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Antibiotic Susceptibility Pattern of Urinary Isolates from a Tertiary Care Hospital in Kathmandu

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ABSTRACT

Urinary tract infection (UTI) is the commonest clinical condition encountered by the clinicians worldwide. The present research was conducted to find out bacterial pathogens responsible for UTI and their antimicrobial susceptibility patterns. The study was done in the Department of Microbiology, Nepalese Army Institute of Health Sciences (NAIHS), Kathmandu, Nepal. Total 450 clean catched midstream urine (MSU) samples were collected, processed, identified and their susceptibility patterns to commonly used antimicrobial agents were recorded according to the CLSI (Clinical Laboratory Standard Institute) guidelines. Out of 450 samples, 108 (24.0%) showed bacterial growth in which UTI occurred more in female with 84 isolates (77.8%) than in male 24 (22.2%). *Escherichia coli* was the predominant bacterial isolate and accounted for 80 (74.1%) of the total UTI cases followed by *Klebsiella pneumoniae* 11 (10.2%), *Proteus mirabilis* 5 (4.6%), *Pseudomonas aeruginosa* 4 (3.7%), *Staphylococcus aureus* 4 (3.7%), *Staphylococcus saprophyticus* 2 (1.9%), and *Enterococcus* species 2 (1.9%). The isolates were more sensitive to cefotaxim, amikacin, ofloxacin and norfloxacin. Most of the strains isolated were resistant to ampicillin, nalidixic acid, nitrofurantoin, cotrimoxazole followed by ciprofloxacin and gentamycin. The resistant patterns of urinary isolates with 3rd generation cephalosporin are increasing due to irrational and empirical use of antibiotics.

Keywords: UTI, Antibiotic susceptibility pattern, *Escherichia coli*

INTRODUCTION

Urinary tract infection (UTI) is a bacterial infection most frequently found in women and with greater frequency in older than in younger women. It refers to both microbial colonization of the urinary tract and tissue invasion. Bacteria are most commonly responsible for the infection [1]. UTI account for approximately 10 % of OPD visits in case of women and 15 % of women will have UTI at some time during their life. In pregnant women, the incidence of UTI can be as high as 8 % [2]. It has been observed that 7 % of children with UTI develop renal scarring [3,4]. UTI is characterized by the presence of more than 10^5 CFU/ml urine in the mid stream urine sample [5]. Pregnant women are at increased risk for UTI because of asymptomatic bacteriuria.

Antimicrobial agents are among the most commonly used and misused of all drugs. The growing awareness amongst the general public about antibiotics and their availability across the counter has given scope for misuse and emergence of resistance to some of the so called new generation of antibiotics. Antibiotics are usually given empirically before the laboratory results of urine cultures are available. To ensure appropriate therapy, current knowledge of the organisms that cause UTI and their antibiotic susceptibility is mandatory [6].

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If untreated, bacteriuria in pregnancy leads to either asymptomatic or symptomatic UTI. During pregnancy reduction in immunity encourages both commensal and non-commensal microorganisms, to increases the plasma volume and decrease the urine concentration and develop the glucosuria which encourages bacterial growth in the urine [7].

Escherichia coli remained the most common causative agent of uncomplicated UTI for many years with 75-90% causes of UTI infection. *Klebsiella pneumoniae* accounts for second highest organisms. The other Gram negative pathogens causing UTI are *Proteus mirabilis* and *Pseudomonas aeruginosa*, however, *Enterococci* sp and *Staphylococcus saprophyticus* are the most frequently encountered Gram positive bacteria in UTI [7,8].

To ensure appropriate therapy, current knowledge of the organisms that cause UTI and their antibiotic susceptibility testing is mandatory. Due to rising antibiotic resistance among uropathogens, it is important to have local hospital based knowledge of the organisms causing UTI and their antibiotic sensitivity patterns [8].

Hence the present study serves to know the prevalence of common pathogens and their antimicrobial susceptibility pattern in a tertiary care hospital.

METHODOLOGY

This study was carried out in the department of Microbiology, Nepalese Army Institute of Health Sciences (NAIHS), Kathmandu, Nepal to isolate the UTI pathogens and determine their antibiotic susceptibility pattern. A total of 450 mid-stream urine (MSU) samples were collected randomly in a sterile, wide mouthed container from the patients who attended the hospital with a suspected case of UTI during the period of January 2014 to December 2014. Urine samples were collected before antibiotic therapy was started and processed according to the Clinical laboratory standard institute (CLSI) guidelines [9].

