Research Article

Prevalence of *Pseudomonas aeruginosa* in Postoperative Wound Infection in hospitals of Omerga region (Maharashtra), India

S. M. Dulange[*1], P. R. Thorat[2]
[1]Department of Microbiology, Adarsh Mahavidyalaya, Omerga, Osmanabad, Maharashtra, India.
[2]PG Department of Microbiology, Shri Shivaji Mahavidyalaya, Barshi, Solapur, Maharashtra, India.
***Corresponding author's E-mail:** sanjaydulange@gmail.com

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ABSTRACT

In the twenty eight moths consistent study (September 2011 to December 2013) eighty three patients those were suffering from postoperative wound infections were studied for isolation of major pathogens from Omerga region (Maharashtra, India). Patients were showing clinical symptoms, wound discharge and/or incriminated organisms after surgical operations; those were mostly infected by *Escherichia coli* (20.5%), *Klebsiella pneumoniae* (14.45%), *Staphyloccus aureus* (18.07%), *Acinetobacter baumannii* (13.25%) and *Pseudomonas aeruginosa* (12.08 %). Antimicrobial Susceptibility Testing (AST) with isolated *Pseudomonas aeruginosa* (12.08%) were showed surprising results with respect to drug resistance. Hundred percent resistance was observed for Moxifloxacin, Cefprozil, Cefirome, Gatifloxacin, Ampicillin / Sulbactum, Cefotaxime, Tetracycline, Tigecycline antibiotics and >75% resistance to Ceftrixone, Levofloxacin, Trimethoprim / sulfamethoxazole, Ticarcillin / Clavulanic acid, Cefpodoxime, Sparfloxacin, while Cefoperazone / Sulbactam, Colistin, Meropenem, Pipercillin / Tazobactum were showing >30% to <40% resistance hence these antibiotics can be used for treatment of postoperative wound infection caused by *Pseudomonas aeruginosa*.

Keywords: *Pseudomonas aeruginosa*, postoperative wound, prevalence, antibiotic.

INTRODUCTION

Since from emergence of drug resistance postoperative wound infections [surgical Site Infections (SSI)] has been created incredible problems in the hospitalized patients[10]. Dramatic, uncontrolled and exponentially spreading drug resistance among the bacterial population was put forth the challenges in front of hospital management, doctors and other staff regarding use of better antibiotic therapy. Inappropriate use of antibiotics itself is the one of the particular reasons in the enhanced multidrug resistance with respect to nosocomial infections caused by *Staphylococcus aureus, Pseudomonas aeruginosa*, *Acinetobacter* species etc[4]. Surveillance is an essential method for understood the occurrence and spread of Healthcare-Associated Infections, which records infection prospectively as well as actively. Accurate surveillance data can be obtained using site-oriented target study from high-risk infections and specialties.

Pseudomonas aeruginosa is the second largest strain causing healthcare associated infections among the Gram negatives. *P. aeruginosa* has showed plasmid bearing drug resistance to most of common and reliable antibiotics. Improper practice of aseptic techniques and prolonged hospitalization of patients will enhance the chances of opportunistic infections by normal microflora viz. *P. aeruginosa* after postoperative wound infections. Operations of abscesses and/or colon those were previously suffered from contamination will increase the great risk of wound infection by drug resistant bacteria[7,8,9,12]. In the developing countries incidence of *P. aeruginosa* in the postoperative wound infection was significantly increased due to inappropriate general hygienic measures, low quality mass production of antiseptics as well as medicinal solutions for treatment and responsibilities of hospital staff during antimicrobial agent's uses. Prevalence of *P. aeruginosa* with respective to postoperative wound infection was determined through the isolation and antimicrobial susceptibility testing[16,18].

