Original Article

Antibiotic susceptibility pattern of pseudomonas aeruginosa isolated at SSG hospital Baroda

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ABSTRACT

Background: Pseudomonas aeruginosa is one of the important bacterial pathogens isolated from various samples. Despite advances in medical and surgical care and introduction of wide variety of antimicrobial agents, Pseudomonas aeruginosa continues to cause life threatening infection & complications in hospital acquired infections.

Aims: To determine the antimicrobial susceptibility pattern of Pseudomonas aeruginosa.

Material and Method: This prospective study was conducted from January 2012 to June 2012. During these period total 6390 samples (blood, wound pus, sputum, various body fluids, urine) were tested, of which 4076 samples showed growth. Out of 4076, 415 Pseudomonas aeruginosa were isolated. The samples were selected on the basis of their growth on routine Mac Conkey medium (lactose non-fermenting pale colonies) and on Brain Heart Infusion agar (greenish pigmented colonies) which were oxidase test positive & all confirmatory test positive for Pseudomonas aeruginosa. Antimicrobial susceptibility of all the isolates were performed by the Modified-Kirby Bauer disc diffusion method with Ceftazidime, Piperacillin, Piperacillin+Tazobactam, Imepenam, Lomefloxacillin, Tobramycin, Polymyxin B, Ofloxacin, Ticarcilin+Calvulanic acid & Amikacin according to CLSI guidelines.

Results: In this study, maximum isolates of Pseudomonas aeruginosa isolated from various samples were sensitive to Imepenem (90%), Ticarcillin+Clavulanic acid (79%) followed by Piperacillin+Tazobactum (73%) & polymyxin B (73%), Piperacillin(64%),Amikacin(52%) Ceftazidime (48%), Tobramycin (48%), Ofloxacin (47%), Lomefloxacillin (46%).

Conclusion: Since Imepenem showed highest sensitivity, clinician should prefer Imepenem in case of Pseudomonas aeruginosa infection. In case of carbepenem resistance combination of drug like Ticarcillin+Calvulanic acid, Piperacillin+ Tazobactum should be used as an alternative.

Key Words: Pseudomonas aeruginosa, Antimicrobial susceptibility, Resistance

INTRODUCTION

In the second half of the last century, Pseudomonas aeruginosa has become an important hospital pathogen [1]. It needs minimal nutritional requirements for growth. It is a commensal in healthy people. This rate of commensalism increases gradually with the increased duration of hospital stay [2]. This bacteria is frequently isolated as an opportunistic pathogen in recurrent infections of hospitalized patients and has been isolated from a number of sites in the hospital environment [3,4]. Pseudomonas aeruginosa is the most important, resistant and dangerous organism infecting the burn patients [5]. It is the fifth common pathogen among hospital microorganisms and causes 10% of all hospital acquired infections [6].

Antibiotic when first introduced was considered as a magic bullet. A single injection of penicillin could eradicate a life threatening infection. Unfortunately with time due to malpractices of natural causes, most of the cheaper antibiotics have lost their efficacy and more and more expensive and complicated antibiotics were introduced and marketed to combat simple infection [7]. The microbial pathogens, as well as, their antibiotic sensitivity pattern, may change from time to time and place to place. Therefore knowledge

of current drug resistance pattern of the common pathogenic bacteria in a particular region is useful in clinical practice.

Several different epidemiological studies indicate that antibiotic resistance is increasing in clinical isolates [8]. Being gram-negative bacteria, pseudomonas spp. are naturally resistant to penicillin and majority of related beta-lactum antibiotics, but a number are sensitive to Imepenem, Piperacillin+Tazobactum, Tobramycin, Polymyxin B. Now-a-days more and more Pseudomonas aeruginosa are encountered in routine clinical practice, a serious problem, increase morbidity and mortality and also cost of treatment.

