



Original Research Article

Resistance Pattern of *Pseudomonas aeruginosa* in a Tertiary Care Hospital

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ABSTRACT

Keywords

Pseudomonas aeruginosa, Drug resistance, Antibiotic policy, Antibiotic sensitivity

Currently antibiotic resistance in bacterial populations is one of the greatest challenges to the effective management of infections. Constant bacteriological monitoring of pathogens in the hospital is necessary to provide accurate data on the prevalence and antibiotic resistance pattern of specific pathogens. *Pseudomonas aeruginosa* (*P. 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 against having anti-pseudomonal activities, life threatening infection caused by *Ps. aeruginosa* continues to cause complications in hospital acquired infections. Several different epidemiological studies indicate that antibiotic resistance is increasing in clinical isolates. The study was conducted at department of Microbiology at a tertiary care teaching Hospital at Bagalkot, in the northern part of Karnataka from January 2014 to December 2014. Total 110 clinical isolates of *P. aeruginosa* collected from blood fluids, pus urine, sputum, and swab. Among the 2380 total clinical samples, 110 isolates of *P.aeruginosa* were isolated (4.6%). Pus (47.27%) was the predominant sample of isolation, which was followed by Swab (35.45%), sputum (9.09%), urine (6.36%) and blood (1.81%) To prevent the spread of the resistant bacteria, it is critically important to have strict antibiotic policies and surveillance programmes for multidrug resistant organisms and infection control procedures need to be implemented. Cystic echinococcosis (CE) (Hydatid cyst) a zoonotic infection caused by larval stage of *Echinococcus granulosus* is a major public health problem and often a neglected one. Primary pancreatic involvement is seen in less than 1% of the patients with hydatidosis in endemic countries. We report a case of hydatid cyst of the tail and body of pancreas causing where the preoperative diagnosis was confirmed by direct microscopic examination of hooklets in the cystic fluid. Pancreatic hydatidosis should always be considered in the differential diagnosis of pancreatic cystic lesions in endemic countries.

Introduction

Pseudomonads are diverse group of established and emerging pathogen widely distributed in the hospital environment where they are particularly difficult to

eradicate (Ravichandra Prakash *et al.*, 2012). *Pseudomonas aeruginosa* (*P. 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 against having anti-pseudomonal activities, life threatening infection caused by *Ps. Aeruginosa* continues to cause complications in hospital acquired infections (Betty *et al.*, 2007). *P. aeruginosa* is increasingly recognized as an emerging opportunistic pathogen of clinical relevance that causes infections in hospitalized patient particularly in burn patients, orthopaedic related infections, respiratory diseases, immunosuppressed and catheterized patients.

Several different epidemiological studies indicate that antibiotic resistance is increasing in clinical isolates. Being gram-negative bacteria, most pseudomonas spp. are naturally resistant to penicillin and majority of related beta-lactum antibiotics, but a number are sensitive to piperacillin, imipenem, tobramycin or ciprofloxacin. Nowadays more and more resistance of

P. aeruginosa are encountered in routine clinical practice, a serious problem, increase morbidity and mortality and also cost of treatment (Washington Winn *et al.*, 1997). Emergence of infections caused by ESBL, MBL, MDR and PDR *P. aeruginosa* strains is alarming which creates serious health problem resulting in an enormous burden of morbidity, mortality and high health care cost.

Materials and Methods

The study was conducted at department of Microbiology at a tertiary care teaching Hospital at Bagalkot, in the northern part of Karnataka from January 2014 to December 2014. Total 110 clinical isolates of *P. aeruginosa* collected from blood fluids, pus urine, sputum, and swab. Ethical committee clearance was obtained from the Institute

and informed consent was obtained from all the patients.

Sample processing

The samples were processed by standard procedures. MacConkey medium showed Non- lactose fermenting colonies and on Nutrient agar pigmented colonies with oxidase positive were taken for the study.

Confirmation of *Pseudomonas* spp

After obtaining the pure strains, the strains were subjected to biochemical identification tests to identify *Pseudomonas* spp. Standard biochemical procedures were followed for the identification of the species.

Antimicrobial disc: 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 CLSIs guidelines. The following antibiotics were tested by disc diffusion method, gentamicin, ciprofloxacin, levofloxacin, cefoperazone, piperacillin/tazobactam, cefipime tazobactam, imipenem, polymyxin B, aztreonam, tobramycin and ceftazidime.

Results and Discussion

Among the 2380 total clinical samples, 110 isolates of *P. aeruginosa* were isolated (4.6%). Pus (47.27%) was the predominant sample of isolation, which was followed by Swab (35.45%), sputum (9.09%), urine (6.36%) and blood (1.81%) (Table 1). Males were affected more than females (Table 2).

