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Full Length Research Paper

A survey on epidemiology of urinary tract infections and resistance pattern of uropathogens in an Iranian 1000-bed tertiary care hospital

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Urinary tract infections (UTIs) are one of the most common infectious diseases diagnosed in communities and hospitalized patients. The aim of this study was to determine frequency of occurrence and antimicrobial susceptibility patterns of uropathogens in Milad hospital of Tehran, Iran. In a prospective study from March to June 2009, a total of 11308 urine sample from patients admitted in Milad hospital of Tehran were analyzed. All specimens were inoculated on routine culture media. Bacterial isolates were identified by conventional bacteriological methods. Susceptibility testing was performed by standard methods as recommended by clinical laboratory standard institute. 11308 urine samples were cultured and 1020 pathogen were isolated. *Escherchia coli* with 620 (60.78%) isolates was the most common causative agent of UTI followed by *Klebsiella pneumoniae* with 115 (11.27%) isolates. Among gram positive *Cocci Enterococcus spp* with 110 (10.78%) isolates and *Staphylococcus aureus* with 81 (7.94%) isolates were predominant organisms. Of 1020 patients, 227 (22.25%) were male and 793 (77.74%) were female. Of 1020 patients, 224 (21.96%) of patients were hospitalized and 796 (78.03%) were outpatients. Of 224 hospitalized patients, 85% of isolates of *E. coli* were resistant to ampicillin, while this figure was 90% for *K. pneumonia*e. Resistant to other antibiotics were also prevalent. Nitrofurantoin was the most effective antibiotics against *E. coli* and *Enterococcus spp*. In conclusion, our study revealed that bacterial resistance in uropathogens in our hospital continues to be a great problem and needs drug resistance surveillance periodically.

Key words: Urinary tract infections, drug resistance.

INTRODUCTION

Urinary tract infections (UTIs) represent one of the most common diseases encountered in medical practice today. (Rashedmarandi et al., 2008; Saderi et al., 2006). It is estimated that about 20 - 30% of adult women experience UTI once during their life time. However, its impact and frequent vary in different population. UTIs occur at the rate of 2 - 3% of hospital admission and account for 35 - 40% of all nosocomial infections. (Nakhjavani et al., 2007). Studies have shown that the urinary tract is the commonest source of nosocomial infection, especially when the bladder is catheterized.

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Most catheter-associated UTIs are derived from the patient's own colonic flora and the catheter predisposes to UTIs in several ways. The most important risk factor for the development of catheter- associated bacteriuria is the duration of catheterization (Tenke et al., 2007). Worldwide, about 150 million people are diagnosed with UTIs each year costing the global economy excess of 6 billion US dollars. UTIs may involve only the lower urinary tract or may involve both the upper and lower tract (Akram et al., 2007).

In the hospital setting and community, the etiology of UTIs and the antimicrobial susceptibility pattern of urinary pathogens have been changed over the years. There is a growing concern regarding antimicrobial resistance worldwide, particularly in *Escherchia coli*, *Klebsiella pneumoniae* and other UTIs causative agents.

Table 1. Frequency of etiological agents of UTI.

Organism	No (%)
E. coli	620(60.78)
K. pneumoniae	115(11.27)
Enterococcus spp	110(10.78)
S. aureus	81(7.94)
P. aeruginosa	30(2.94)
Citrobacter Spp	12(1.17)
E. cloacae	11(1.07)
S.epidermidis	11(1.07)
A.r baumannii	11(1.07)
K. oxytoca	8 (0.78)
P. mirabilis	6 (0.58)
E. aeruginosa	4 (0.39)
K. planticola	1 (0.098)
Total	1020

Nowadays, the majority pathogens isolated from urine are resistant to commonly used antibiotics and the first choice of an antimicrobial agent for empiric treatment of pediatric urinary tract infections (UTIs) is not well established (Tseng et al., 2008). Factors such as the patients population, extensive use and misuse of antimicrobial agents, could contribute to change in microbial profile of urinary tract isolates (Gales et al., 2005). Antibiotics are usually given empirically before the laboratory results of urine culture are available .To ensure appropriate therapy, current knowledge of the organism that causes (UTIs) and their antibiotic susceptibility pattern is mandatory. In our country, there is much data regarding urinary tract both in outpatients and hospitalized patients. Since pattern of antibiotic resistance in a wide variety of pathogenic organisms may vary over short periods and depend on site of isolation and different environment conditions, periodic evaluation of antibacterial activity is needed to update information (Gupta et al., 2002). This study was carried out to determine the etiologic agents of (UTIs) and their antibiotic susceptibility pattern isolates in outpatients and inpatients in Milad hospital of Tehran.

