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ISSN: 0975-7538
Research Article

Prevalence of *Pseudomonas aeruginosa* and its antibiotic susceptibility pattern in a Tertiary Care Hospital

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ABSTRACT

Pseudomonas aeruginosa is one of the common infections in a hospital set up. The main objective of the present study is to analyse the prevalence of *Pseudomonas aeruginosa* infection and its antibiogram in a tertiary hospital. 830 samples were included in the study. *Pseudomonas aeruginosa* was isolated from 100 samples using standard conventional techniques. Antibiotic susceptibility testing was done by using modified – Kirby - Bauer disc diffusion method. In our study, highest resistance was observed for Cefotaxime, cefdinir and Cefuroxime (90, 88 and 83 %). Least resistance was seen for Amikacin and Gentamicin (7% and 18%) indicating them to be better drugs in treating the Pseudomonas infections.

Keywords: antibiotics; multidrug resistance; Pseudomonas aeruginosa

INTRODUCTION

Pseudomonas aeruginosa, is a gram-negative bacillus, actively motile by a polar flagellum, non-capsulated, belonging to the family Pseudomonadaceae. *Pseudomonas aeruginosa* is one of the common nosocomial infections especially in immune-compromised patients and patients admitted in intensive care units (Viren et al,2008). The organism has been isolated from various infections like respiratory tract infections, cystic fibrosis, ear infections like suppurative otitis media, orthopaedic infections, urinary tract infections, surgical infections, severe burns, etc. It is also reported frequently from patients undergoing chemotherapy for neoplastic diseases.

Pseudomonas aeruginosa is one of the important opportunistic pathogens which demonstrate resistance to multiple antibiotics (Pathi et al,). Therefore the present study was undertaken to find out the antibiotic susceptibility patterns of *Pseudomonas aeruginosa* isolates from various specimen in our hospital set up.

MATERIAL AND METHODS

The study was conducted during August 2014 to November 2014 in a tertiary care hospital. Various clinical samples from patients attending the OPD (Out Patient Department) and the wards of the hospital were collected and immediately processed in the Microbiology laboratory.

During this period total 830 samples were tested. Out of which 413 samples showed growth on culture. *Pseudomonas aeruginosa* was isolated from hundred samples of them. All clinical samples (urine, blood, pus, sputum, wound swab, ear swab and endotracheal tube) were included in the present study. The samples were cultured in Nutrient agar, MacConkey agar and Blood agar plates as surface streaks. The plates were checked for growth after overnight incubation. MacConkey agar showing Non lactose fermenting colonies were picked up and subjected to Gram staining, oxidase test and other Biochemical tests to identify Pseudomonas species. The growth from the colonies were inoculated in Citrate media, Urease media, Triple Sugar Iron media (TSI), Peptone water and incubated at 37°C for 18 hours. After overnight incubation, Pseudomonas species was identified when TSI medium showed alkaline slant and no reaction in the butt, Indole test negative, Urease test negative, citrate test positive. Oxidase test positive, catalase test positive, motility test by `Hanging drop' method showing motile bacteria.

The antibiotic susceptibility pattern of the *Pseudomonas aeruginosa* isolates were determined by Kirby - Bauer disc diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines. The bacterial suspension was inoculated on the Mueller-Hinton agar plate as a smooth lawn, and antibiotic discs were placed on it, incubated at 37^{o}C overnight. The following antibiotic discs were tested. Norfloxacin (10ug), ciprofloxacin (5ug), Azteronam (30ug), cefotaxime (30ug), ceftriaxone (30ug), nalidixicacid (30ug), nitrofurantoin (30ug), cefuroxime (30ug), gentamycin (10ug), amikacin (30ug), ofloxacin (5ug), ceftazidime (30ug), cefixime (5ug), cefdinir (5ug). The size of zone

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Received on: 20-02-2015
Revised on: 25-02-2015
Accepted on: 27-02-2015

Table 1: Sex wise distribution (n=100)

