Uropathogens and their antimicrobial susceptibility pattern in Bharatpur, Nepal

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ABSTRACT

Urinary tract infection is one of the common clinical condition in the patients presenting to the clinics and hospitals. Detection of common pathogens and their antimicrobial susceptibility pattern is mandatory for effective treatment. The present study was conducted to detect common pathogens of urinary tract infection (UTI) and their susceptibility pattern to the commonly used antimicrobial agents in local scenario. We conducted a retrospective study on bacteria isolated from the urine samples submitted in microbiology unit from May 2009 to October 2009 at Chitwan Medical College. Study included total 950 clean catched midstream urine samples which were processed to identify the causative agents and their susceptibility pattern to commonly used antimicrobial agents according to the CLSI guidelines. This study showed UTI is more common in young females. Out of total 950 samples, 237 (24.94%) samples grew potential pathogens causing UTI. *Escherichia coli* were the predominant 163 (68.77%) isolates followed by *Enterobacter* spp 33 (13.92%). Most of the urinary isolates showed hundred percent resistant to Ampicillin and high degree of resistance to Nalidixic acid, Nitrofurantoin, Cotrimoxazole followed by Ciprofloxacin and Gentamicin. More than 50% of common pathogens were resistant to Ceftriaxone. Uropathogens were more sensitive to Cephotaxim, Amikacin, Ofloxacin and Norfloxacin. Uropathogens resistant to 3rd generation cephalosporin are increasing. Irrational and repeated use of antibiotics is the main cause of increasing resistant organism of UTI.

Keywords: Urinary tract infection, common pathogens, susceptibility pattern.

INTRODUCTION

Urinary tract infections (UTIs) are one of the most common bacterial infections encountered by both general practitioners and hospital doctors. UTI constitutes one of the major cause of morbidity and mortality. Incidence of infection is higher in women and 20.0-50.0% of whom, will suffer at least one clinical episode of UTI during their life time.[1] It has been observed that 7.0 % of children with UTI develop renal scarring. It also has been observed that UTI in pregnancy may be associated with an increased neonatal mortality and can also be a source of gram negative septicemia which frequently proves fatal.[2]

Appropriate antimicrobial therapy may reduce the potential for complication. Choice of appropriate antibiotics depends on the knowledge of common organisms and their antimicrobial susceptibility pattern in local scenario. No such data concerning the antimicrobial susceptibility pattern of uropathogens in Bharatpur have been published till date. We hope this study will help the clinicians to become familiar with the common pathogens responsible for UTIs and their antimicrobial susceptibility patterns which definitely help the clinicians to choose the proper empirical antimicrobial management of UTI.

MATERIALS AND METHODS

We carried out a retrospective study in the department of Microbiology on all of the bacterial strains isolated from the urine sample of patients who attended the Chitwan Medical College (CMC) with a suspected case of urinary tract infection between May 2009 and October 2009. All clean catched midstream urine samples were collected and inoculated onto the blood agar and Mac Conkey agar using sterile loop. The plates were observed for bacterial growth after 24 hrs of aerobic incubation at 37 ^{0}c. The bacteria were identified based on the colony characteristics, gram staining findings and biochemical reactions.[3,4] only patients who had significant bacteriuria (>10^5 cfu/mL) were included in the microbiological analysis.

The demographic datas were recorded and tabulated.

Susceptibility test was performed to currently used antibiotics using Kirby Bauer disc diffusion technique on Mueller–Hinton Agar (MH) or MH agar + 5% sheep blood, as recommended by the CLSI guidelines.[5]

Antibiotic discs were obtained from Hi-Media. *Escherichia coli* ATCC 25922 and *Staphylococcus aureus* ATCC 25923 were used as controls.

Table -1: Bacteria isolated from UTI cases in Bharatpur, Nepal

Organisms	Total isolates (N= 237)
Eshcherichia coli	163 (68.77%)
Enterobacter species	33 (13.92%)
Klebsiella species	14 (5.90%)
Citrobacter species	11 (4.64%)
Proteus species	3 (1.26%)
Pseudomonas species	7 (2.95%)
Acinetobacter species	3 (1.26%)
Enterococcus species	2 (0.84%)
Staphylococcus species	1 (0.42%)
Total	237 (100%)
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RESULTS

In the present study out of 950 urine samples processed, 237 (24.94%) showed significant bacterial growth.