Samples showing more than 10^5 CFU/ml of urine were considered as significant and were subjected to antibiotic susceptibility testing by Modified Kirby Bauer's disc diffusion technique as recommended by CLSI guidelines [9,10]. The antibiotics used were amikacin, ampicillin, cefotaxime, ciprofloxacin, co-trimoxazole, gentamycin, nalidixic acid, nitrofurantoin, norfloxacin, ofloxacin (Hi-Media, India).

RESULTS

Out of total 450 clean catched midstream urine (MSU) samples, 108 (24.0%) samples showed bacterial growth. In the present study UTI occurred more in females than in males, comprising 84 (77.8%) and 24 (22.2%) respectively (**Table-1**).

Table 1. Prevalence of UTI in different age and sex groups

Age group (years)	Male	Female	Total (n = 108)	Percentage
0-10	2	3	5	3.7
11-20	0	7	7	6.5
21-30	0	21	21	19.4
31-40	2	32	36	33.3
41-50	7	13	21	19.4
51-60	13	8	19	17.6
Total	24	84	108	

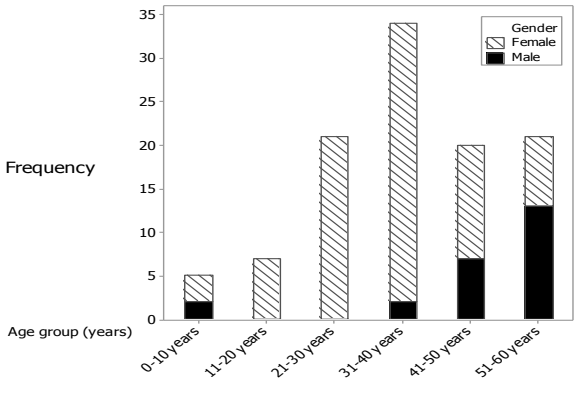

Figure 1. Prevalence of UTI in different age and sex groups

Escherichia coli was the commonest bacteria isolates 80 (74.1%), followed by *Klebsiella pneumonia* 11(10.2%), *Proteus mirabilis 5* (4.6%) *Pseudomonas aeruginosa 4* (3.7%), *Staphylococcus aureus 4* (3.7%), *Staphylococcus saprophyticus* 2 (1.9%), and *Enterococcus* species 2 (1.9%). (**Table -2**)

Table 2. Bacterial isolates from UTI cases

Organisms	Total isolates n = 108 (24.0%)
Escherichia coli	80 (74.0%)
Klebsiella pneumoniae	11 (10.2%)
Proteus mirabilis	5 (4.6%)
Pseudomonas aeruginosa	4 (3.7%)
Staphylococcus aureus	4 (3.7%)
Staphylococcus saprophyticus	2(1.9%)
Enterococcus species	2(1.9%)

Table 3. Sensitivity patterns of isolated organisms to commonly used antibiotics

Antibiotics	Conc (in mcg /disc)	Zone of Inhibition (mm)			*E. coli*	*Klebsiella* sp.	*Proteus* sp.	*P. aeruginosa*	*S. aureus*	*S. saprophyticus*	*Enterococcus* sp.
		R	I	S							
Ampicillin	10	13	18	19	85.50	95.00	95.00	35.0	50.00	40.00	20.0
Ciprofloxacin	5	15	16-20	21	00.00	15.20	10.00	35.50	30.00	35.00	5.20
Nalidixic acid	30	13	14-18	15	30.00	40.00	7.00	31.10	15.00	29.00	25.00
Nitrofurantoin	300	14	15-16	17	88.10	55.00	35.00	31.00	89.00	ND	71.00
Cotrimoxazole	25	10	11-15	16	35.00	50.00	07.00	ND	28.00	20.0	10.0
Amikacin	30	14	15-16	17	87.00	97.00	95.00	30.00	55.00	42.00	20.00
Gentamycin	10	12	13-14	15	65.00	72.00	28.0	30.00	65.00	35.00	50.00
Norfloxacin	10	12	13-16	17	33.00	25.00	25.0	40.00	35.10	ND	15.20
Ofloxacin	5	12	15-17	18	35.00	ND	ND	ND	49.00	45.50	09.10
Cefotaxime	30	14	15-22	23	30.10	65.00	70.40	25.00	65.00	25.1.0	36.00

R= Resistance
I = Intermediate
S = Sensitive
ND = Not Done
E = Escherichia
S = Staphylocuccus

Antibiotic sensitivity test was carried out on the basis of past experiences with type of organism and it's sensitivity. The isolates were more sensitive to cefotaxim, amikacin, ofloxacin and norfloxacin. Most of the strains isolated were resistant to ampicillin and nalidixic acid, nitrofurantoin, cotrimoxazole followed by ciprofloxacin and gentamycin. (**Table-3**).

