

PREVALANCE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF CLINICAL ISOLATES OF *PSEUDOMONAS AERUGINOSA* IN A TERTIARY CARE TEACHING HOSPITALSaloni Agarwal¹, Rekha Rai², Vimal Karnaker³, Sanjeev H⁴, Pai Asha K.B⁴ and Ganesh H. R⁵

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ABSTRACT: The study was conducted to know the prevalence of *Pseudomonas aeruginosa* in clinical infections and its antibiotic susceptibility pattern to commonly used antibiotics in a tertiary care teaching hospital. We received 897 relevant clinical isolates among, which 203 was *P.aeruginosa*. Antibiotic susceptibility was determined by Kirby Bauer's disc diffusion method with first line and second line antibiotics. **Results** – Among the first line antibiotics the isolate displayed an increased resistance to Ciprofloxacin (28.57%) followed by Levofloxacin (25.61%), and the least was towards Amikacin (14.77%), whereas most of the second line antibiotics such as Polymyxin B and Colistin exhibited a high sensitivity (99.02 %). **Conclusion**-The ability of the opportunistic pathogen *P.aeruginosa* to rapidly develop resistance to multiple classes of antibiotics during the course of treatment makes it important to determine the antibiotic susceptibility pattern. As the pipeline of new drugs continues to diminish, it is critical that we look for new strategies to combat the threat of antibacterial resistance.

Key words: Drug resistance, *P. aeruginosa*

INTRODUCTION

Pseudomonas aeruginosa is a gram-negative bacterium that continues to be a major cause of opportunistic nosocomial infections, causing around 9–10% of hospital infections (Hancock & Speert, 1996, 2000). Despite improvements in antibiotic therapy in recent decades *P.aeruginosa* has emerged as multidrug resistant superbugs (Hancock et al., 2000; Landman et al., 2007). As it is ubiquitous organism present in many diverse environmental settings, it can be isolated from variety of sources, including plants, animals and humans. The ability of *P.aeruginosa* to survive on minimal nutritional requirements and to tolerate a variety of physical conditions has permitted this organism to persist in both community and hospital settings (Lister et al., 2009; Pollak et al., 1995). It prefers moist environment and so can contaminate many of the aqueous solutions administered to hospitalized patients (ranging from disinfectants and soaps to irrigation and dialysis fluids), as well as the sinks and showers in patient rooms (Daneman et al., 2012; Cross et al., 1966). This organism is seldom a member of the normal microbial flora in humans. Representative colonization rates for specific sites in humans range from 0 to 2% for skin, 0 to 3.3% for the nasal mucosa, 0 to 6.6% for the throat, and 2.6 to 24% for fecal samples. However, colonization rates may exceed 50% during hospitalization, especially among patients who have experienced trauma to or a breach in cutaneous or mucosal barriers by mechanical ventilation, catheters, tracheostomy, surgery or severe burns (Lister et al., 2009; Pollak et al., 1995; Morrison et al., 1984). Risk factors for this being prolonged ventilation, hospitalization, exposure to inadequate antimicrobial therapy and immunocompromised state (Livermore et al., 1995). This study was conducted to determine the prevalence of *P.aeruginosa* among the various clinical isolates and its sensitivity pattern to commonly used antimicrobials.

MATERIALS AND METHOD

A retrospective analysis was made from August 2011 to July 2012 with 203 non-duplicate, *P. aeruginosa* isolates which were recovered from 897 clinically significant isolates from the various samples collected from the inpatients coming to a tertiary care teaching hospital with clinically significant details, the samples included upper and lower respiratory tract secretions, pus/wound infections, blood, urine, and body fluids. All the isolates were identified by standard laboratory techniques using colony morphology on Blood Agar, MacConkey Agar & Cetrimide Agar, Gram stain characteristics, motility detection, positive reaction to oxidase, citrate utilization, pigment production and ability to grow at 42°C (Forbes et al., 1998). Antibiotic sensitivity testing was performed on Mueller-Hinton agar plates by Kirby-Bauer disc diffusion method using Amikacin (30mcg), Gentamicin (10mcg), Tobramycin (10mcg), Ceftazidime (30mcg), Cefepime (30mcg), Ciprofloxacin (30mcg), Levofloxacin (5mcg), Gatifloxacin (5mcg), Norfloxacin (5mcg), Piperacillin (100mcg), Imipenem (10mcg), Meropenem (10mcg), Polymyxin B (50units) and Colistin (10mcg) discs. The results were recorded and interpreted as per CLSI recommendations (Wayne et al., 2006). *P.aeruginosa* ATCC 27853 was used as a control.

