was interpreted as ESBL positive isolate [9].

Isolates were measured a possible ESBL creator if the zone of inhibition for ceftazidime was observed to be< 22 mm. Possible ESBL producer was then subjected for ESBL Phenotypic confirmatory test –Disc Diffusion method as recommended by Clinical Laboratory Standards Institute, 2015 [10].

3. RESULTS

A total of 250 non duplicate isolates of *Pseudomonas aeruginosa* recognized through the research duration. Out of 250 isolates,177 (70.7%) isolates of *Pseudomonas aeruginosa* demonstrated zone of inhibition≤ 22 mm for Ceftazidime. Occurrence of ESBL producing *Pseudomonas aeruginosa* in this study was 26.5%. Out of which 46 (69.69%) samples were of male patients and 20(30.3%) were from female patients. We isolated ESBL positive *P. aeruginosa* from diverse type of samples, out of which greatest amount were of pus and swabs

17 (36.1%) after that by Endotracheal aspirates 12 (25.5%), urine 6(12.76%), sputum 5(10.63%), drain tip 04 (8.51%), blood 2 (4.2%) & cerebrospinal fluid 01 (2.1%). Most of the samples received from middle age group (30-50). All ESBL positive *Pseudomonas aeruginosa* isolates demonstrated elevated confrontation to ciprofloxacin 43 (91.04%), Gentamicin 34 (72.3%) and tobramycin 33 (70.21%). Confrontation was little to mixture drugs like cefoparazone +salbactum 9 (19.1%) and piperacillin + Tazobactum 7 (14.89%). These strains also showed resistance to carbapenems like Imipenem 8 (17.02%), which were found to be the precious weapon against *Pseudomonas aeruginosa* infections and this, is an alarming sign. All isolates from urine samples showed (100%) resistance to Norfloxacin.

4. DISCUSSION

Lest of *P. aeruginosa*, utmost defenselessness to antibiotics was experiential in case of pus, urine, high vaginal, and ear swabs while greatly fewer weakness was accounted in case secretions/aspirates acquired from endotracheal and tracheostomy tubes. Inspection is a solution to the control of antimicrobial resistance [11].

Our study showed 47 (26.5%) isolates were ESBL creator which is extremely alike to further researches, by Prashant et al. [12] and Agarwal et al. [13] which were 22.22% & 20.27% correspondingly while, elevated percentage of isolates were ESBL creator (45.19%) by Senthamarai S. et al. [14] 42.30% ESBL creator were experiential in the research of Varun Goel et al. [15].

In the current research, In Patient Department (IPD) 91.02% and only 8.98% samples were of OPD patients. A comparable examination was completed by Shampa Anupurba et al. [16] and Prashant et al. [12]. Alike high occurrence in middle age group is accounted by Senthamarai S et al. [14].

ESBL-producing P.aeruginosa is regularly opposed to to numerous additional module of antibiotics, counting aminoglycosides and fluoroquinolones [17]. This is owing to the coexistence of genes programming drug confrontation to other antibiotics on the plasmids which encode ESBL [18,19]. In France a superior vulnerability rate of 86% of amikacin was described by Cavallo et al. [20]. Quite a few researches explained that amikacin was additional sensitive than gentamicin and our findings too sustain the above urging. In 2010 gentamicin was 59% resistant in India [19] and 55.5% in Bangladesh [21], as in Bulgaria it was 36.11% evidenced in Pseudomonas spp. by Strateva et al. [22].

In the present research susceptibility to Imipenem was inferior contrast to the 100% susceptibility found in ESBL-producing gram-negative isolates By Ullah et al. [23]. Reduced susceptibility to Imipenem is a subject of huge apprehension and points out the imperative require for enhanced infection control strategies. Findings were in constant with e studies conducted by Ali et al. [24] and Jabeen et al. [9]. from Pakistan, 40% and 43% ESBLs producers.

Essentials and information establish by surveillance proceedings can be utilized to straight experiential prescribing of antimicrobial agents, to recognize recently rising resistances, to conclude significance for explore, and to assess association strategies and possible control trials intended at dipping the occurrence of resistant pathogens.

Table 1. Distribution of *P. aeruginosa* isolates in the different clinical samples obtained

S. no	Drug	No of Resistance sample	Percentage
1	Ciprofloxacin (5 µg)	43	91.4
2	Gentamicin (10 µg)	34	72.3
3	Tobramycin (10 µg)	33	70.21
4	Cefaperazone Salbactum (75/10 µg)	9	19.1
5	Piperacillin Tazobactam (100/10 µg)	7	14.89
6	Imipenem (10 µg	8	17.02
7	Norfloxacin (10 µg)	0	0
8	Polymyxin B (300U	0	0

5. CONCLUSION

Phenotypic shared Disc Diffusion test is extensively utilized owing to its straightforwardness and simplicity to carry out and understand this test. The majority of these isolates were from hospitalized subjects which point out additional probability of their nosocomial prevalence. The occurrence of ESBL positivity in out patient department is disturbing symbol for community spread and enhance in community-acquired ESBLs.

CONSENT AND ETHICAL APPROVAL

Ethical approval was taken from the institutional ethical committee and written informed consent was taken from all the participants.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/68494