

# Gram Negative Uropathogens and their Susceptibility Pattern: A Retrospective Analysis

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**Abstract- Background:** Urinary Tract Infection is one of the most common infections observed in clinical practice among community & hospitalized patients. Since the pattern of sensitivity is constantly changing, monitoring the antimicrobial susceptibilities has become more important. It provides information of the pathogenic organisms isolated from patients as well as assists in choosing the appropriate antimicrobial therapy.

**Aims & Objectives:** This retrospective study aims to analyze various Gram negative uropathogens and their antibiotic susceptibility pattern which would assist in selecting the most appropriate antibiotic therapy & for treatment of Urinary Tract Infection in a Tertiary Care Hospital.

**Materials & Methods:** 510 urine isolates were studied retrospectively from November 2010 to October 2011 and cultured on to Mac Conkey agar plate. The plates that showed colonies  $>10^5$  were considered significant & were identified by standard biochemical tests & sensitivity of the organisms was performed by Kirby – Bauer method on Mueller Hinton agar.

**Results:** Out of the 510 samples processed, 118 (23.13%) gave positive urine culture, of which 73 (61.86%) were Escherichia coli, 22 (18.64%) were Klebsiella, 15(12.71%) were Pseudomonas, 4 (3.38%)were Citrobacter, and 1 isolate of Proteus and 1 isolate of Acinetobacter. The resistance to Quinolones was found to be very high 85/118 (72.03%).

**Conclusion:** This study discourages the indiscriminate use of antibiotics which in turn would prevent further development of bacterial drug resistance. For this, a proper knowledge of susceptibility pattern of uropathogens is necessary before prescribing empirical antibiotic therapy.

## I. BACKGROUND

Urinary Tract Infection (UTI) is one of the most common infections observed in clinical practice among community & hospitalized patients<sup>1</sup>. Despite the widespread availability of antibiotics, UTI remains the most common bacterial infection in human population.<sup>2</sup> Since the antibiotic susceptibility pattern is constantly changing, monitoring the antimicrobial susceptibility has become mandatory.<sup>3</sup> It provides information on the pathogenic organisms isolated from patients as well as assists in choosing the most appropriate antimicrobial therapy.<sup>4</sup>

Antibiotics today are the frontline therapeutic means of medical intervention in an infection, which plays a central role in the control and management of infectious diseases. Antimicrobial resistance occurs in intestinal bacteria due to antibiotic therapy for treating infections outside the urinary tract. The use of antibiotics have an influence in the spread of antimicrobial resistance among bacteria.<sup>5</sup> The current knowledge of

susceptibility pattern is mandatory for the proper management of Urinary Tract Infection.<sup>6</sup> The present study is undertaken to determine the sensitivity profiles of urinary isolates from Vinayaka Missions Kirupananda Variyar Medical College, Salem which guides in choosing the appropriate antibiotic therapy for the treatment of UTI.

## II. AIMS & OBJECTIVES

This retrospective study aims to analyze various Gram negative uropathogens and their antibiotic susceptibility pattern in a Tertiary Care Hospital, which would assist in selecting the most appropriate antibiotic therapy and for treatment of Urinary Tract Infection.

## III. MATERIALS & METHODS

510 urine samples were studied retrospectively from November 2010 to October 2011. 427 samples were mid – stream urine specimens obtained by clean catch method. Others included catheterized urine samples also ( Table 1 ). Culture was done on Blood agar plate and Mac Conkey agar plate by standard loop method. The plates were incubated at 37 ° C overnight. Samples that showed a colony count of  $>10^5$  were considered significant. The colonies were identified by standard biochemical tests. Antibiotic susceptibility testing was done according to CLSI guidelines on Mueller Hinton agar by Kirby – Bauer method using 0.5 Mac Farland’s standards and ATCC *E.coli* 25922 as a control. The data was recorded and analyzed.

**Table 1. Distribution of Type of Urine Samples**

S.No	Type of Urine Sample	Total Number
1.	Mid – Stream Urine Samples	427
2.	Catheterized Urine Samples	83
3.	<b>Total</b>	<b>510</b>

IV. RESULTS

Out of the 510 samples processed, growth was seen in 116 (23.13%) samples. Out of the 116 isolates 73(61.86%) were *Escherichia coli*, 22 (18.64%) were *Klebsiella spp.*, 15 (12.71%) were *Pseudomonas spp.*, 4 (3.38%) were *Citrobacter spp.*, 1 sample of *Proteus spp.* (0.08%) and 1 sample of *Acinetobacter spp.* (0.08%) were obtained (Table. 2). Polymicrobial infection mounted to 12 (10.16%). 8 isolates of *Candida* were obtained.

**Table 2. Percentage of various organisms isolated from Urine samples**

Organism isolated	Number of organisms( n, %)
<i>Escherichia coli</i>	73 (61.86%)
<i>Klebsiella spp.</i>	22 (18.64%)
<i>Pseudomonas spp.</i>	15 (12.71%)

<i>Citrobacter spp.</i>	4 (3.38%)
<i>Proteus spp.</i>	1 (0.08%)
<i>Acinetobacter spp.</i>	1 (0.08%)
TOTAL	116

The sensitivity pattern in all the organisms were as follows :

Sensitivity to Imipenem was 100%, Nitrofurantoin was 90.57%, Amikacin was 83.02%, Netilmycin was 80.19%, Amoxyclav was 73.59%, fourth generation cephalosporin was 43.4%, Fluoroquinolones was 32.1% and Third Generation Cephalosporin was 30.8%. The sensitivity pattern of the isolated organisms to various drugs is given in Table 3.

