



A STUDY ON DRUG RESISTANCE PATTERN AMONG URINARY PATHOGENS IN A TERTIARY TEACHING HOSPITAL

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ABSTRACT

One of the commonest infection worldwide is urinary tract infection and the antibacterial susceptibility and clinical characteristic are important in deciding the management. This study is done to assess the susceptibility and frequency of urinary pathogens in our geographical location. A total of 332 positive urine samples were assessed; *E. coli* was the most prevalent organism (43.4%). With respect to the uropathogens susceptibility rates, the resistance of enterobacteria to ciprofloxacin and sulfamethoxazole-trimethoprim was 30% and 50%, respectively. Susceptibility was more than 90% for nitrofurantoin, third-generation cephalosporins and aminoglycosides. Increased resistance of antimicrobials to organisms signifies the need of knowledge of susceptibility rates of uropathogens in particular geographic location which will be useful in deciding the management regarding patients with urinary tract infections.

KEYWORDS: Urinary tract infections; Antibacterial drug resistance; Antibacterial agents.

INTRODUCTION

Urinary tract infections (UTI) is one of most common infections, superceded only by respiratory and gastrointestinal infections. Every year about 150 million people gets urinary tract infection around the world.^[1] Generally UTI is defined as bacterial occupation of any part of the urinary tract, from the urethra to kidneys.^[2] Which may be either lower or upper urinary tract. There may be variation in antibiotic susceptibility depending upon local conditions which is important in deciding the ideal choice for empirical antimicrobial therapy.^[3]

Gram-negative bacteria's are one of most common causative agent of UTI among which *Escherichia coli* being the commonest. *Proteus mirabilis*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, Group B *Streptococcus* and *Staphylococcus* are other most common following *E. coli*.^[4] Disparity in microbial range and susceptibility patterns may present in different geographical regions, and hence the previous use of antimicrobials is an important prognostic factor of resistance.^[5]

There is increase in incidence of these infections and it's a must to start the antibiotics even before the results of culture and sensitivity become available which often lead to the starting empirical therapy. Many studies have shown rise in resistance to common antimicrobials.^[6] Hence having a clear idea about resistance pattern of urinary pathogens is important in choosing ideal

antibiotic in the initial empirical management of the patient. The aim of this study is to assess the frequency of infective organisms and their antibiotic susceptibility in patients with community acquired UTI in a tertiary teaching hospital.

MATERIALS AND METHODS

We did this as a retrospective study to estimate the inference of urine cultures our central microbiological laboratory in Dharmapuri Medical College. Reports were collected from Decemeber 2016 to June 2017.

The urine specimens were Inoculated into CLED agar. A count $\geq 100,000$ colony forming units (CFU) per millilitre of urine was considered positive. The drug liability was confirmed on specimens using the disk diffusion method, according to CLSI (Clinical & Laboratory Standard Institute) 2016 recommendations. Only aerobic bacterial infections were evaluated in this study. Cultures showing fungal growth, insignificant growth and those not conclusive in the laboratory were excluded.

RESULTS

A total of 332 urine samples showed growth in culture. Of these, 200 (60.24%) were from women. The mean age of patients was 33.74 years and median was 28 years at the time of evaluation (range 1 year – 85 years). Among the patients with samples having positive growth 46 (14%) were older than 60 years; of these, 20 (43.5%)

were female. Among the urine samples with growth, the most frequent urinary pathogen found was *E. coli* (144/43.4%), followed by *Klebsiella* spp. (74/22.3%), Coagulase Negative *Staphylococcus* spp. (70/21%) and *Pseudomonas*. (32/9.7%).

Data are summarized in Tables 1 and 2.

Table 1: Frequency of common urinary pathogens.

Common urinary pathogens(n=332)		
Organism	No of patients	Percentage
<i>E.coli</i>	144	43.40%
<i>Klebsiella</i>	74	22.30%
Cons	70	21%
<i>Pseudomonas</i>	32	9.70%
<i>Staph aureus</i>	6	1.80%
<i>Citrobacter</i>	4	1.20%
<i>Proteus</i>	2	0.60%

Table 2: Percentage of antibiotic susceptibility in common organisms.

Antimicrobial	% susceptible			
	<i>E.coli</i> (n=144)	<i>Klebsiella</i> (n = 74)	Cons (n=70)	<i>Pseudomonas</i> (n=32)
Amikacin	86%	94%	77%	75%
Gentamicin	80%	77%	83%	75%
Ciprofloxacin	70%	66%	61%	80%
Nitrofurantoin	69%	81%	57%	91%
Cotrimoxazole	50%	53%	89%	25%
Ceftriaxone	57%	93%	70%	58%
Erythromycin	47%	75%	68%	25%
Ofloxacin	80%	65%	90%	57%
Norfloxacin	68%	58%	63%	75%

Resistance to ciprofloxacin was identified in 30% of *E. coli* and 34% of *Klebsiella* spp., and 20% of *pseudomonas* species. Resistance to sulfamethoxazole-trimethoprim was very high 50% for *E. coli*, 53% for *Klebsiella* spp., 11% for CONS., and 75% for *Pseudomonas* spp which is very high. Sensitivity to ceftriaxone was 57 % for *E. coli*, 93% for *Klebsiella* spp., and 70% for CONS spp. *E. coli* was sensitive to nitrofurantoin in 69% of the samples. Coming to aminoglycosides, susceptibility to amikacin was 86% for *E. coli*, 94% for *Klebsiella* spp., and 77% for CONS spp.