The resistant pattern of urinary isolates with 3rd generation Cephalosporin are increasing due to irrational and repeated use of antibiotics.

DISCUSSION

This study evaluated the causative agents of UTI and their antimicrobial susceptibility patterns in urine samples obtained from a tertiary care hospital of Kathmandu, Nepal. In our study the total growth positive rate (24.0%) was observed. Similar result was noted in a study done by *Kumari et al* with a prevalence of 25.7% [3]. The findings are slightly higher in comparison to the findings from *Chhetri et al* (21.8%) [11] and *Raza S et al* (19.7%) [12]. The result is much higher in comparison to the findings from *Akram et al* (10.8%) from India [13]. However, the findings are much less in comparison to the study conducted by *Rai et al* (37.4%) in Kathmandu, Nepal [14]. Almost similar observation was found in a study done by *Rama Prasad et al* in India [15]. In the present study UTI occurred more in females than in males. Of the 108 isolates obtained 84 (77.8%) were from females while 24 (22.2%) were from males.

The study showed that UTI is more common in females than males with a female to male ratio of 3.5:1. This is in agreement with other findings which stresses that UTI is more frequent in females than in males and this is presumably due to shorter and wider urethra. The anatomical proximity of the female urethral opening and vagina makes the former prone to trauma during sexual intercourse. Bacteria may also get easy access to urethra during pregnancy and child birth [16]. In general, UTI occur less frequently in men at all ages but the frequency increases with age. Among the males, 54.2% isolates were from more than 50-year age group. This may be due to variety of risk factors such as benign prostrate hypertrophy, diabetes, and use of urinary catheter [17].

In this study *E. coli* (74.1%) was the predominant bacterial pathogen followed by *Klebsiella* species, *Proteus* species and others. This was similar to other studies. In contrast to these findings, one study from Aurangabad showed *Klebsiella* as the commonest isolate followed by *E. coli, P. aeruginosa and S. aureus.* This may be due to the fact that the *Klebsiella* is one of the most important organisms causing nosocomial infection [18].

The antimicrobial sensitivity and resistance pattern may differ from community to community and hospital to hospital. Present study showed high rate of resistance to Ciprofloxacin for *E. coli* which is one of the most recommended drug for the treatment of UTI. This study is similar to the study conducted by *Kumari et al* [3]. This indicates that there is haphazard use of ciprofloxacin due to lack of antibiotic policy and quinolones are comparatively cheaper than the western world and are easily available across the counters.

Current study showed higher rate of sensitivity towards aminoglycoside for *E. coli, Klebsiella* species and others. This study is reinforced by the study conducted by *Mutate et al* [19]. The study showed high degree of resistance to amipicillin, norfloxacin and co-trimoxazole. Co-trimoxazole in the present study was no longer found to be effective for UTI caused by *E. coli.* The above mentioned result correlated with the study done by Babypadhmini [20].

Indiscriminate use of antibiotic had led to the development of resistant strains. A better approach to control this is, judicious use of antibiotics, only after proper antibiotic susceptibility testing. In fact, the irrational and in appropriate use of antibiotics is responsible for the development of resistance of the Enterobacteriaceae family including *E. coli*. 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 the antibiotics and for better patient management.

Conclusively, resistance rates among common uropathogens continue to evolve and appear to be increasing towards commonly used antimicrobials especially to quinolones. Continued surveillance of resistance rates among uropathogens is needed to ensure appropriate recommendations for the treatment of the infections.

CONCLUSION

The resistance rates among common uropathogens continue to evolve and appear to be increasing towards commonly used antimicrobials especially to quinolones. Continued surveillance of resistance rates among uropathogens is needed to ensure appropriate recommendations for the treatment of the infections.

COMPETING INTERESTS

The authors declare that they have no competing interest

AUTHOR CONTRIBUTIONS

GG conceived and designed the study, did the lab work and drafted the manuscript. Y.I supervised, designed the protocol for the study. RC, SB, BA, MP did the laboratory work concerning sample collection, processing, identification of clinical isolates. JB did the statistical analysis.

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