**Table 3. Sensitivity pattern of various organisms to various drugs**

Name of the organism isolated (n)	Percentage of sensitivity								
	I	Ak	3GC	4GC	Nx	Nf	Nt	Ac	Pit
<i>Escherichia coli</i> (73)	100	84.93	34.24	27.39	19.17	82.19	78.08	30.13	93.15
<i>Klebsiella species</i> (22)	100	90.90	18.18	18.18	0	63.63	72.72	4.1	90.90
<i>Pseudomonas species</i> (15)	100	60	26.66	33.33	40	33.33	53.3	2	80
<i>Citrobacter species</i> (4)	100	75	0	0	0	50	50	0	50
<i>Proteus mirabilis</i> (1)	100	100	100	100	100	100	100	100	100
<i>Acinetobacter species</i> (1)	100	100	100	100	100	100	100	100	100

I – Imipenem; Ak – Amikacin; 3GC – 3<sup>rd</sup> Generation Cephalosporin; 4GC – 4<sup>th</sup> Generation Cephalosporin; Nx – Norfloxacin; Nf – Nitrofurantoin; Nt – Netilmycin; Ac – Amoxycylav; Pit – Piperacillin / Tazobactam

## V. DISCUSSION

Urinary Tract infection is a commonest cause of morbidity and can lead to significant mortality. Careful diagnosis and treatment result in successful resolution of infection in most instances.<sup>6</sup> Our study shows that *E.coli* is still the commonest cause of UTI in the community and hospital settings followed by *Klebsiella*, *Pseudomonas*, *Citrobacter*, *Proteus* & *Acinetobacter*. Study done by Asad U Khan and Mohd S Zaman of Aligarh also states that *Escherichia coli* is common in both the community and in hospitalized patients.<sup>7</sup> This study correlates with the study done by Smitha Sood et al in Jaipur where *E.coli* was found to be predominant (61.84%) and also with the studies done by Saurabh Jain et al (65.96%) in Ujain and Mohammed Akram et al (61%) in Aligarh.<sup>8,9,10</sup> In the paediatric age group also *E.coli* was found to be common.<sup>11</sup> The overall sensitivity pattern to various antibiotics were as follows: Imipenem was 100%, Nitrofurantoin was 90.57%, Amikacin was 83.02%, Netilmycin was 80.19%, Amoxycylav was 73.59%, Fourth generation cephalosporin was 43.4%, Fluoroquinolones was 32.1% and Third generation Cephalosporin was 30.8%. In the present study, the isolates showed high degree of resistance to Third generation Cephalosporin and Fluoroquinolones which indicates that they can no longer be opted for treating UTI.<sup>5</sup> Nitrofurantoin and Amikacin was found to be more effective for Gram negative isolates which is in concordance with the study done by Jha VC and Yadav JN of Nepal.<sup>12</sup>

## VI. CONCLUSION

This study discourages the indiscriminate use of antibiotics which helps to curb further development of bacterial drug resistance. For this, a proper knowledge of susceptibility pattern of uropathogens in the given locality is necessary before prescribing empirical antibiotic therapy.

## REFERENCES

- [1] S.W.Khan.A.Ahmed. Uropathogens and their Susceptibility Pattern : a Retrospective Analysis, JPMA 51 : 98,2001.
- [2] Charania S.Siddiqui P. Hayat L. Astudy of urinary infections in school going female children. J. Pak. Med. Assoc.,1980;30:165 – 167
- [3] Gupta V, Yadav A, Joshi RM. Antibiotic resistance pattern in uropathogens.Indian J Med Microbiol 2002;20:96-8.
- [4] K.D.Deshpande, A.P. Pichare et al. Antibigram of Gram negative uropathogens in hospitalized patients. International J of Recent Trends in Sciences and Technology, Vol 1, Issue 2,2011:56-60.

- [5] K.R.Rajesh,S.Mathavi,R.Indira Priyadarsini. Prevalence of Antimicrobial Resistance in Uropathogens and determining Empirical herapy for Urinary tract Infections;International Journal of Basic Medical Sciences, Vol.1,Issue 5,2011:1-9.
- [6] SB Shrestha, RB Basnet, P Shahi. A Retrospective study on prevalence of Multidrug resistant strains of uropathogens in Kathmandu model hospital. National Academy of Medical Sciences-NAMS;Vol.7,No.2,July-Dec 2007:56-65
- [7] Asad U Khan and Mohd S Zaman. Multiple drug resistance pattern in Urinary Tract Infection patients in Aligarh
- [8] Smitha Sood, Ravi Gupta. Antibiotic Resistance Pattern of Community Acquired Uropathogens in a Tertiary Care Hospitalin Jaipur, Rajasthan. Indian Journal of Community Medicine;Vol.37,Issue 1, January 2012
- [9] Dr.Saurabh Jain et al.Prevalence of Uropathogens in various Age groups & their Resistance Pattern in a Tertiary Care Hospital in Central India. NJIRM 2011; Vol.2(4). October-December.
- [10] Mohammed Akram et al.Etiology and antibiotic resistance patterns in community-acquired Urinary Tract Infections in JNMC Hospital in Aligarh,India.Annals of Clinical Microbiology and Antimicrobials 2007;6:4.
- [11] Mohammad al Shra et al. A five year etiology and Antimicrobial Susceptibility pattern of Urinary Pathogens in Children at Princess Rahmah Hospital, Jordan. Saudi J Kidney Dis Transpl. 2011;22 (6);1249 – 1252.
- [12] Jha VC,Yadav JN. Bacterial species isolated from urine of UTI patients and their sensitivity to commonly available antibiotics. J Nepal Med Assoc 1992;30:222 – 225.

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