RESULTS

Table.1 shows out of 897 total clinically significant isolates the prevalence of *P.aeruginosa* was found to be 203(25.15%). The prevalence of *P. aeruginosa* from wound infections, upper & lower respiratory tract infections, urinary tract infections and blood stream infections & body fluids was found to be 33.33%, 28.88%, 20.45%, 9.69%, respectively. Among the 203 isolates of *P.aeruginosa* 128(63.05) were found to be sensitive to all the antibiotics tested. Fig.1 shows the antibiotic susceptibility pattern of *P.aeruginosa*. The isolates exhibited highest sensitivity to Polymyxin B and Colistin (99.02%) followed by Amikacin 173(85.23), Tobramycin 171(84.24) and a linear decreasing sensitivity observed most for Levofloxacin 151(74.38) followed by Ciprofloxacin 145(71.42).

Table No. 1 Distribution of *P.aeruginosa* in various clinical samples

Site of Sample Collection	Total No. of Clinically Significant Isolates	Total No. of <i>P.aeruginosa</i> Isolates
Upper & Lower Respiratory Tract Secretions	315	91 (28.88%)
Pus/ Wound Samples	252	84 (33.33%)
Blood & Body Fluids	196	19 (9.69%)
Urine	44	9 (20.45%)
Total	897	203 (25.15%)

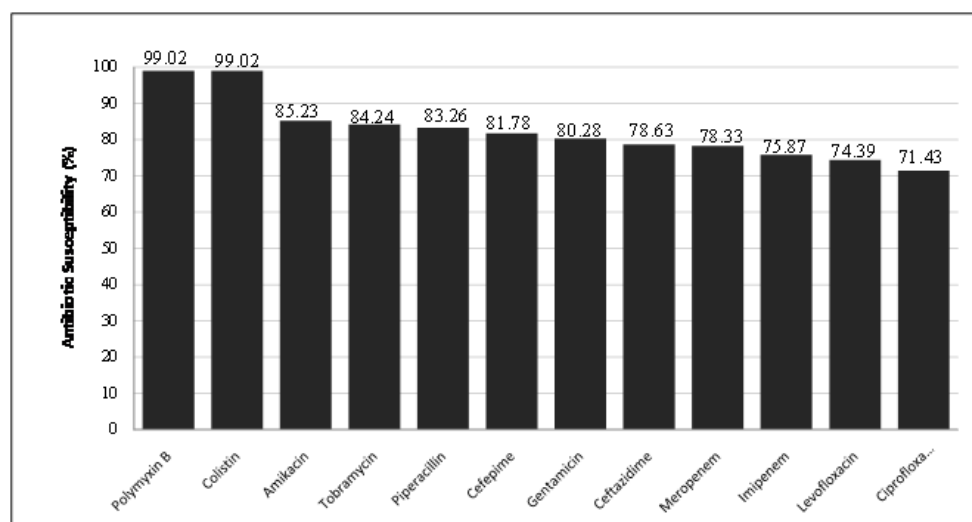


Fig.1 In-vitro Susceptibilities to Antimicrobial Agents for Clinical isolates of *P. aeruginosa*

DISCUSSION

Our results indicates that prevalence rate of *P. aeruginosa* of all the pathogens isolated from various infections is faintly more and is in agreement with the study done by Lister et al. (2009) which states that *P. aeruginosa* was accountable for 30% of upper & lower respiratory tract infections, 19% of urinary tract infections, and 10% of bloodstream infections (Landman et al., 2007) and 32% of wound infections (Shampa et al., 2006). Although the number of isolates obtained were more from the upper and lower respiratory tract infections, the isolates from the wound infections exhibited higher resistance. Similar to our study the work done by Shampa et al., (2006) indicates that *P. aeruginosa* infection is dependent on age, sex and duration of hospital stay. The infection was more common in young and middle age group while males were more susceptible than female. A study done by James et al indicates that majority of the isolates tested were sensitive to Amikacin and Piperacillin and a line a decreasing sensitivity was observed most for Ciprofloxacin followed by Levofloxacin which correlates with our study (Karlowsky et al., 2003). Of the Indian workers, Varaiya et al., (2008) reported resistance of 26% towards Carbapenem and Gladstone et al., (2005) reported 42.8% Carbapenem resistance among *P.aeruginosa*, whereas in our study we found resistance to Cabapenems being 29.05%. All the strains were almost sensitive to Polymyxin B and Colistin. In conclusion 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. These organisms are resistant to almost all commonly available antibiotics with limited treatment options. The major risk factors were found to be prolonged hospitalization and ventilation associated lower respiratory tract infection. Multidrug resistant *P.aeruginosa* is still a problem in the hospital setup. This calls for stringent preventive measures which includes strict infection control practices and judicious use of antibiotics with implementation of adequate antibiotic policy.

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