MATERIALS AND METHODS

The study was conducted in the microbiology laboratory of Adarsh Mahavidyalaya, Omerga region (Maharashtra: India). Hospitalized patients suffering from postoperative wound infection were considered as target for specimen collection during September 2011 to December 2013. Sterile cotton wool swabbing was practiced aseptically for collection of sample. Suspension prepared using cotton swab was used for isolation of *P. aeruginosa* on Blood agar, MacConkey agar and Nutrient agar. Plates were incubated for 24 to 48 hours and colony characters, morphological characters as well as biochemical characters were studied for confirmation of *P. aeruginosa*. Biochemical testing was practiced according to API20E and Vitek2 system. Potent drug resistant isolates were identified using 16S rRNA sequencing. Disk diffusion antimicrobial susceptibility testing [Central Laboratory Standards Institute (CLSI) guidelines] was practiced using nutrient agar plates and standard antibiotic disks of Span Diagnostics (Ticarcillin / Clavulanic acid, Meropenem, Levofloxacin, Moxifloxacin, Cefprozil, Cefirome, Ceftizoxime, Cefpodoxime, Cefoperazone / Sulbactam, Sparfloxacin, Pipercillin / Tazobactum, Gatifloxacin, Imipenem / Cilastatin and Tobramycin).

RESULTS

Table 1: Antimicrobial Resistance patterns of *Pseudomonas aeruginosa*

Antibiotics	Culture numbers										
	3	5	6	38	46	68	69	78	80	82	% R
Ticarcillin / Clavulanic acid	R	R	R	R	R	R	S	R	R	R	90
Meropenem	S	S	R	I	S	R	R	I	R	S	40
Levofloxacin	I	R	R	S	R	R	I	R	R	R	77
Moxifloxacin	R	R	R	R	R	R	R	R	R	R	100
Cefprozil	R	R	R	R	R	R	R	R	R	R	100
Cefirome	R	R	R	R	R	R	R	R	R	R	100
Ceftizoxime	R	R	S	S	R	R	R	S	S	S	50
Cefpodoxime	R	R	S	R	R	R	R	R	R	R	90
Cefoperazone / Sulbactam	S	R	R	R	S	S	S	S	S	S	30
Pipercillin / Tazobactum	S	S	R	S	I	R	R	R	I	I	40
Sparfloxacin	R	R	R	R	R	R	S	R	R	R	90
Gatifloxacin	R	R	R	R	R	R	R	R	R	R	100
Imipenem / Cilastatin	S	S	S	R	S	R	R	R	R	R	60
Tobramycin	S	R	R	S	S	R	S	R	R	R	60
Ampicillin/Sulbactum	R	R	R	R	R	R	–	–	–	–	100
Ceftazidime	S	R	R	S	S	R	R	R	S	R	60
Cefotaxime	–	–	–	–	–	R	R	R	R	R	100
Ceftrixone	R	R	R	S	I	R	R	–	–	R	75
Cefepime	S	S	R	S	S	R	R	R	S	R	50
Amikacin	S	R	R	S	S	R	R	S	S	R	50
Gentamycin	S	I	R	S	S	R	R	S	R	R	50
Ciprofloxacin	I	R	R	S	S	R	I	R	R	I	50
Tetracycline	R	R	R	R	R	R	–	–	–	–	100
Tigecycline	R	R	R	R	R	R	R	R	R	R	100
Colistin	I	S	S	S	S	R	R	S	S	R	30
Trimethoprim / sulfamethoxazole	R	R	R	R	R	R	S	R	R	S	80

R – Resistant S - Sensitive I – Intermediate - Test not performed

Escherichia coli (20.5%), *Klebsiella pneumoniae* (14.45%), *Staphyloccus aureus* (18.07%), *Acinetobacter baumannii (13.25%) and Pseudomonas aeruginosa* (12.08 %) were isolated from hospitalized patients suffering due to postoperative wound infection at surgical, pediatrics, orthopedic, obstetrics, and gynecology wards[3]. Results of sensitivity to different antibiotics were as per following Table 1. Majority of *Pseudomons aeruginosa* isolates were resistant to Moxifloxacin (100%), Cefprozil (100%), Cefirome (100%), Gatifloxacin (100%), Ampicillin/sulbactum (100%), Cefotaxime (100%), Tetracycline (100%), Tigecycline (100%), Ticarcillin/Clavulanic acid (90%), Cefpodoxime (90%), Sparfloxacin (90%), Trimethoprim / sulfamethoxazole (80%), Levofloxacin (77%) and Ceftrixone (75%). Some were low to moderate resistant to Imipenem / Cilastatin (60%), Tobramycin (60%), Ceftazidime (60%), Ceftizoxime (50%), Cefepime (50%), Amikacin (50%) and Gentamycin (50%). However, they were sensitive to Cefoperazone / Sulbactam and Colistin.

