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Study of Demographic Characteristics of Adult Patients with Positive Urine Culture in Tehran, Iran

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ABSTRACT

Background and Objective: Urinary tract infection (UTI) is a common disease in adults that its early diagnosis and proper treatment has high importance and analysis of type and antibiotics resistance of isolated bacteria from urine of adult of different sex and ages can help in choosing of antibiotics in empirical therapy.

Materials & Methods: Data of patients (gender, age, kind of admission and isolated bacteria) with bacterial positive urine culture during three months in 2013 at Pars Hospital, Tehran, Iran, were studied and analyzed by SPSS software. Antimicrobial susceptibility pattern of isolates to cotrimoxazole, ampicillin, ciprofloxacin, gentamicin, amikacin and nitrofurantoin, were also determined by the standard disk diffusion method according to CLSI recommendation.

Results: A total of 1123 urine isolates were collected. Studied patients were often female and outpatients (78.3% and 88.7%, respectively). *Escherichia coli* was the most common isolate (50%), followed by S*treptococcus agalactiae* (22.9%), *Klebsiella*spp. (8.5%), *Enterococcus* spp. (7.6%), coagulase negative *Staphylococci* (3.7%) and *Staphylococcus aureus* (2%). Statistically significant differences were seen in distribution of some bacteria regarding demographic characteristics of patients. Highest resistance rates were shown to cotrimoxazole and ampicillin (56.9% and 55%, respectively) among isolated bacteria.

Conclusion: The results show a relationship between demographic characteristics of Iranian patients and type of isolated bacteria from urine and high resistance to common antimicrobial agents.

Key Words:
Bacteria
Patients
Urine culture
Antibiotic resistance

1. Introduction

Urinary tract infections (UTIs) are one of the most common bacterial infections in the community as well as in the hospital and refer to the presence of potentially pathogenic bacteria in the urinary tract (1, 2). The annual incidence of UTI is approximately 25 million people in the world (3). Urinary tract infection can be classified according to the anatomical site of involvement, including: inflammation of the bladder (bacterial cystitis), inflammation of the renal pelvis and renal parenchyma (acute or chronic pyelonephritis), inflammation of the prostate gland (bacterial prostatitis) and asymptomatic bacteriuria (4).

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Urinary tract infection frequently occurs in both sexes and in all age groups, although its prevalence depends on the sex and age of patients (6). Although, demographics characteristics of patients with positive urine culture have been reported in previous studies of Iran but no comprehensive study has been done in this field so far. In this study, age, gender and kind of admission (outpatient or inpatient) of patients with positive urine cultures were evaluated. Also, antibiotic resistance of bacteria isolated from adult patients in Tehran, Iran, were determined to guild physician in empirical therapy.

2. Materials and Methods

Data of adult (≥15 years old) patients with positive urine culture in microbiology laboratory of Pars general hospital, Tehran, Iran, from April to July 2013, were collected and analyzed using SPSS software, version 16.0. These data include demographic characteristics of patient (sex and age) and kind of admission (outpatient or inpatient), which were enrolled from patient records and isolated bacteria from urine and their antibiotic resistances, which give by routine microbiological methods and disk diffusion tests, respectively.

For microbiological tests, morning midstream clean catch urine specimens were collected in a wide mouth sterile container from patients who had not received previous antibiotic therapy. The urine specimens were immediately inoculated by a surface streak procedure on both blood and MacConkey agar medium by calibrated loop and incubated aerobically for 18-24 h at 37°C and for 48 hours in negative cases. The only criteria for patients enrolled in the study were the presence of positive urine culture and significant leukocyturia. A positive culture was defined as the growth of a single organism with colony counts higher than or equal to 10^5 colonies forming units (CFU)/ml. Bacterial identification was made using routine phenotypic test.

Antimicrobial resistance of isolates was determined by disk diffusion method according to CLSI recommendation (7). Antibiotic disks were purchased from Rosco Company, Denmark, and included ampicillin, amikacin, ciprofloxacin, nitrofurantoin, gentamicin and cotrimoxazole.

For comparison among groups, the Chi-square test and Fisher exact test were used. A p value less than 0.05 was considered statistically significant.

2.1. Ethical considerations

All the personal information of the patients remained private during all steps of the research.

3. Results

In this study, a total of 1123 non-duplicated bacterial isolates were collected from the urine of patients aged 15 to 96 years old (mean age 55.05±19.50 years). Most of the studied isolates were found in urine sample of patients aged 60 years and older (48%), whereas 11.8% of isolated bacteria from patients 15-29 years and 40.2% of isolated bacteria from patients aged 30-59 year. In this study, female patients have constituted 78.3% of patients (n=879) and remaining were male (244 patients, 21.7%). Also, 996 (88.7%) and 127 (11.3%) out of them were outpatient and inpatient, respectively.