Highest resistance was observed for ceftazidime (65.38%), ciprofloxacin (61.53%), piperacillin (59.61%),

ticarcillin/clavulanic acid (56.73%), ceftriaxone (55.76%), cefotaxime (51.92%), and gentamycin (51.92%). Those strains showed resistance to ceftazidime, ceftriaxone and cefotaxime were subjected to ESBL detection tests.

The *Pseudomonas aeruginosa* isolated from different samples showed different resistance pattern. The isolates showed least resistance to amikacin, piperacillin-tazobatum and azithromicin. High amount of resistance was shown to ofloxacin, ciprofloxacin, gentamicin and cefixime. Moderate amount of resistance was shown

to tobramycin, ceftazidime, nalidixic acid and doxycycline (Table 3).

P. aeruginosa has been emerged as a significant pathogen and is the most common dreadful gram negative bacilli found in various health care associated infections all over the world due to its virulence, well known ability to resist killing by various antibiotics and disinfectants. The bacterial resistance has been increasing and this has both clinical and financial implication in therapy of infected patients (CLSI, 2011).

Table.1 *Pseudomonas aeruginosa* isolated from different clinical samples

Pus	52 (47.27%)
Swab	39 (35.45%)
Sputum	10 (9.09%)
Urine	7 (6.36%)
Blood	2 (1.81%)

Table.2 Sex wise distribution of isolates

Sex	No of isolates	Percentage
Male	66	60%
Female	44	40%
Total	110	100%

Table.3 Antimicrobial resistance pattern of *Pseudomonas aeruginosa* isolates

Antimicrobial agent	No of Resistance cases	Percentage
Ofloxacin	73	80.3
Ciprofloxacin	71	78.1
Gentamicin	69	75.9
Cefixime	54	59.4
Tobramycin	29	31.9
Ceftazidime	22	24.2
Nalidixic acid	31	34.1
Doxycycline	23	25.3
Amikacin	14	15.4
Piperacillin-tazobactum	8	8.8
Azithromicin	12	13.2

In India, prevalence rate of *P. aeruginosa* infection varies from 10.5% to 30%. It ranged from 3 to 16%, in a multicentric study conducted by (Ling and Cheng, 1995). The prevalence in our study was found to be 4.6% which is comparable to above study.

In present study, the maximum clinical isolates of *P. aeruginosa* were isolated from pus (47.27%), followed by swab (35.45%), sputum (9.09%). These results are in line with studies of (Jamshaid *et al.*, 2008). In present study the highest percentage (52%) of *Pseudomonas aeruginosa* infections were observed in the surgical ward, followed by and medical ward (27%) and paediatric ward (18%) as seen in other studies (Shenoy *et al.*, 2002; Arshi syed *et al.*, 2007; Murase *et al.*, 1995; Stark and Maki, 1984; Henwood *et al.*, 2001). Prevalence of infection was higher in surgical ward as maximum isolates were isolated from pus/swab samples.

In our study the resistance against ofloxacin and ciprofloxacin was observed between 75 – 80%. The quinolone resistant *Pseudomonas aeruginosa* showed the presence of new outer membrane protein in the range of 51–54 KDa. These proteins apparently actively transport quinolone out of the cell (John Smith *et al.*, 2000). The resistance pattern against gentamycin, tobramycin, ceftazidim, doxycycline, was observed to be less as compared to other drugs in this study. These finding are in good agreement with the other similar studies (Van Elder, 2003). The least resistance was seen with amikacin, azithromycin, and piperacillin-tazobactam. Among all the drugs piperacillin-tazobactam showed the highest sensitivity against *Pseudomonas aeruginosa* which is in corroboration with an earlier report published from India (Smitha *et al.*, 2005). Amikacin and piperacillin-tazobactam seems to be a promising therapy for

Pseudomonas infection. Hence, its use should be restricted to severe nosocomial infections, in order to avoid rapid emergence of resistant strains (Poole, 2005).

The problem of increasing resistance to *Pseudomonas aeruginosa* has limited the use of other classes of antibiotics like the fluoroquinolones, tetracyclines, macrolides and chloramphenicol (Chambers, 2006).

In conclusion, the irrational and inappropriate use of antibiotics is responsible for the development of resistance of *Pseudomonas* species to antibiotic monotherapy. Hence, there is a need to emphasize the rational use of antimicrobials and strictly adhere to the concept of “reserve drugs” to minimize the misuse of available antimicrobials. In addition, regular antimicrobial surveillance is essential for monitoring of the resistance patterns. An effective national and state level antibiotic policy and guidelines should be introduced to preserve the effectiveness of antibiotics and for better patient management.

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