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RESEARCH ARTICLE

Assessment of Asymptomatic Urinary Tract Infection and Susceptibility of Antimicrobials Agents and Resistant Patterns among Suspected Females Patients of Two Major Hospitals of Western Nepal

Suman Sharma*

Department of Surgery, Gandaki Medical College, Pokhara, Kaski, Nepal, India

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ABSTRACT

Urinary tract infection (UTI) is a common and serious health problem affecting many people each year around the world especially females. Therapy of UTI relies on the predictability of the agents causing UTI and knowledge of their antimicrobial susceptibility patterns. A retrospective cross-sectional study was conducted in two major hospitals of Western Nepal. Tools for data collection were a data collection form. A total of 400 patient's file with suspected UTI were reviewed, out of which 173 (43.3%) of the suspected samples showed the presence of potential pathogens causing UTI. UTI was most prevalent in females of age group of 21–30 years. *Escherichia coli* was the predominant (65.1%) bacterial pathogen. Amikacin was found to be the most sensitive antimicrobial followed by nitrofurantoin and gentamicin. Ampicillin showed a higher percentage of resistant, compared to other antimicrobials. As drug resistance among bacterial pathogens is an evolving process, regular surveillance and monitoring are necessary to provide effective treatment of UTIs.

Keywords: Urinary tract infection, antimicrobials, sensitivity, retrospective

INTRODUCTION

Urinary tract infection (UTI) is defined as significant bacteriuria in the presence of symptoms. UTI is the most common bacterial infection, accounting for 25% of all infections. UTI can occur in any populations and age groups; however, infection is most common in women in reproductive age.[1] It is predicted that one-half of all women will experience a UTI in their lifetime, and one in three women will receive antimicrobial therapy for UTI.[2] UTI is a heterogeneous disease, which can be divided into several types of infections such as acute, uncomplicated bacterial pyelonephritis, complicated UTI, recurrent cystitis, and asymptomatic bacteriuria. Acute UTI is one of the most common bacterial infections among women presenting to primary care.[3] Symptomatic UTI is either uncomplicated or complicated. Uncomplicated infections occur in healthy women in the community and are usually caused by *Escherichia coli*. Complicated infections are associated with anatomical, functional, or metabolic abnormalities of the urinary tract that disable the natural, innate host defense and lead to tissue injury.[4] Major causative organisms for UTI are *E. coli*, *Klebsiella* species, *Proteus* species, *Pseudomonas* species, and *Staphylococcus* species.[5]

Bacterial UTIs are frequent infections in the outpatient as well as in the nosocomial setting. UTI is among the most prevalent microbial diseases, and their financial burden on society is substantial. Approximately, 15% of all community-prescribed antibiotics are dispensed for UTI. In uncomplicated UTIs, *E. coli* is the leading organism, whereas, in complicated UTIs, the bacterial spectrum is much broad including Gram-negative and Gram-positive and often multi-resistant organisms. The therapy of uncomplicated UTIs is almost exclusively antibacterial, whereas in complicated UTIs the complicating factors have to be treated as well. There are two predominant aims in the antimicrobial treatment of both uncomplicated and complicated UTIs: (1) Rapid and effective

***Corresponding Author:**
Dr. Suman Sharma,
E-mail: drsumansharmams@hotmail.com

response to therapy and prevention of recurrence of the individual patient treated; and (2) prevention of emergence of resistance to antimicrobial chemotherapy in the microbial environment.[6]

MATERIALS AND METHODS

A retrospective cross-sectional study was conducted in two major hospitals of Western Nepal, Western Regional Hospital and Gandaki Medical College from September 2018 to January 2019, after approval of the proposal from Gandaki Medical College – Institutional Review Committee, Lekhnath, Kaski, Nepal. Inclusion criteria for the study were the data of females patient suspected with UTI, data of sensitivity pattern that was up to 5 months back from the time of the study. Exclusion criteria were data of sensitivity pattern other than UTI, data of sensitivity pattern that was >5 months back from the time of the study. Initially, a total of 400 patient's files with suspected UTI were reviewed. Tools for data collection were the structured form, and the variables for data collection were the patient's demographic data, the causative agent of the UTI and sensitivity and resistant pattern of antimicrobials. Results were analyzed using SPSS version 17 for windows.