In this study, the most common bacteria isolated from urine of adult patients were *Escherichia coli* (50%), followed by *Streptococcus agalactiae* (22.9%), *Klebsiella* spp. (8.5%), *Enterococcus* spp., (7.6%), coagulase negative *Staphylococci* (3.1%) and *S. aureus* (2%). Other bacteria were different species from *Proteus*, *Citrobacter*, *Enterobacter*, *Morganella*, *Salmonella, Pseudomonas* and *Acinetobacter* genera and *Stenotrophomonas maltophilia*, *Staphylococcus saprophyticus* and *Streptococci* other than *agalactiae*. Altogether, the Gram negatives were more prevalent than Gram positives (63.7% and 36.3%, respectively).

Table 1 shows distribution rate of most frequently isolated uropathogenic bacteria according to gender, age and kind of admission in studied Iranian adult patients. As this table show, statistically significant difference (P<0.05) was shown for isolation of some bacteria; Gram positives and *S. agalactiae* were isolated more from women as compared to men.

Table 1. Gender, age and admission distribution of most uropathogenic isolated bacteria in this study

Organism	Gender			Admission			Age (years)			
	Female (n=879)	Male (n=244)	*P* value	Inpatient (n=127)	Outpatient (n=996)	*P* value	15-29 (n=133)	30-59 (n=451)	≥60 (n=539)	*P* value
E. coli	441 (50.2%)	121 (49.6%)	0.885	67 (52.8%)	495 (49.7%)	0.572	47 (35.3%)	207 (45.9%)	308 (57.1%)	0.000 *
***Klebsiella* spp.**	71 (8.1%)	24 (9.8%)	0.366	10 (7.9%)	85 (8.5%)	1.000	9 (6.8%)	34 (7.5%)	52 (9.6%)	0.374
Total Gram negatives	546 (62.1%)	169 (69.3%)	0.042 *	88 (69.3%)	627 (63%)	0.171	63 (47.4%)	254 (56.3%)	398 (73.8%)	0.000 *
S. aureus	15 (1.7%)	8 (3.3%)	0.129	3 (2.4%)	20 (2%)	0.738	5 (3.8%)	11 (2.4%)	7 (1.3%)	0.150
S. agalactiae	223 (25.4%)	34 (13.9%)	0.000 *	12 (9.4%)	245 (24.6%)	0.000*	51 (38.3%)	129 (28.6%)	77 (14.3%)	0.000 *
***Enterococcus* spp.**	65 (7.4%)	20 (8.2%)	0.682	18 (14.2%)	67 (6.7%)	0.006*	10 (7.5%)	38 (8.4%)	37 (6.9%)	0.652
Total Gram positives	333 (37.9%)	75 (30.7%)	0.042 *	39 (30.7%)	369 (37%)	0.171	70 (52.6%)	197 (43.7%)	141 (26.2%)	0.000 *

*Statistical significance difference were considered at value of p<0.05

The frequency of each isolate was different among different age groups (15-29, 30-59 and ≥60 years old), which was statistically significant for Gram positives and *S. agalactiae* and were isolated less and Gram negatives more from older patients. These statistically significant differences were also seen for isolation of Gram negatives and *E. coli,* which were isolated more from older female and Gram positives, *S. agalactiae* and *S. aureus*, which were isolated more from younger female.

Most of studied bacteria (88.7%) were isolated from outpatients. Statistically significant difference (p<0.05) had shown for isolation of some bacteria; *S. agalactiae* was isolated more and *Enterococcus* spp. was isolated less from outpatients compared to inpatients.

Fig. 1 shows the pattern of susceptibility among isolated uropathogenic bacteria. The highest resistances were shown to cotrimoxazole and ampicillin (56.9% and 55%, respectively) and lowest to nitrofurantoin (6.4%).