S. No	Sex	Number
1	Male	52
2	Female	48
	Total	**100**

Table 2: Various samples from which *Pseudomonas aeruginosa* was isolated

S. No	Clinical Samples	Number of isolates
1	Urine	16
2	Blood	14
3	Pus	42
4	Sputum	8
5	Wound swab	10
6	Ear swab	8
7	Endotracheal tube	2
	Total	**100**

Table 3: Antibiotic susceptibility pattern of *Pseudomonas aeruginosa* from various clinical samples (n=100)

Sl. No.	Antibiotics	No. of sensitive isolates (%)	No. of resistant isolates (%)
1.	Amikacin (AK)	93	7
2.	Gentamycin 1(GM)	82	18
3.	Ciprofloxacin (CI)	75	25
4.	Ofloxacin (OF)	71	29
5.	Norfloxcin (NF)	70	30
6.	Ceftrixone (FR)	66	34
7.	Azteronam (AT)	59	41
8.	Ceftazidime (CZ)	58	42
9.	Cefixime (CX)	49	51
10.	Nalidixic acid (NA)	22	78
11.	Nitrofurantoin (FU)	20	80
12.	Cefuroxime (CR)	17	83
13.	Cefdinir (CN)	12	88
14.	Cefotaxime (FX)	10	90

of inhibition was measured and susceptibility is interpreted according to CSLI guidelines.

In our study, Multi Drug Resistance (MDR) was determined according to the criteria set by CLSI guidelines against antimicrobials by disc diffusion method. Resistance against 2 or more antibiotic classes is considered as multi drug resistance (Mama et al, 2014).

RESULT

Total of 830 clinical samples from various departments were processed in our microbiology laboratory. Out of which 413 showed growth on culture. Out of the 413 samples,*Pseudomonas aeruginosa* was isolated from 100 samples and tested for antibiotic susceptibility.

DISCUSSION

Pseudomonas aeruginosa has emerged as one of the most common nosocomial pathogens. Hence we have undertaken this study to analyse the prevalence and antimicrobial susceptibility pattern of *Pseudomonas aeruginosa* from various clinical samples. Our study measures the rate of isolation of Pseudomonas which is quite similar to the previous studies. Compared to other studies (Rajat et al,2012, Jamshaid et al,2008) the present study showed higher rate of prevalence of Pseudomonas in males (52%) compared to females (48%).

The maximum rate of isolation of the Pseudomonas in our study is from pus samples (42%) followed by urine (16%) which correlates well with the previous literature (Shenoy et al, 2002, Arshy et al 2007).

Most of the Pseudomonas isolates were recovered from surgery and orthopaedic wards followed by Paediatric wards, gynaecology and obstetrics ward, medical ward and ICU. Prevalence of infection was higher in surgical ward as maximum isolates was isolated from pus/swab samples.

Nowadays Antibiotic resistance has been reported commonly in the Pseudomonas isolates. Many studies have been carried out to assess the antibiotic resistance pattern observed in Pseudomonas isolates (Rashid et al, 2007, Rajat et al, 2012). Our study also