RESULTS

Age distribution among suspected UTI patients

A total of 400 medical files were reviewed of patients suspected with UTI. Among those suspected with UTI a higher percentage of females (27.8%) were found within the age group of 21–30 years; however, the lowest percentage (3.0%) of the patient was with age group of >80 years as shown in Table 1.

Bacterial growth representation

Out of 400 urine samples of suspected patients, growth of multiple organism occurred in 27 samples (6.75%), significant growth of a singular organism that causes UTI was found in 173 samples (43.25%), in significant growth of microorganism occurred in 31 samples (7.75%), and no growth of microorganism occurred in 169 samples (42.25%) as shown in Figure 1.

Table 1: Age distribution among suspected UTI patients

Age group	Frequency (%)
0–10	26 (6.5)
10–20	52 (13.0)
21–30	111 (27.7)
31–40	55 (13.8)
41–50	42 (10.5)
51–60	46 (11.5)
61–70	34 (8.5)
71–80	22 (5.5)
>80	12 (3.0)
Total	400 (100)

UTI: Urinary tract infection

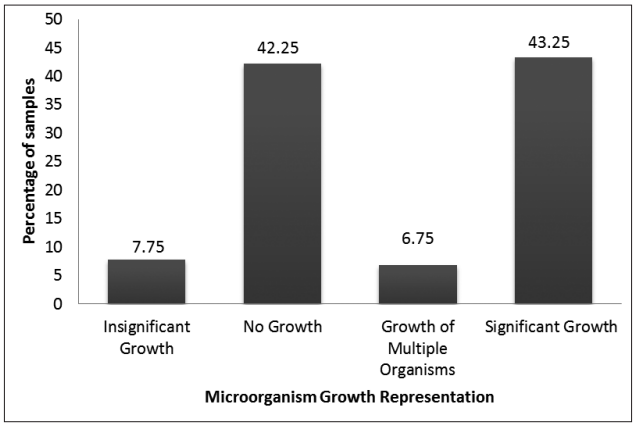

Figure 1: Bacterial growth in urine samples of suspected patients

Different isolated organism

Total nine species of microorganisms were isolated and among which, *E. coli* (65.12%) was the most common pathogen causing UTI, followed by *Staphylococcus* species (11.63%), *Proteus* species (6.98%), *Klebsiella* species (6.4%), *Enterococcus* species (5.81%), *Citrobactor* species (1.74%), *Aciretobacter* species (1.16%), *Pseudomonas* species (0.58%), and *Candida albicans* (0.58%) as shown in Figure 2.

Sensitivity pattern of antimicrobials

Antimicrobial susceptibility test shows that amikacin to be most sensitive antimicrobials among others with the sensitivity percentage of 94% and ampicillin a least sensitive which shows sensitive in 25% of microorganism. The order of sensitivity pattern is Amikacin > Nitrofurantoin > Gentamicin > Azithromicin > Cefpodoxine > Ceftriaxone > Cefixime > Ofloxacin > Cotrimoxazole > Ciprofloxacin > Norfloxacin > Ampicillin.

Resistance pattern of antimicrobials

Ampicillin was found to be highly resistant showing resistance in 75% of organisms and amikacin least resistant 4.72%. Resistance pattern of a microorganism to different antibiotics is shown in Figure 3. Order for resistance pattern is Ampicillin > Cephalexin > Cotrimoxazole > Norfloxain > Cefixime > Ceftriaxone > Ciprofloxaxin > Azithromicin > Ofloxacin > Gentamicin > Nitrofurantoin > Amikacin.

