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Antibiotic Resistance Patterns of *Pseudomonas aeruginosa* Strains Isolated from Various Clinical Specimens in Tertiary Care Hospital, Bhopal (M.P)

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Pseudomonas aeruginosa **has been associated with various nosocomial and community acquired infections. The aim of this study is to ascertain the current antimicrobial resistance pattern of** ***Pseudomonas aeruginosa*** **in this environment as this will be of clinical relevance in the management of these infections. The study was conducted over a period of two years in a 750 bedded tertiary care hospital. A total of 3219 samples were collected out of which 570 strains of** ***Pseudomonas aeruginosa*** **were isolated and the rate of isolation was found to be 17.70%. Imipenem, piperacillin-tazobactum and tobramycin were found to most sensitive.**

Key words: *Pseudomonas aeruginosa*, Resistance, Antibiotic.

Pseudomonas aeruginosa is a motile gram-negative rod that belongs to the family Pseudomonadaceae. It is a leading cause of nosocomial infections, especially among critically ill admitted in intensive care unit, immuno compromised patients[1,2,3]. Various factors that contribute to *Pseudomonas aeruginosa* infection includes extremes of age, immuno compromised state, severe underlying disease and a high incidence of cross infection[4,5]. It has been implicated in diverse nosocomial infection like nosocomial pneumonia, urinary tract infection, surgical site infection, severe burns and infections of patient undergoing either chemotherapy for neoplastic disease or those on antibiotics therapy[6-8]. *Pseudomonas aeruginosa* is ubiquitous in nature and it survives better in hospital environment which thus encourages it to cause infection in hospitalized patients. The characteristic features of the organism allows it to remain persistent in the hospital environment, thus acquire resistance to variety of antibiotics, physical conditions like temperature, high concentration of salts and antiseptics[9].

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MATERIALS AND METHODS

The study was conducted over a period of two years from January 2009 to December 2010 in a 750 bedded tertiary care hospital. Samples were collected aseptically from all patients admitted in the hospital for more than one week. Various specimens obtained were urine, body fluids, blood, sputum, aspirate and exudates from any lesion which were present. A total of 3219 samples were obtained.

All samples were plated on 5% blood agar and MacConkey's agar and incubated at 37ºC for 48 hours. Each colony suspected to be *Pseudomonas aeruginosa* was picked and identified according to the procedure (colonial

morphology, pigmentation, oxidase test, motility, citrate) described in Manual of Clinical Microbiology[10]. All the isolates that were identified as *Pseudomonas aeruginosa* were further tested for antibiotic susceptibility using on Mueller Hinton Agar by Kirby Bauer disc diffusion method as per Clinical Laboratory Standards Institute [CLSI] guidelines[10,11]. *Pseudomonas aeruginosa* ATCC 27853 of was used as control strain. Following antibiotics were tested: amikacin [30mcg], aztreonam[30mcg], cefepime [30mcg], ceftazidime [30mcg], ciprofloxacin[5mcg], gentamicin [10mcg], imipenem [10mcg], netilmicin [30mcg], piperacillin-tazobactum [100/10mcg], tobramycin[10mcg],

These two additional antibiotics were used while testing urine specimen: norfloxacin [10mcg] and nitrofurantoin[300mcg].

Table 1. *Pseudomonas aeruginosa* from various specimen

S.No	Specimen	2009	2010	Total
1.	Burn	47	96	143
2.	Pus	85	56	141
3.	Sputum	49	72	121
4.	Blood	26	08	34
5.	Urine	34	17	51
6.	ET	14	17	31
7.	Body fluids	31	18	49
	Total	286	284	570

Table 2. Resistance pattern of *Pseudomonas aeruginosa*

S.No.	Antibiotic	2009	2010
1.	Gentamicin	123(43%)	112(39.4%)
2.	Tobramycin	000	47 (16.55%)
3.	Netilmicin	131 (45.8%)	75(26.4%)
4.	Amikacin	13 (4.6)	130(45.8%)
5.	Ceftazidime	128(44.8%)	109(38.4%)
6.	Cefepime	95(33.2%)	48(16.9%)
7.	Piperacillin-tazobactum	43(15%)	21(7.4%)
8.	Ciprofloxacin	108(37.8%)	141(49.6%)
9.	Aztreonam	129(45.1%)	63(22.2%)
10.	Imipenem	21(7.3%)	35(12.3%)

RESULTS

A total 570 strains of *Pseudomonas aeruginosa* were isolated from various specimens. The rate of isolation of *Pseudomonas aeruginosa* was found to be 17.70%. Maximum number of isolates were obtained from burn wounds, 143 (25.08%) followed by pus 141 (24.74%) and sputum & bronchial washing 121 (21.23%). (Table 1).

The antibiotic susceptibility data were compared by using chi-square test with Graphpad software, version 16.3. There was significant relationship between antibiotic resistance pattern in 2009 and 2010 ($p<0.0001$).

In 2009 more than 45% of the strains of Pseudomonas were found to be resistant to netilmicin, aztreonam, ceftazidime and gentamicin while in 2010 similar percentage of resistant was seen only in amikacin and ciprofloxacin. This is in contrast to some of the studies which show resistance percent of >50% to these antibiotics[2,12].

Imipenem, piperacillin-tazobactum and tobramycin were found to most sensitive. (Table. 2)

DISCUSSION

Pseudomonas aeruginosa is a major cause of nosocomial infection. Despite advances in sanitation facilities and the introduction of a wide variety of antimicrobial agents with

antipseudomonal activities, life threatening infections caused by *Pseudomonas aeruginosa* continue to be hospital infections[13].

Pseudomonas aeruginosa isolates from various clinical specimens in the study period showed change in resistance pattern of antibiotic tested. All the strains were sensitive to tobramycin in 2009 but in 2010, 16.55% of the strains were resistant. There was a significant drop in resistance percentage of netilmicin, aztreonam and cefepime while an increase in resistance to amikacin and tobramycin. This could be attributed to decreased usage of the former and increased usage of the latter. This shows that excessive use of antibiotic to treat *Pseudomonas aeruginosa* infection can simultaneously lead to emergence of multi drug resistance.

In this study, the prevalence of *P. aeruginosa* isolates in various clinical specimens examined over the period of two years was 17.70%, which is low when compared to similar studies conducted in Pakistan (30%)[14] and Karnataka, India (31.52%)[2] but comparable to studies elsewhere[15,12]. Interestingly the number of isolates from both the years has been almost equal indicating a need for an intensive approach to curb nosocomial infections in our setup.

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