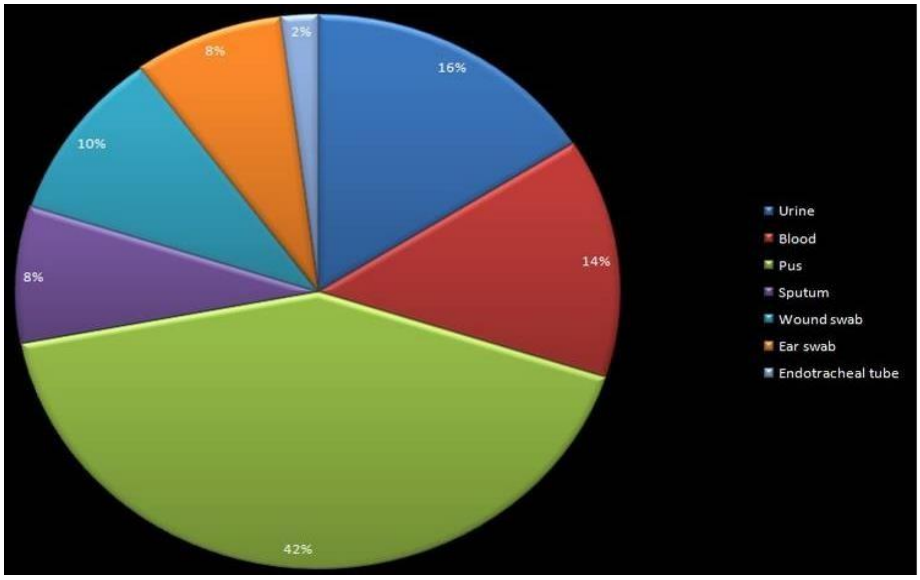

Figure 1: Sample Distribution

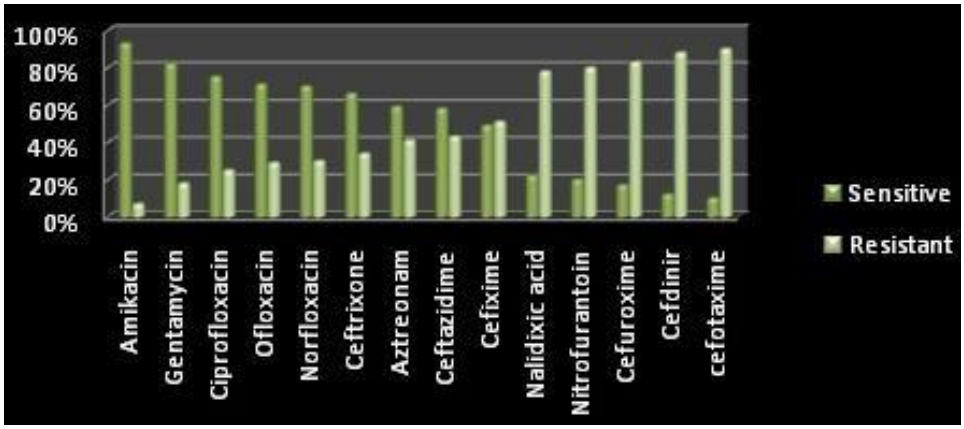

Figure 2: Antimicrobial susceptibility pattern percentage

showed that most of the Pseudomonas isolates were multidrug resistant. This is comparable well with the other studies (Rajat et al, 2012). This may be due to prolonged stay in the hospital, as the immunity level may be reduced in the admitted patients in the hospitals.

The analysis of the susceptibility pattern of the organism will help in proper drug treatment to the patients. In the present study, highest resistance was observed for Cefotaxime and Cefuroxime (90 % and 83%). At the same time, the isolates showed least resistance to Amikacin and gentamicin indicating them to be better drugs in treating the Pseudomonas infections. This is in agreement with another study by Ravichandra Prakash et al (Ravichandra et al, 2012)

In the current study, most of the isolates were found to be susceptible to quinolones like ciprofloxacin (75%) followed by Ofloxacin (71%), Norfloxcin(70%), Ceftriaxone(66%), Asteronam(59%), Ceftazidime(58%) which is comparable with previous literature (Raja et al, 2007)

CONCLUSION

Our study demonstates a high prevalence of Pseudomonas isolates especially in the hospital acquired infections. The statistics in this study show low rates of antibiotic resistance to Amikacin, Aminoglycosides like gentamicin followed by Quinolones like Ciprofloxacin suggesting them to be better drugs in treating the Pseudomonas infections. Also high rate of multidrug resistance is observed in the isolates. Hence, Standard antimicrobial susceptibility surveillance is needed to help the physicians in selecting proper antibiotic therapy. Strict follow up of antibiotic policies and minimal stay in hospital may help in control of the emergence of multidrug resistant strains.

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