

# Role of pseudomonas aeruginosa in nosocomial urinary tract infections

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## Abstract

**Introduction:** Nosocomial urinary tract infections accounts for 40% of nosocomial infections. *Pseudomonas aeruginosa* as the causative agent of nosocomial UTIs is 10.3% in previous studies. In the present study the role of *Pseudomonas aeruginosa* in nosocomial UTIs is studied in a rural medical college hospital. The result shows that the incidence of *Pseudomonas aeruginosa* as causative agent of nosocomial UTI is 12.96%. Of the isolates 25% are resistant to fluoroquinolones norfloxacin and ciprofloxacin. 20% are resistant to aminoglycosides gentamycin, 12% are resistant to amikacin and 8% are resistant to tobramycin. The resistance to carbapenems imipenem is 2% and meropenem is 5%. Multi drug resistant isolates of *Pseudomonas aeruginosa* is more compared to accepted studies.

**Keywords:** *Pseudomonas aeruginosa*, UTIs, Antimicrobials, Resistance.

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## INTRODUCTION

Nosocomial urinary tract infections constitute mostly health care associated UTIs, seen in recently catheterized patients. UTIs seen in long term care facilities (LTCFs) also should be included in this category.<sup>1</sup> In hospitals and LTCFs, catheter associated UTI is the major reservoir of antimicrobial resistant urinary pathogen in patients, which increase the risk of cross infection among catheterized patients.<sup>10</sup> 97% of all nosocomial UTIs are associated with some kind of instrumentation<sup>2,3</sup>. Nosocomial UTIs are the most common nosocomial infection worldwide (4). Most episodes of bacteriuria in short term catheterized patients are caused by single organism mostly enterococci or gram negative bacilli<sup>5</sup>. Most episodes of catheter associated bacteriuria is caused by *Escherichia coli*<sup>6</sup>. Other enterobacteriaceae like *klebsiella spp*, *Serratia spp* and *Citrobacter spp* and Non fermenters

like *Pseudomonas aeruginosa* and gram positive cocci and *Enterococci spp* is implicated in most of other episodes of nosocomial urinary tract infection<sup>6</sup>. The prevalence of *Escherichia coli* in nosocomial urinary tract infection has been widely studied but the prevalence of the non fermenter *Pseudomonas aeruginosa* in nosocomial UTIs in a rural Kerala tertiary care hospital lacks a study.

## MATERIAL AND METHODS

The study was done in Sree Narayana institute of medical sciences, over a period of one year from April 2013 to March 2014. The urine specimen sent from admitted patients for culture and sensitivity was processed. Culture was done using standard media following accepted procedures. Standard biochemical tests were performed on primary isolates for identification of the bacterial and fungal isolates. Antimicrobial sensitivity of the bacterial isolates was done by Kirby-Bauer antimicrobial sensitivity testing method. The antimicrobial protocols as per CLSI guidelines were followed. The urine specimen of patients admitted with symptoms of urinary tract infection was excluded from the study. Only patients who developed Urinary tract infection after admission to the hospital were included in the study.

## RESULTS

A total of 5400 urine specimens were studied taking into consideration the exclusion and inclusion criteria. Of this 1620 urine specimen was culture positive

No: of specimen studied	No: of culture positive specimen
5400	1620

The distribution of the isolates were as follows

Isolates	No: of each isolate
<i>Escherichia coli</i>	648
<i>Klebsiella spp</i>	243
<i>Pseudomonas aeruginosa</i>	210
<i>Proteus spp</i>	115
<i>Enterococci spp</i>	162
<i>Staphylococcus aureus</i>	48
Coagulase negative <i>Staphylococci</i>	113
<i>Candida albicans</i>	81

Percentage (%) wise distribution of the isolates

Isolates	Percentage (%) of each isolate
<i>Escherichia coli</i>	40%
<i>Klebsiella spp</i>	15%
<i>Pseudomonas aeruginosa</i>	12.96%
<i>Proteus spp</i>	7.09%
<i>Enterococci spp</i>	10%
<i>Staphylococcus aureus</i>	2.96%
Coagulase negative <i>Staphylococci</i>	6.97%
<i>Candida albicans</i>	5%