DISCUSSION

The age group analysis shows that the female patients in the range of 20–30 years had the highest prevalence rate (27.8%), and then the least was found in the age group of >80 years, this might be due to reason that female in the reproductive age groups has a high prevalence rate of UTI and similarly the incidence of symptomatic UTI is high in sexually active young women.[7]

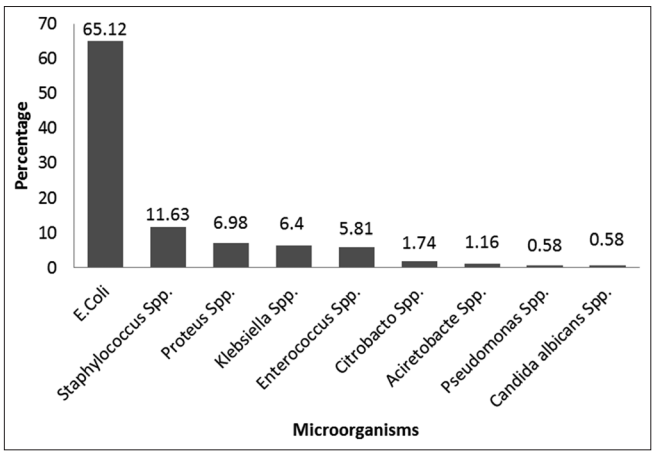

Figure 2: Percentage of different isolated organisms

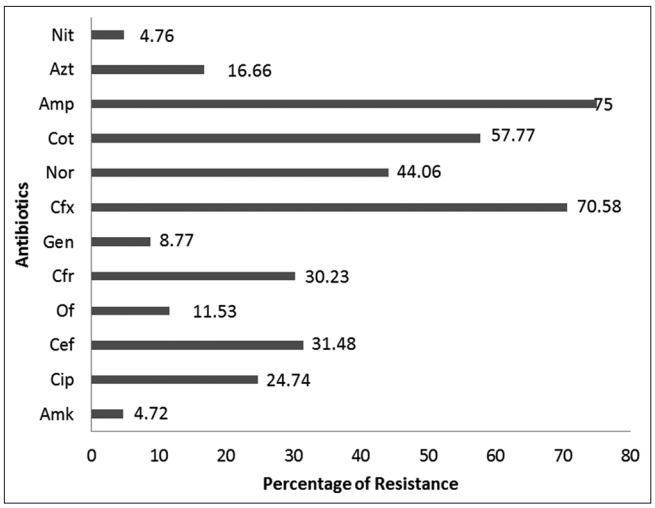

Figure 3: Resistance pattern of antibiotics

The uropathogens found in this study are similar to uropathogens identified in other studies conducted in different parts of the world.[8] The similarities and differences in the type and distribution of uropathogens may result from different environmental conditions and host factors, and practices such as health care and education programs, socioeconomic standards, and hygiene practices in each country.[9]

Among different uropathogens, the most predominant organism was found to be *E. coli* (65.1%), which is confirmatory to the study done by Oluremi, 2011,[10] and also in a study conducted by Chakupurakal *et al*., 2010, where the predominant organism was *E. coli*.[11] Moreover, in a number of reports Worldwide where the particular organisms are identified as most common uropathogens.[12] The dominance of *E. coli* is followed by *Staphylococcus aureus* (11.6%) in this study resembles the study done by Jha and Bapat, 2005, which found out that *S. aureus* (23%) was the second most organisms causing UTI.[13]

Antibiotic susceptibility test reveals that higher percentage of susceptibility for amikacin (94%), followed by nitrofurantoin (92.8%), gentamicn (88.55%), and least for ampicillin (25%) as shown in Table 2. This study resembles to the study conducted by Farajnia *et al*. 2009 where a higher percentage of susceptibility was seen for amikacin (96.6%).[8] Second to amikacin is the nitrofurantoin which is considered as an appropriate agent for first-line treatment of community-acquired UTIs, it can be administered orally and is highly concentrated in urine; it may, therefore, be the most appropriate agent for empirical use in uncomplicated UTI. Aminoglycosides (amikacin, gentamicin, and netilmicin) have also shown a decreasing resistance trend against E. coli from the year 2007 to 2009. Aminoglycosides being injectables are used restrictively in the community-care setting and hence have shown better sensitivity rates.[14]

Ampicillin was found to show the higher resistant rate followed by cephalexin and cotrimoxazole which resembles the study conducted by Nerurkar *et al*., 2012, which shows that isolates of most of the species exhibited a high rate of resistance to ampicillin, cotrimoxazole, cefazolin, norfloxacin, and nitrofurantoin. Resistance to antibiotics develops due to its frequent misuse.[15] The regional variation of resistance to antibiotics may be explained in part by different antibiotic practices.