Most antibiotic resistant *Pseudomonas aeruginosa* (Cul.80) isolate was further identified by 16s rRNA sequencing[5]. It has following type of partial sequencing:

GGGGATTTGGNATGGGCGAAGCCTGATCCAGCCATGCCGCG
TGTGTGAAGAAGGTCTTCGGATTGTAAAGCACTTTAAGTTGG
GAGGAAGGGCAGTAAGTTAATACCTTGCTGTTTTGACGTTAC
CAACAGAATAAGCACCGGCTAACTTCGTGCCAGCAGCCGCG
GTAATACNAAGGGTGCAAGCGTTAATCGGAATTACTGGGCG
TAAAGCGCGCGTAGGTGGTTCAGCAAGTTGGATGTGAAATC
CCCGGGCTCAACCTGGGAACTGCATCCAAAACTACTGAGCTA
GAGTACGGTAGAGGGTGGTGGAATTTCCTGTGTAGCGGTGA
AATGCGTANATATAGGAAGGAACACCAGTGGCGAAGGCGA
CCACCTGGACTGATACTGACACTGANGTGCGAAAGCGTGGG
GAGCAAACAGGATTANATACCCTGGTAGTCCACGCCGTAAA
CGATGTCGACTAGCCGTTGGGATCCTTGAGATCTTANTGGCG
CAGCTAACGCGATAAGTCGACCGCCTGGGGAGTACGGCCGC
NAGGTTAAAACTCAAATGAATTGACGGGGGCCCGCACAAGC
GGTGGAGCATGTGGTTTAATTCGAAGCAACGCGAAGAACCT
TACCTGGCCTTGACATGCTGAGAACTTTCC.

Following Figure 1 represents phylogenic tree diagram of culture 80.

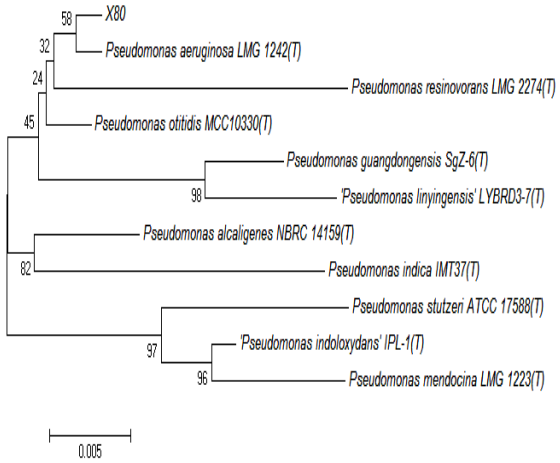

Figure 1: Nucleotide based Phylogeny of culture no. 80 isolate.

Basic Local Alignment Search Tool (BLAST) was used for similarity and phylogenic relation based identification of cataloged strain number 80. It was found that said strain was 99.69% similarity with *Pseudomonas aeruginosa* LMG 1242(T) 16S ribosomal RNA gene partial sequence (Z76651).

DISCUSSION

Surgical site infection, still form a large health problem and contribute substantially to patient morbidity, mortality, prolonged hospital stay, expensive hospitalization and prolonged therapy[6]. Emergence of poly antimicrobial resistant strains of hospital pathogens has also presented a major challenge in the provision of good quality in patient care. Present study shows that prevalence rate of *P. aeruginosa* was 12.08% of all the pathogens isolated from wound infections. The prevalence rate is in agreement with the work done in

Africa (11.9%)[11], as well as a previous study from Ethiopia (10.2%)[15].

Most of isolated *P. aeruginosa* were showing resistance to daily used antibiotics viz. Ampicillin / Sulbactum (100%) and Gentamycin (50%) which was in line with (100%), (50.00%) resistant to ampicillin and gentamycin[19,20]. Most of the *Pseudomonas aeruginosa* strains isolated were highly sensitive to Cefoperazone / Sulbactam and Colistin. Surveillance of *P. aeruginosa* infections has revealed trends of increasing multidrug resistance, because of its capability of affecting many mechanisms of antibacterial resistance including multidrug efflux pumps, β-lactamases, down regulation of outer membrane porins, enzymatic degradation and target structure alteration[1,2,13,14,17].

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