Multidrug Resistant Pseudomonas aeruginosa from Wound & Pyogenic Infections.

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Abstracts: Background: Wound infections are one of the most common hospital acquired infections and are an important cause of morbidity and account for 70-80% mortality. Pseudomonas aeruginosa is an epitome of opportunistic nosocomial pathogen & responsible for serious infection such as septicemia ,pneumonia ,various pyogenic & wound infections. Pseudomonas aeruginosa is inherently resistant to many antibiotics and can mutate to even more resistant strains during therapy. So the present study aimed to find out the strains of Pseudomonas aeruginosa from various pyogenic & wound infections, their antibiotic sensitivity profile & to find out multidrug resistant strains. Methodology**:** Pseudomonas aeruginosa isolates obtained from pyogenic & wound infection samples were identified by conventional microbiological techniques. All these isolates were tested for antimicrobial susceptibility on Muller-Hinton's agar by Kirby-Bauer disk diffusion method as per CLSI guidelines. Results: Out of 90 Pseudomonas aeruginosa strains,49 (54.44 %) were MDR strains & highest sensitivity was found to levofloxacin (74.44 %) ,amikacin, (67.77%),cefepime(65.55 %), pipercillin (64.4%) & ceftazidime (63.33 %). Conclusion**:** The prevalence of MDR strains in our study is 54.4 % which calls for the judicious selection of antibiotics in clinical practice. In addition, regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. An effective national and state level antibiotic policy and draft guidelines should be introduced to preserve the effectiveness of antibiotics and for better patient management. [Chate S NJIRM 2015; 6(2):6-9]

Key Words: Multidrug resistance, Pseudomonas aeruginosa, Wound & pyogenic infections.

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Introduction: Wound infections are one of the most common hospital acquired infections and are an important cause of morbidity and account for 70-80% mortality[1] .Pseudomonas aeruginosa is an epitome of opportunistic nosocomial pathogen & responsible for serious infection such as septicemia, pneumonia & various pyogenic & wound infections[2,3]. Infections caused by multidrug resistant (MDR) gram negative bacteria, especially MDR Pseudomonas aeruginosa have been associated with increased morbidity,mortality and is challenging. Cephalosporins ,Carbapenem , Imipenem are the most effective treatment options for Pseudomonas aeruginosa. But now resistance to these drugs is also reported from many hospitals. Pseudo.aeruginosa is inherently resistant to many antibiotics and can mutate to even more resistant strains during therapy[1].So the prevalence of multidrug resistant Pseudo. aeruginosa isolates has been increasing[4].

Although numerous resistance mechanisms have been identified, the mutation of porin proteins constitutes the major mechanism of resistance. Penetration of antibiotics into the Pseudomonad cell is primarily through pores in the outer membrane. If the proteins forming the walls of these pores are altered to restrict flow through the channels, resistance to many classes of antibiotics can develop. Pseudo. aeruginosa also produces a number of different beta-lactamases that can inactivate many beta-lactam antibiotics (eg. penicillins,cephalosporins and carbapenems)[3,5]. Resistance is often mediated by Metallo-Beta-lactamases (MBL) production .Pseudomonas aeruginosa strains that produce metallo-beta-lactamases (MBLs) are becoming increasingly prevalent in wound infections[6,7].The appearance of MBL genes and their spread among bacterial pathogens is a matter of concern with regard to the future of antimicrobial therapy[5].

Wound is a major concern among healthcare practitioners, not only in terms of increased trauma to the patient but also in view of its burden on financial resources due to increased hospital stay, use of antimicrobial agents and the increasing requirement for cost effective management within the health care system[3].Antibiotic resistance can be controlled by appropriate antimicrobial prescribing, prudent infection control, new treatment alternatives, and continued surveillance.

Due to significant changes in microbial genetic ecology, as a result of indiscriminate use of anti-microbials, the spread of antimicrobial resistance is now a global problem[2]. The present study was carried out to find out Pseudomonas aeruginosa from wound & pyogenic infections and their antibiotic susceptibility to various antibiotics & to find out multidrug resistant strains. It assists the clinicians in appropriate selection of antibiotics.

Material and Methods: This study was conducted during Jan 2013 to October 2014 in the Dept of microbiology , MIMER Medical College, Talegaon (Dabhade), Pune. Approvals of Institute Research Council and Ethics Committees were obtained prior to commencement of the study. Samples form wound & pyogenic infections were collected from the patients with complaints of discharge, pain, swelling, abscess , ear swab / discharge ,foul smelling discharge & delayed and non healing wounds, by using a sterile swab.Total 90 strain of Pseudomonas aeruginosa isolated were identified to the species level by standard microbiological methods [8].

The isolates were subjected to susceptibility testing against various antibiotics (discs from Himedia, Mumbai) like ceftazidime (30 µg), ticarcillin(75 µg), piperacillin(100 µg), amikacin(30 µg), cefepime(30 µg), cefoperazone(75 µg), ciprofloxacin(5µg), tobramycin(10 µg), netillin(30 µg), gentamicin(10 µg), Levofloxacin(5 µg), meropenem(10 µg) by disc diffusion test & the results were expressed as susceptible or resistant according to interpretative zone diameters recommended by the Clinical and Laboratory Standards Institute (CLSI)[9,10].

E.coli ATCC 25922 and Pseudomonas aeruginosa ATCC 27853 were used as control strains.