This study showed that UTI is more common in females than in males. Female/male ratio is 1.6:1

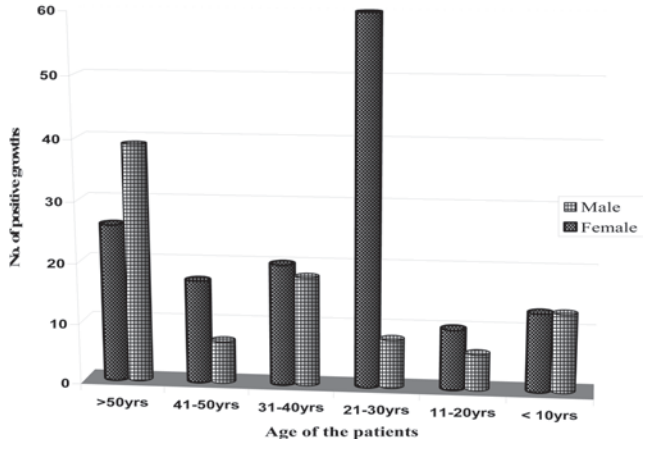

Fig. 1. Age distribution among the growth positive cases

Present study showed that a high percentage of organisms were isolated from both male and females within the age brackets of 51-60 (39) and 21-30 (60) respectively (Fig. 1).

Out of 237 bacterial growth, *E. coli* was the predominant bacterial isolates and accounted for 163 (68.77%) of the total isolates followed by *Enterobacter sp* 33 (13.92%) and *Klebsiella sp* 14 (5.90%) (Table-1). Ampicillin, Nalidixic acid, Nitrofurantoin, Cotrimoxazole and Ciprofloxacin showed less sensitivity to commonly isolated pathogens. The present study showed very sad and alarming results that more than 50% of common pathogens were resistant to Ceftriaxone. However Cephotaxim, Ofloxacin, Norfloxacin and Amikacin were found to be more effective for common pathogens (Table-2)

DISCUSSION

This is the study to evaluate the causative agents of UTI and their antimicrobial susceptibility patterns in Bharatpur, Nepal. This study provides valuable laboratory data and allows comparison of the situation in Bharatpur with that in other studies.

The total growth positive rate (24.94%) observed in this study was lower in comparison to the finding of Chitra et al (40.4%) from India.[6] However this was in agreement with other study conducted by Chhetri *et al* (21.8%), Rai *et al* (28.6%) and Kumari *et al* (25.7%) from Nepal.[7-9]

In the present study UTI occurred more in females than in males. Of the 237 isolates obtained 146 (61.60%) were from females while 91 (38.39%) were from males. This is in agreement with other reports which stress that UTI is more frequent in females than in males, during youth and adulthood. This is as a result of shorter and wider urethra. The anatomical relationship of the female's urethra and the vagina makes it liable to trauma during sexual intercourse as well as bacteria been massaged up to urethra into the bladder during pregnancy and child birth.[10,11]

UTIs occur less frequently in men at all ages. Among them (42.85%) isolates were from more than 50 years of age group. It may be because of benign prostate hypertrophy, diabetes, presence of catheter, as a risk factors associated with UTI.[12]

In this study *E. coli* was the predominant organism isolated and constituted (68.77%) of all positive samples. This finding is similar to the data obtained by other groups which indicate that *E. coli* is the commonest pathogen isolated in patient with UTI.[13] This was followed by *Enterobacter* spp (13.92%), *Klebsiella sp*