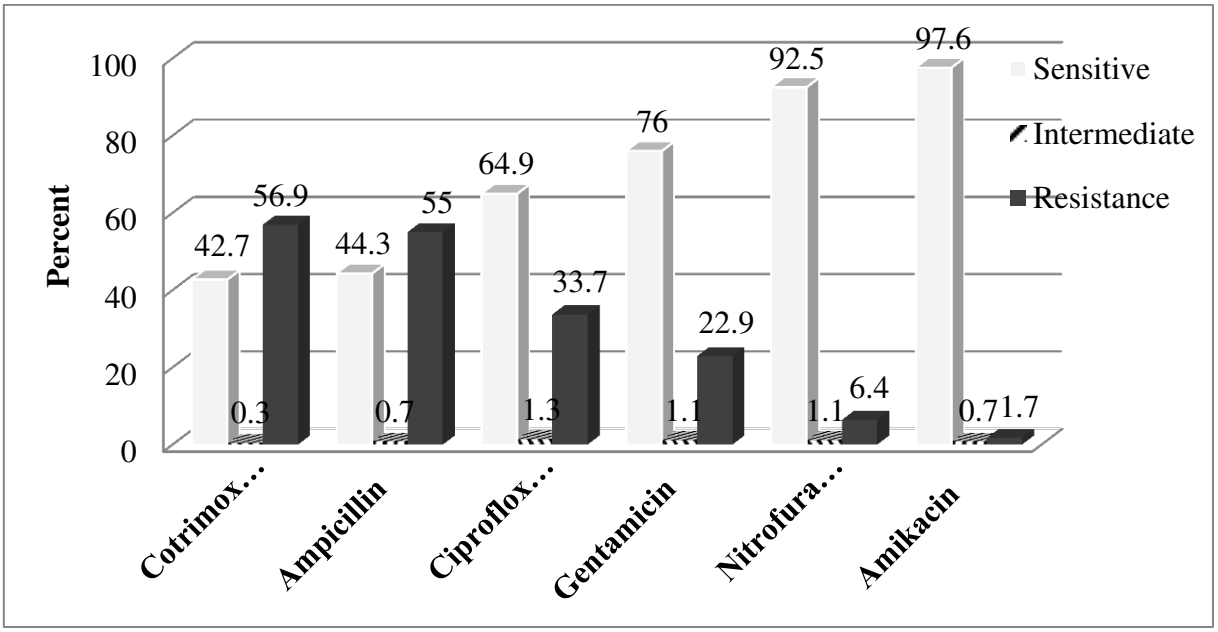

Fig. 1. Antimicrobial susceptibility pattern of isolated bacteria from urine of adult patients in this study

4. Discussion

Considering that urinary tract infection is a very common disease, diagnosis and treatment of it is very importance (8). The majority of urine infections are caused by bacteria (1). In this study, most of the studied bacterial isolates were found in urine sample of female and older patients. Other studies had also shown that urinary tract infections occur more commonly in older people and women (9-13), which is attributed to the anatomical characteristics. Also, similar findings about prevalence of *E. coli* and Gram negatives in urine culture of adult patients had also been seen in other Iranian studies as well as studies from other countries (5, 14, 15). The prevalence of *E. coli* was 50%, which is comparatively lower than two studies conducted in Iran (68.8% in study of Kashef and colleagues and 73.5% in study of Ghorbani and colleagues), which can be attributed to the high rate of diagnostic techniques of Pars general Hospital, where the study was performed, that allow identification of less common bacteria in urine samples.

In this study, Gram positives and *S. agalactiae* were isolated more from women compare men, which can be due to the fact that these bacteria can be a colonizing agent in women genitourinary tracts. This finding is in agreement with others finding too, although isolated bacteria was different in other studies (5, 9-11, 13, 14).Also, the shown differences between the distributions of isolated bacteria from different age groups were reported in other Iranian studies (5, 14). In a study by Magliano and colleagues in Italy, the differences have been seen in the isolation of some bacterial between male and female at different age, for example, the isolation rate of *E. coli* from female patients aged 60 years and older was greater as compared to males (10).

In this study, most of bacteria were isolated from outpatients, due to greater number of urine specimens obtained from outpatients compared with inpatients in Pars General Hospital, Tehran, Iran. A difference between inpatient and outpatient regarding isolated bacteria shown in this study were also reported by other investigators (16-18). In the study of Koningstein and colleagues, *E. coli* was less common in inpatient and *Enterococcus* spp., *Proteus mirabilis*, *Enterobacter* spp. and *P. aeruginosa* were more common in outpatients (17).

High rate of resistance of isolated bacteria from urine of adult Iranian patients to cotrimoxazole and ampicillin; common antimicrobial agents in UTI therapy; is probably due to the frequent haphazard use of them in Iran. Similar results had also been reported in other studies in Iran and other countries (1, 2, 5, 8, 9, 11-21).

Conclusion

The obtained results of this study describe the demographic characteristics of adult patients with positive urine culture. Our finding indicates the importance of age and gender in determining UTIs etiology that these leads as to more accurate detection and identification. On the basis of our results, the prevalence of some pathogens was very high in female patients, it also showed that *E. coli* was the most important causative agent of UTI in females especially ≥60 years old. Our study emphasizes on the planning protocols to determine the prevalence of UTI pathogens based on demographic characteristics of patients in each hospital. Our data was the first comprehensive Iranian report according to the demographic characteristics of adult patients with UTI.

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