DISCUSSION

Our study gives a wide evidence about the various species causing community acquired UTI and their drug susceptibility and resistance in concern with antibiotics. All samples were collected in tertiary care teaching hospital. Among our samples collected were mostly from women with prevalence of 60.24%. While patients above 60 year were around 14%, mostly women,

Furthermore, we had a high percentage of samples from people aged 60 and over (31.9%), predominantly women. As we know from previous studies that UTI is more common in older persons, particularly women, there will be more incidence of asymptomatic bacteriuria and UTIs.^[7] Hence there is increased rate of antimicrobial use in this group of patients. All these aspects have in all probability contributed to a varied sensitivity profile to the antibiotics. Similarly due to above said reasons in this study there is high resistance of Gram-negative Enterobacteriaceae to quinolones and high resistance of *Pseudomonas* to cotrimoxazole and erythromycin.

Escherichia coli, *Klebsiella* spp, *Pseudomonas* spp and Coagulase Negative *Staphylococci* (CONS) were isolated in 96% of the samples, and most were susceptible to aminoglycosides. Individually *E.coli* and *Klebsiella* was highly susceptible to Amikacin. While CONS was highly susceptible to ofloxacin and *Pseudomonas* to Nitrofurantoin.

In our population we use fluoroquinolones (FQs) widely for empirical treatment of UTI. But here we witnessed high resistance levels in main species to the tested FQs like more than 20% for *E. coli*. Similar data were seen in some studies done before. Another risk factor for development of this resistance is previous use of quinolones.^[8] Hence the indiscriminate use of FQs in Community acquired UTI may lead to rise of percentage of resistance seen. Therefore, quinolones must be considered with more intensive thought for empirical therapy to avoid future development of resistance.

Most of the *E.coli* isolated (50%) and other species were resistant to cotrimoxazole except CONS, this is similar to earlier studies^[9] this is mainly due to common use of this drug in various infections in community. Hence it's not a safest choice for empirical therapy. Even guidelines of the American Infectious Diseases Society recommend that antibiotics with a resistance above 20% should be avoided prescribing empirically to patients with uncomplicated urinary tract infection unless susceptibility is confirmed by prior isolation in culture.^[10]

The high susceptibility to third-generation cephalosporins and aminoglycosides (> 75% in almost all strains), make them the drug of choice in empirical

therapy of UTI until culture results are available. Based on above results its clear the most common infection in our community is E.coli. Female are more prone for such infections. In paediatric age group the most common infections were E.Coli followed by CONS. They were highly susceptible to Aminoglycosides and Cotrimoxazole respectively. Whereas in reproductive age group it was E.Coli and Klebsiella was the most frequent causative organisms and were highly susceptible to aminoglycosides and Cephalosporins respectively

To conclude treating physicians must know the significance of awareness of the local antimicrobial susceptibility in deciding the treatment for UTI, thereby reducing the indiscriminate usage of antimicrobials and to reducing the development of resistance of community bacteria to antimicrobials commonly prescribed for this condition.

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REFERENCES

1. Hooton TM. Clinical practice. Uncomplicated urinary tract infection. *N Engl J Med*, 2012; 366: 1028-37.
2. Saadeh SA, Mattoo TK. Managing urinary tract infections. *Pediatr Nephrol*, 2011; 26: 1967-76
3. Hsueh PR, Hoban DJ, Carmeli Y, Chen SY, Desikan S, Alejandria M, et al. Consensus review of the epidemiology and appropriate antimicrobial therapy of complicated urinary tract infections in Asia-Pacific region. *J Infect*, 2011; 63: 114-23.
4. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in J N M C Hospital Aligarh, India. *Ann Clin Microbiol Antimicrob*, 2007; 6: 4.
5. Kiffer CR, Camargo EC, Shimakura SE, Ribeiro PJ Jr, Bailey TC, Pignatari AC, et al. A spatial approach for the epidemiology of antibiotic use and resistance in community-based studies: the emergence of urban clusters of *Escherichia coli* quinolone resistance in Sao Paulo, Brasil. *Int J Health Geogr*, 2011; 10: 17.
6. Kiffer CR, Mendes C, Oplustil CP, Sampaio JL. Antibiotic resistance and trend of urinary pathogens in general outpatients from a major urban city. *Int Braz J Urol*, 2007; 33: 42-8.
7. Mody L, Juthani-Mehta M. Urinary tract infections in older women: a clinical review. *Jama*, 2014; 311: 844-54.
8. Killgore KM, March KL, Guglielmo BJ. Risk factors for community-acquired ciprofloxacin-resistant *Escherichia coli* urinary tract infection. *Ann Pharmacother*, 2004; 38: 1148-52.
9. Andrade SS, Sader HS, Jones RN, Pereira AS, Pignatari AC, Gales AC. Increased resistance to first-line agents among bacterial pathogens isolated from urinary tract infections in Latin America: time for local guidelines? *Mem Inst Oswaldo Cruz*, 2006; 101: 741-8.
10. Gupta K, Hooton TM, Naber KG, Wullt B, Colgan R, Miller LG, et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: a 2010 update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. *Clin Infect Dis*, 2011; 52: e103-20.