Results: A total of 90 isolates of Pseudo. aeruginosa were obtained from samples collected from patients having post-operative wound infection, frankly infected wound , diabetic foot, abscesses , cellulitis, otitis media. Out of 90 patients infected with Pseudomonas aeruginosa, 56(62.2%) were male and 34 (37.7%) were females. Amongst the 90 isolates of P.aeruginosa 42 (44.4 %) were from frankly infected wound sample, 16 (17.7 %) from post-operative wound infection, 14(15.5 %) from diabetic foot 8 (8.8 %) from abscess ,6 (6.6 %) from ear swab / discharge & 4 (4.4 %) from cellulitis.

Antibiotic susceptibility testing of the isolates showed varying degree of sensitivity to the antibiotics tested. (Table 1)

Table 1: Antibiotic Susceptibility Of The Pseudo. aeruginosa Isolates Wound & Pyogenic Infections

Sr. No	Antibiotic	Sensitive strains	Percentage
1	Ceftazidime	57	63.33 %
2	Ticarcillin,	49	54.44 %
3	Piperacillin	58	64.44 %
4	Amikacin	61	67.77 %
5	Cefepime	59	65.55 %
6	Cefoperazone	53	58.88 %
7	Ciprofloxacin	54	60 %
8	Tobramycin	54	60 %
9	Netillin,	49	54.44 %
10	Gentamicin	53	58.88 %
11	Leofloxacin	67	74.44 %
12	Meropenem	56	62.22 %

Antibiotic susceptibility Screening for MDR isolates showed that 49 (54.4%) isolates were MDR strains showing resistance to at least 3 antibiotics.

Out of 49 MDR strains, 7 were resistant to all antibiotics used in the present study, 15 strains were resistant to 9 to 11 antibiotics, 16 strains were resistant to 6 to 8 antibiotics & 11 strains were resistant to 3 to 5 antibiotics.

Discussion: Wound is a major concern among healthcare practitioners**.** The widespread uses of antibiotics, together with the length of time over which they have been available have led to major problems of resistant organisms contributing to morbidity and mortality[1,6]**.**There is an alarming increase of infections caused by antibiotic-resistant bacteria, particularly in the emergence of VRSA / VISA, meropenem, and third generation cephalosporin resistant Pseudomonas aeruginosa[2,4]. Nosocomial outbreaks of MDR Pseudomonas aeruginosa have been described in various European hospitals [14].

The most frequently isolated bacterium is Staph. aureus from wound & pyogenic infections. Pseudomonas spp. was the second most common organism isolated from pyogenic & wound infections[6]. In the present study also Pseudomonas spp. was the second most common isolated organism after Staph. aureus. Mulugeta et al reported Pseudomonas spp. was the second most common isolated organism after Staph. aureus[6].C.Manikandan et al reported Pseudomonas aeruginosa was the predominant isolates followed by Staphylococcus aureus isolates[1].

Out of 90 isolates of Pseudo. aeruginosa highest susceptibility was seen for Leofloxacin (74.4%) followed by Amikacin(67.7%), Cefepime (65.5%) , pipercillin (64.4%) & Ceftazidime (63.33 %).

Siva Subba Rao et al reported 95.12% susceptibility to Amikacin & 85.36 % susceptibility to Ceftazidime[17]. M.Mehta et al reported 89% susceptibility to Amikacin & 84% susceptibility to Ceftazidime in Pseudomonas aeruginosa isolated from pus samples[11]. C.Manikandan et al reported 100% susceptibility to Amikacin[1].

In the present study 64.4%strains were susceptibile to pipercillin .N.Agnihotri reported pipercillin was found to be the most effective drug against P. aeruginosa in their study[16].

In the present study 62.22 % strains were susceptibile to meropenem. Amutha et al reported 83% susceptibility to meropenem[3]. C.Manikandan et al reported highest i.e 89 % susceptibility to carbapenem[1]. Nutanbala N.et al reported less i.e 51.35 % susceptibility tomeropenem[2].

S. Murugan et al reported maximum sensitivity of Pseudomonas aeruginosa to pipercillin, Amikacin & Imipenem[13].

Out of 90 isolates of Pseudo. aeruginosa less susceptibility was seen for Netillin & Ticarcillin i.e. 49 (54.44%), Gentamicin & Cefoperazone i.e.53 (58.88 %), Ciprofloxacin & Tobramycin i.e. 54(60%). Nutanbala N. et al reported lessi.e 83.78 % susceptibility to Ciprofloxacin[2].

Amongst the 90 isolates of Pseudo. aeruginosa that 49 (54.4%) isolates were MDR strains showing resistance to at least 3 antibiotics. Mulugeta K. et al reported highest i e. 82.6%P. aeruginosa were MDR strains from wound infections[6] . Amutha et al reported 45.2% MDR strains in their study[3].

Conclusion: There is an alarming increase of infections caused by antibiotic-resistant bacteria.The results of this study showed 54.4%.P. aeruginosa were MDR strains from wound & pyogenic infections. Lack of uniform antibiotic policy and indiscriminate use of antibiotics may have lead to emergence of resistant bacterial strains . New antimicrobial agents with activity against Pseudo. aeruginosa will not be available in the future, so ongoing surveillance of the activities of currently available agents is of clinical importance.

In addition, regular antimicrobial susceptibility surveillance is essential for area-wise monitoring of the resistance patterns. An effective national and state level antibiotic policy and draft guidelines should be introduced to preserve the effectiveness of antibiotics and for better patient management. This study assists the clinicians in appropriate selection of antibiotics against Pseudomonas aeruginosa causing wound & pyogenic infections.

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