ORIGINAL RESEARCH PAPER

Medical Microbiology

ANTIBIOTIC PROFILE OF PSEUDOMONAS AERUGINOSA IN TERTIARY CARE HOSPITAL, VADODARA, GUJARAT, INDIA.

KEY WORDS: Pseudomonas Aeruginosa, Antibiotic Susceptibility, Piperacillin/Tazobactem.

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ABSTRACT

Pseudomonas aeruginosa is an adaptable bacteria that causes an extensive spectrum of infections and intrinsically resistant to many antibiotics. Antimicrobial resistance has increased among these bacteria due to many resistance mechanisms. This study was done to evaluate the antibiogram of *Pseudomonas aeruginosa* at a tertiary care centre, Vadodara. 115 isolates were recovered from various specimens for a period of 6 months from January to June 2023 and antibiotic susceptibility testing was done in Vitek 2 automated machine. *Pseudomonas aeruginosa* was found to be high (45.9%) in pus/wound than other samples. Out of 115 *Pseudomonas aeruginosa* isolates, 60 isolates are most sensitive to Piperacillin/Tazobactem (52.17%) followed in decreasing order by Amikacin (51.30%), Cefoperazone/Sulbactam (49.57%), Cefepime (47.83%), Meropenem (46.09%), Imipenem (45.22%), Ciprofloxacin (42,61%), ceftazidime (40%), Levofloxacin (37.39%), Gentamicin (35.65%), Aztreonam (13.04%) and Colistin, Minocyclin, Tigecycline, Trimethoprim/Sulphamethoxazole, fosfomycin (0%).

INTRODUCTION:

Pseudomonas aeruginosa (P. aeruginosa) is an opportunistic bacterium that causes extensive spectrum of infections ranging from ear infections, bacteremia, urinary tract infections, burn infections, bacteremia and respiratory tract infections [1,2]. Prevalence rate of P. aeruginosa infection is between 10-30% in India [3]. It is responsible for both hospitalized and community acquired infections. Treatment of *P. aeruginosa* infection is a therapeutic challenge as the organism has both intrinsic and acquired resistance to various classes of antibiotics. Antibiotic resistance is increasing drastically in the *P. aeruginosa* and is a threat to the Public health. Therefore, monitoring these bacterial populations is necessary to formulate the antibiotic treatment policy. This analysis was done to assess the antibiotic sensitivity pattern of *P. aeruginosa* isolates from different specimens.

MATERIALS AND METHODS:

This prospective analysis was done in tertiary care hospital in Vadodara during the period of January - June 2023. 115 non-duplicate *P. aeruginosa* were recovered from samples such as urine, pus, sputum, wound swab, ear swab, blood, endotracheal aspirate from various departments of Smt. B. K. Shah Medical Institute and Research Centre (Table 1). The clinical samples were inoculated by streak plate method on nutrient agar (Himedia, Mumbai, India), Mac Conkey agar (Himedia, Mumbai, India) and blood agar (Himedia, Mumbai, India) from urine, pus, wound swab, ear swab, endotracheal secretion. Blood was inoculated in BACTEC automated machine and positive cultures were plated on blood agar, Mac Conkey agar and nutrient agar. The isolated colonies on the different media were identified based on the morphology of the colony, pyocyanin production, Gram staining, oxidase test and confirmed identification was done in VITEK 2 automated machine. VITEK 2 also gave us antibiotic profile of the bacterium in all samples. All the media, oxidase disc, Gram staining kit purchased from Himedia, Mumbai, India.

RESULTS:

115 *P. aeruginosa* were isolated from 221 different samples. The prevalence rate of the organism was found to be 52.04%.

Table 1: Gender wise distribution of *P. aeruginosa* isolates:

Gender	No. of isolates (%)
Male	73 (63.48%)
Female	42 (36.52%)
Total	115 (100%)

Table 1 shows that among 115 *P. aeruginosa* isolates, 73 (63.48 %) were from males and 42 (36.52 %) from females.

Table 2: distribution of isolates according to type of specimen:

Type of specimen	No. of isolates (%)
Pus	54 (46.96%)
Sputum	20 (17.39%)
Urine	13 (11.30%)
ET secretion	11 (9.57%)
Catheter Tip	9 (7.83%)
Blood	5 (4.35%)
Ascitic fluid	2 (1.74%)
Pleural fluid	1 (0.86%)
Total	115 (100%)

Table 2 shows that out of 115 isolates, 54 (46.96%) of the isolates were from Pus, 20 (17.39%) were from sputum, 13 (11.30 %) were from urine, 11 (9.57%) were from ET secretion, 9 (7.83%) were from catheter tip, 5 (4.35%) were from blood, 2 (1.74%) were from ascitic fluid and 1 (0.86%) was from Pleural fluid.