Table-2: Percentage of resistant uropathogens to commonly used antibiotics

Antibiotics	*E-coli %*	*Enterobacter species %*	*Klebsiella species %*	*Citrobacter species %*	*Proteus species %*	*Pseudomonas species %*	*Acinetobacter species %*	*Enterococcus species %*
Ampicillin	100	87.87	100.0	63.36	100.0	71.42	100.0	100.0
Cotrimoxazole	55.82	42.4	7.14	27.27	66.66	14.28	ND	100.0
Ciprofloxacin	49	51.5	14.28	37.36	33.33	14.28	33.3	50.0
Nalidixic acid	90.1	57.57	64.28	45.45	66.66	57.14	100.0	100.0
Nitrofurantoin	28.8	42.42	64.28	9.09	100.0	42.85	100.0	ND
Gentamicin	26.9	39.39	35.71	9.09	ND	28.57	66.66	ND
Amikacin	22.08	12.12	21.4	9.09	ND	ND	ND	50.0
Norfloxacin	15.95	6.06	21.4	9.09	ND	ND	ND	50.0
Ofloxacin	16.56	15.15	21.4	18.18	ND	14.28	ND	50.0
Cephotaxime	1.2	15.15	28.5	18.18	ND	ND	ND	ND
Ceftriaxone	57.0	48.48	57.14	54.54	33.33	28.57	66.66	50.0
Ceftazidime	ND	ND	ND	ND	ND	57.14	ND	ND
Tobramycin	ND	ND	ND	ND	ND	0.00	ND	ND
Piperacillin	ND	ND	ND	ND	ND	0.00	ND	ND
Carbencillin	ND	ND	ND	ND	ND	0.00	ND	ND

ND- not done

(5.90%), *Citrobacter sp* (4.64%) and others. In contrast to these findings, other studies showed *Klebsiella sp* was the second predominant isolates. This variation may be due to the fact that the *Klebsiella* spp is one of the most important organism causing nosocomial infection and is a rather uncommon source (<2.0%) of urinary tract infection in community practice.[9]

However in Anklesaria *et al* study, *Enterobacter* spp were the second most common isolates.[14]

The main differences between our results and the results of studies conducted in other places were the resistance patterns of uropathogens.

Antibiotic sensitivity pattern of organisms changing rapidly over a short period. It is especially true for developing country where antibiotics are prescribed irrationally not only by the medical practitioners but the antibiotics are also purchased directly from the chemist (Medicine shop keepers) without prescription.

It has been advised that clinicians should be aware of the rising resistance of urinary pathogens to commonly prescribed antibiotics. Ampicillin and Nalidixic acid were poorly effective against majority of the organism isolated in this study. This is followed by Nitrofurantoin, Co-trimoxazole and Ciprofloxacin.

These findings differ from the study of Ronald et al where Ampicillin and Co-trimoxazole remain the most useful antimicrobial agents and Ebie *et al* where Nitrofurantoin was the very effective drugs.[15,16]

However our findings is similar to Kolawole *et al* and Bajaj *et al* where ampicillin, nitrofurantoin and co-trimoxazole were poorly effective drugs.[12,17] The difference may be due to the practices of self medication and indiscriminate use of these antibiotics in developing country like Nepal and India and the acquirance of plasmid encoded resistance gene.[18]

This study shows that 57.14% of *Pseudomonas sp* were resistant to Ceftazidime and 28.57% to ceftriaxone. This finding is similar to Kumari from Nepal.[9] More over, the increasing resistance rate to third generation cephalosporins in E. coli between 2005 and 2006 is striking. This is due to the increase in strains harboring an extended-spectrum beta-lactamases (ESBLs).[19]
In the present study higher proportion of isolates were resistant to ceftriaxone. This finding is not corresponding to any other study's findings. It has been observed that most of the patients with even simple viral fever seeks local chemist and local doctors. Principle auther experienced that in this part of Nepal, not only local chemist but even experienced clinicians treat most of the fever with ceftriaxone considering the enteric fever. This over use of ceftriaxone certainly helps in developing the ceftriaxone resistant uropathogens.

This study highlights the need for the development of

protocol for rational use of antibiotics and local chemist as well as clinician should be train for importance of rational use of antibiotics. However in the present study Norfloxacin, Ofloxacin, Cephotaxime and Amikacin remain the most effective drugs against pathogens isolated from the subjects with urinary tract infection from this part of Nepal.

This retrospective study should be followed by a multicentre study on antimicrobial resistance in Bharatpur and other regions in Nepal to determine whether the resistance patterns and the increase in resistance to third-generation cephalosporins are similar.

Irrational and repeated use of antibiotics is the main cause of increasing resistant organism of UTI. Awareness regarding the antibiotic resistance and use is mandatory among the health care workers; otherwise the resistance to third-generation cephalosporins, the broad spectrum of the drugs that remain highly efficient, will increase rapidly in the near future.

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