Percentage (%) wise distribution of Antimicrobial sensitivity and resistance pattern of the *Pseudomonas aeruginosa* isolates

Antimicrobial	%:of sensitive isolates	%:of resistant isolates
<b>Beta lactan/Beta lactam inhibitor combination</b>		
Piperacillin	85	15
Piperacillin-Tazobactam	95	5
<b>Cephalosporins(Parentral)</b>		
Ceftazidime	89	11
Cefepime	91	8
<b>Monobactams</b>		
Aztreonam	93	8
<b>Carbapenems</b>		
Imipenem	98	2
Meropenem	97	3
<b>Aminoglycosides</b>		
Gentamicin	80	20
Amikacin	88	12
Tobramicin	92	8
Netilmicin	95	5
<b>Fluoroquinolones</b>		
Ciprofloxacin	75	25
Norfloxacin	75	25
Ofloxacin	78	22
Levofloxacin	85	15

## DISCUSSION

The number of cases of nosocomial urinary tract infection caused by *Pseudomonas aeruginosa* is 210 out of the 1620 case of nosocomial UTI cases studied. This is 12.96% of all the cases studied. In an earlier study by Richard MJ, Edward JR et al, the percentage of nosocomial UTIs was

only 10.3 %.<sup>6</sup> The present study shows that there is an increase in number of cases of nosocomial UTI with *Pseudomonas aeruginosa* as the causative organism. This in the Indian scenario is a reason for apprehension. The antimicrobial sensitivity and resistance pattern shows that the resistance for the fluoroquinolone ,ciprofloxacin is the

maximum, which is 25% of all *Pseudomonas aeruginosa* isolated and the fluoroquinolone, norfloxacin also showing resistance to 25% of *Pseudomonas aeruginosa* isolated. A previous study by Philip D Lister et al also mentions that the resistance exhibited by *Pseudomonas aeruginosa* to fluoroquinolones is highest and of the fluoroquinolones ciprofloxacin showed more resistance which was about 20 to 35%<sup>7</sup>. But in the present study the resistance exhibited by norfloxacin is also similar to ciprofloxacin. In the present study 20 % of *Pseudomonas aeruginosa* isolated are resistant to the aminoglycoside, gentamicin. This is in accordance with a previous study done by Philip D Lister et al<sup>7</sup>. The resistance exhibited by the isolated *Pseudomonas aeruginosa* to the other aminoglycosides amikacin is 12% and to bramycin is 8%. This is much less than a previous study<sup>7</sup>. The resistance shown by the *Pseudomonas aeruginosa* isolates to carbapenems, imipenem is 2% and meropenem is 5%. This is much less when compared to a previous study by Landman D et al in which it was 30% for imipenem and 23% for meropenem<sup>8</sup>. This is a sure sign that the resistance shown to carbapenems is not as alarming in Indian scenario when compared to other studies. The *Pseudomonas aeruginosa* isolates in the study shows resistance to multiple drugs, including beta lactams and beta lactam inhibitor combinations and also to cephalosporins, aminoglycosides, fluoroquinolones and even to carbapenems. This study shows that there is an evolution of multi drug resistance among the *Pseudomonas aeruginosa* isolated. This is in concurrence with a previous study done by Flamm et al<sup>6,9</sup>

## CONCLUSION

1. The increase in number of nosocomial urinary tract infection caused by *Pseudomonas aeruginosa* is a cause for concern for health care professionals.
2. The study shows that, *Pseudomonas aeruginosa* developing resistance to carbapenems is not on

the rise when compared to previous studies, which is a relief to the medical fraternity.

3. The study results, shows that the evolution of multi drug resistance by *Pseudomonas aeruginosa* should be viewed with caution in medical circles

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