Table 3: Distribution of isolates according to Department of hospital from where the sample has been received:

Department of Hospital	No. of isolates
ICU	52 (45.22%)
Surgery	22 (19.13%)
Medicine	14 (12.17%)
Orthopedics	7 (6.09%)
Obstetrics and Gynecology	3 (2.61%)
Casualty	4 (3.48%)
Skin	4 (3.48%)
ENT	2 (1.74%)
Chemotherapy	4 (3.48%)
Urology	1 (0.87%)
Oncology	2 (1.74%)
total	115 (100%)

Table 3 shows that 45.22 % of strains were isolated from the samples sent from ICU followed in decreasing order by 19.1 % from Surgery Department, 12.17% from Medicine Department, 6.09% from Orthopedic Department, 3.48% from Casualty, Skin and Chemotherapy each, 2.61% from Obstetric and Gynecology Department, 1.74% from ENT and Oncology each and 0.87 % from Urology.

Table 4: Distribution of isolates according to their Antibiotic sensitivity pattern:

Antibiotic	No. of isolates (sensitive)
PIPERACILLIN/TAZOBACTAM (PIT)	60 (52.17%)

CEFTAZIDIME (CAZ)	46 (40%)
CEFOPERAZONE/SULBACTAM (CFS)	57 (49.57%)
CEFEPIME (CPM)	55 (47.83%)
AZTREONAM (AT)	15 (13.04%)
IMIPENEM (IPM)	52 (45.22%)
MEROPENEM (MRP)	53 (46.09%)
AMIKACIN (AK)	59 (51.30%)
GENTAMICIN (GEN)	41 (35.65%)
CIPROFLOXACIN (CIP)	49 (42.61%)
LEVOFLOXACIN (LE)	43 (37.39%)
COLISTIN (CL)	0 (0%)

Out of 115 *Pseudomonas aeruginosa* isolates, 60 isolates are most sensitive to Piperacillin/Tazobactam (52.17%) followed in decreasing order by Amikacin (51.30%), Cefoperazone/ Sulbactam (49.57%), Cefepime (47.83%), Meropenem (46.09%), Imipenem (45.22%), Ciprofloxacin (42.61%), ceftazidime (40%), Levofloxacin (37.39%), Gentamicin (35.65%), Aztreonam (13.04%) and Colistin (0%). 67.83 % isolates were found to be multidrug resistant.

DISCUSSION:

P. aeruginosa is the prime cause of hospital acquired infections among the Gram negative bacteria. Widespread use of the antimicrobials has resulted in the emergence of the multidrug resistant isolates among these pathogens. Multiple drug resistance (MDR) is the resistance exhibited by an microgranism to alteast one antibiotic in three or more antibiotic categories. In our study, out of 115 isolates, 78 (67.83%) isolates are MDR. It causes infections frequently in clinical settings especially in surgical wards and ICUs and the resistance patterns in different geographical areas. Hence antibiotic surveillance is of prime importance to the policy makers to frame the empirical treatment protocol for these bacterial infections. The prevalence of isolation was higher from ICU and surgery Department samples.This might be due to prolonged hospital stay following surgery that results into colonization and infection [5]. *P. aeruginosa* occurrence was predominant in males (63.48 %) in our study similar to other studies [6,7]. In this study, the frequency of *P. aeruginosa* was predominant in pus than other specimens which were similar to studies of Siguan SS et al., Masaadeh HA et al and Ranjan et al [6,7,8]. In contrast in certain studies blood has been found to be the predominant sample followed by pus [10-12]. In this study, most of the isolates were from ICU and surgery Department similar to a study by Ramalakshmi [14]. In the present study, Prevalence rate of *P. aeruginosa* was 52.04 % while in other studies in India by Ramakrishnan et al [14] and Sorabh Singh Sambyal [15], the prevalence were lower (6.8 % and 4.8% respectively). In our study, the isolates are most sensitive to Piperacillin/Tazobactam (52.17%). In study done by Bindu et al, sensitivity to Piperacillin/Tazobactam was 83.8% [18]. This can be explained by the fact that the prevalence and sensitivity of *P. aeruginosa* often varies between communities, hospitals in the same community and among different patient population in the same hospital. Faced with these differences, the physician has the responsibility of making clinical judgments and should have access to recent data on the prevalence and antimicrobial resistance pattern of commonly encountered pathogens [19].

CONCLUSION:

The antibiotic susceptibility pattern varies from time to time and differs in different geographical regions. Piperacillin/ Tazobactam, Amikacin and Cefoperazone/ Sulbactam has been the promising antimicrobial agents to treat the *P. aeruginosa* infections from our study. *P. aeruginosa* infections were common among patients of ICU and surgery Department. So continuous monitoring of the antibiotic susceptibility pattern of pathogens and following the infection control practices can greatly help us to treat and reduce the infections.

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