MATERIAL AND METHOD [9, 10]

Sample size

This prospective study was conducted at the Department of Microbiology in a SSG hospital, Baroda. It is tertiary care centre, referral and teaching hospital. This study was conducted from January 2012 to June 2012. During this period total 6390 samples were tested for microbiological diagnosis to the Microbiology Department. All these samples were obtained from various wards of the hospital. The clinical data was obtained from the respective units and wards of the patients.

Inclusion criteria

Various clinical specimens- Blood, Urine, and Miscellaneous samples like (sputum, vaginal swabs, body fluids, wound, pus) of all age patients having Clinical infection ,received for culture & sensitivity test in Department of Microbiology, Medical College Baroda.

Exclusion criteria [8]

- Unlabelled & improperly labeled specimen.
- Specimen that have leaked out of container.
- Specimen received in non-sterile container.
- Sputum specimen with >25 squamous epithelial cells/ low power field.
- A dried-out swab is received or material collected is insufficient in volume.

Sample processing

The samples were selected on the basis of their growth on routine Mac Conkey medium (lactose Non-fermenting pale colonies) & on Brain Heart Infusion Agar (greenish pigmented colonies) which were oxidase test positive.

Confirmation of pseudomonas species

After obtaining the pure strains, the strains were subjected to biochemical identification tests to identify Pseudomonas spp. For this purpose samples were inoculated in Triple Sugar Iron media (TSI), Citrate media, Peptone water, and Urease media and kept in an incubator for 18 hrs at 37°C. Next day the results were noted on TSI, Citrate media and Urease media. Part of growth on Peptone water was subjected to Indole test with Kovac's Reagent and part for motility test by 'Hanging drop' method. A strain of Pseudomonas in the TSI medium showed alkaline slant, no reaction in butt. It showed negative reaction for indole test, negative urease test and positive citrate test. Glucose is utilized oxidatively, forming acid only.

Antimicrobial susceptibility test

Application of antibiotic discs to the inoculated agar plates:

Antimicrobial susceptibility of all the isolates was performed by the disc-diffusion (Modified-Kirby Baur disc diffusion method) according to CLSI guidelines. The following antibiotics were tested by disc diffusion method, Ceftazidime, Piperacillin, Piperacillin + Tazobactam, Imepenam, Lomefloxacillin, Tobramycin, Polymyxin B, Ofloxacin, Ticarcilin + Clavulanic acid and Amikacin.

Ethical consideration

All these samples were a part of routine diagnosis. So, ethical consideration is not necessary.

RESULTS

Total 6390 samples were tested, out of these, 4076 samples were showing growth on culture and out of 4076, 415 Pseudomonas aeruginosa were isolated and tested for antibiotic sensitivity.

Table 1: Sex wise distribution of specimens

Sex	Total No.	Percentage (%)
Male	312	75
Female	103	25
Total	415	100

Table-1 Shows sex wise distribution of samples. Pseudomonas aeruginosa was isolated from (75%) males and (25%) females.

Table 2: Distribution of Pseudomonas aeruginosa among various type of specimen

Name of samples	No. of Sample in which Pseudo. aeruginosa Isolated (n =415)	Percentage (%)
Wound	291	70
Blood	25	6
Urine	30	8
Pus	30	8
ICD fluid	16	3
Sputum	15	3
Tracheostomy	5	1
Drain	2	0.5
Ascitic fluid	1	0.5

Table 3: Ward- wise distribution of Pseudomonas aeruginosa isolates

Ward	No. of Pseudomonas aeruginosa isolates (n=415)	Percentage (%)
NICU	6	2
PICU	4	1
Paediatric ward	43	10
Medicine	27	6
TB ward	22	5
SICU	3	1
Surgical Ward	287	68
Orthopaedic ward	10	3
ENT ward	4	1
OPD	6	2
Obs. & Gynec. Ward	3	1

Table- 2 shows Distribution of Pseudomonas aeruginosa among various type of specimen. Highest number of Pseudomonas aeruginosa was isolated from wound (70%) specimen followed by pus & urine (8% each) followed by Blood (6%).