Table 2: Sensitivity pattern of the microorganism to different antibiotics

Antibiotics→	Amk	Cip	Cef	Ofl	Cfr	Gen	Nor	Cft	Cot	Amp	Azt	Nit
No of samples→	148	97	54	78	86	114	59	24	45	48	54	126
Microorganism ↓	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
E. coli	92 (62)	43 (44.3)	19 (35.18)	29 (37.2)	35 (40.7)	75 (65.78)	12 (20)	13 (54.16)	13 (28.9)	7 (15)	34 (63)	87 (69)
Klebsiella Spp.	9 (6.1)	4 (4.12)	4 (7.4)	2 (2.56)	3 (3.48)	4 (3.5)	2 (3.4)	0	2 (4.44)	1 (2.1)	1 (1.9)	6 (4.76)
Proteus Spp.	11 (7.4)	5 (5.15)	3 (5.55)	3 (3.84)	4 (4.65)	7 (6.14)	2 (3.4)	1 (4.16)	0	1 (2.1)	3 (5.6)	10 (7.93)
Staphylococcus Spp.	17 (11)	3 (3.09)	5 (9.25)	9 (11.5)	5 (5.81)	8 (7.01)	8 (14)	2 (8.33)	6 (13.3)	1 (2.1)	5 (9.3)	4 (3.17)
Aciretobacte Spp.	1 (0.7)	0	0	0	0	0	0	0	0	0	0	1 (0.79)
Enterococcus Spp.	5 (3.4)	0	0	0	0	4 ((3.5)	1 (1.7)	0	3 (6.66)	1 (2.1)	0	6 (4.76)
Candida albicans Spp.	1 (0.7)	0	0	0	0	0	0	0	0	0	0	0
Pseudomonas Spp.	1 (0.7)	1 (1.03)	1 (1.85)	1 (1.28)	3 (3.48)	1 (0.87)	1 (1.7)	0	0	0	1 (1.9)	0
Citrobactor Spp.	2 (1.4)	0	0	2 (2.56)	1 (1.16)	2 (1.75)	1 (1.7)	0	2 (4.44)	1 (2.1)	0	3 (2.38)
Total	139 (94)	56 (57.7)	32 (59.23)	46 (58.9)	51 (59.3)	101 (88.55)	27 (46)	16 (66.65)	26 (57.8)	12 (25)	44 (81)	117 (92.8)

n: Number of samples, Amk: Amikacin, Cip: Ciprofloxacin, Cef: Cefixime, Ofl: Ofloxacin, Cfr: Ceftriaxone, Gen: Gentamicin, Nor: Norfloxacin, Cft: Cefpodoxime, Cot: Cotrimoxazole, Amp: Ampicillin, Azt: Azithromycin, Nit: Nitrofurantoin

The influence of excessive and inappropriate use on the development of antibiotic-resistant strains particularly broad-spectrum antibiotics prescribed empirically has been demonstrated. Transmission of resistant isolates between people and/or by consumption of foods originated from animals that have received antibiotics, and greater mobility of individuals Worldwide has also contributed to the expansion of antibiotic resistance.[8]

CONCLUSION

Female patients in reproductive age groups are more prone to develop UTI. *E. coli* remains the most common pathogens in patients with UTI. The pattern of sensitivity of bacteria to antibiotics varies over time and in different geographical regions, antibiotic treatment of infections should be based on the local experience of sensitivity and resistance pattern.

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