Table-3 shows Ward- wise distribution of Pseudomonas aeruginosa. Maximum pseudomonas aeruginosa were isolated from surgical ward (68%) followed by paediatric ward (10%) then Medicine ward (6%) followed by TB ward (5%).

Table 4: Antibiotic sensitivity of Pseudomonas aeruginosa isolated from different clinical samples

Antibiotic	Sensitivity (%) (n=415)
Ceftazidime (CAZ)	48
Piperacillin (PIP)	64
Tobramycin (TOB)	48
Lomefloxacin (LOM)	46
Polymyxin B (PB)	73
Imepenem (IPM)	90
Piperacillin tazobactam(TZP)	79
Ticarcilin+Clavulanic acid (TIM)	73
Ciprofloxacin (CIP)	47
Amikacin (AN)	52

Table-4 shows Antibiotic sensitivity of Pseudomonas aeruginosa isolated from different clinical samples. Pseudomonas aeruginosa isolated from various samples were sensitive to Imepenem (90%), Ticarcillin + Clavulanic acid (79%) followed by Piperacillin + Tazobactum (73%) & polymyxin B (73%), Piperacillin (64%), Amikacin (52%) Ceftazidime (48%), Tobramycin (48%), Ofloxacin (47%), Lomefloxacillin (46%).

DISCUSSION

Pseudomonas aeruginosa is emerged as an important pathogen and responsible for the nosocomial infections. It is one of the important causes of morbidity among hospital patients.

The pre-eminent of pseudomonas aeruginosa in hospital infections is due to its resistance to common antibiotics and antiseptics, and its ability to establish itself widely in hospitals. Being an extremely adaptable organism, it can survive and multiply even with minimum nutrients, if moisture is available. As pseudomonas aeruginosa causes serious infections and is one of the leading causes of hospital acquired infections, several studies were carried out to detect antibiotic sensitivity pattern for the various drugs available. Such study helps clinicians for the better management of patients. So the present study was conducted to determine the antibiotic sensitivity pattern of Pseudomonas aeruginosa isolated from various clinical samples.

In present study the isolation rate of Pseudomonas aeruginosa was comparable with other studies. In the present study sex wise prevalence of clinical isolates shows that infections caused by Pseudomonas aeruginosa are more common in males (75%)

compared to females (25%). This is comparable with study of Rajat R [9], Javiya VA [10] and Jamshaid AK [11].

In present study, the maximum clinical isolates of Ps. aeruginosa were isolated from wound (70%), followed by urine (8%) & blood (6%) These results are in line with studies of Jamshaid AK [11,12].

In present study the highest percentage (68%) of Pseudomonas aeruginosa infections were observed in the surgical ward, followed by paediatric ward (10%) and medical ward (6%). Prevalence of infection was higher in surgical ward as maximum isolates were isolated from wound/pus swab samples.

This study shows that the clinical isolates of Pseudomonas aeruginosa are becoming resistant to commonly used antibiotics and gaining more and more resistance to newer antibiotics. The antimicrobial agents are losing their efficacy because of the spread of resistant organisms due to indiscriminate use of antibiotics, lack of awareness, patient non compliance and unhygienic condition. It is the need of the time that antibiotic policies should be formulated and implemented to resist and overcome this emerging problem. Every effort should be made to prevent spread of resistant organisms.

CONCLUSION

To prevent the spread of the resistant bacteria, it is critically important to have strict antibiotic policies while surveillance programmes for multidrug resistant organisms and infection control procedures need to be implemented. In the meantime, it is desirable that the antibiotic susceptibility pattern of bacterial pathogens like Pseudomonas aeruginosa in specialized clinical units to be continuously monitored and the results readily made available to clinicians so as to minimize the resistance. The solution can be planned by continuous efforts of microbiologist, clinician, pharmacist and community to promote greater understanding of this problem. Frequent hand washing to prevent spread of organism should be encouraged. Better surgical and medical care should be provided to patients during hospital stay.

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