MATERIALS AND METHODS

In a prospective study from March to June 2009, a total of 11308 urine sample from patients admitted to Milad hospital of Tehran were analyzed. Each sample was inoculated with 0.01 ml platinum loop onto blood agar and MacConkey agar plates. All plates were incubated at 35°C for 24 - 48 h. Positive cultures were identified by criteria as defined earlier. All Isolated bacteria were identified by standard bacteriological tests (Isenberg, 2004). Susceptibility testing was perfumed by disk diffusion methods as recommended by clinical laboratory standard institute (CLSI, 2006). The following disks (MAST diagnostic Group UK) were used: Tetracycline (30 µg), Amikacin (30 µg), Nalidixic acid (30 µg), Gentamycin (10 µg), Nitrofurantoin (300 µg), Co-trimoxazol (1.25/23.75 µg), Oflaxacin (5 µg), Cefotaxime (30 µg), Ceftizoxime (30 µg), Cephalothin (30 µg), Ceftriaxone (30 µg), Ceftazidime (30 µg), Carbenicillin (100 µg), Ampicillin (10 µg), Rifampin (5 µg), Penicillin (10 unit), Erythromycin (15 µg), vancomycin (30 µg), Clindamycin (2 µg), Cefixime (30 µg), Ciprofloxain (5 µg). *E. coli* ATCC25922, *S. aureus* ATCC29213, *Pseudomona aeruginosa ATCC* 27853, *Enterococcus faecalis* ATCC 29212 and *E. coli* were used as quality control strains. Interpretative criteria for each antimicrobial test were recommended by clinical laboratory standards institute (CLSI, 2006).

Demographic data of patients including patients' age, gender, type of infection (hospital or community acquired), and presence of urinary catheter, ward of admission and duration of hospital stay were recorded.

RESULTS

11308 urine culture and 1020 non-duplicate pathogen were isolated during our study. Of 1020 patients, 227 (22.25%) were male and 793 (77.74%) were female. 224 (21.96%) patients were hospitalized and 796 (78.03%) were outpatients. 224 were hospitalized patients, 53 (23%) patients had urine catheter. *E. coli* with 620 (60%) isolates was the most common cause of UTIs followed by *K. pneumoniae* with 115 (11%) isolates. *P. aeruginosa* accounted 30 (2%) of all isolates. In our previous study Table 1. Among gram positive *Cocci, Enterococcus spp* with 110 (10%) isolates and *S. aureus* with 86 (8%) isolates were the predominant organisms. 85% of isolates of *E.coli* were resistant to ampicillin, while this figure was 90% for *K. pneumonia*. Nearly (30%) isolates of *E.coli* and (15%) isolates of *K. pneumonia* were resistant to ofloxacin, while (73%) isolates of *P. aeruginosa* were resistant to this antibiotic. Among the aminoglycosids, amikacin was the most effective antibiotic against gram negative bacilli. Resistant to other antibiotics were also prevalent.Table 2. Nitrofurantoin was the most effective antibiotics against *E. coli* and only (0.05%) isolates of this organism was resistant to this antibiotic. The majority isolates of *K. pneumoniae* (68%) were resistant to nitrofurantoin. All isolates (100%) of *S. auerus* were susceptible to vancomycin. (15%) isolates of *E. faecalis* were vancomycin resistant. Nitrofurantoin was the most effective antibiotic against both vancomycin resistant and susceptible strains of *Enterococci.* Table 3.

DISCUSSION

In this study, we evaluated the distribution of micro-organisms causing UTIs and their antibiotic susceptibility pattern. In our study, *E. coli* was the most frequent uropathogen with 60% of all isolates. This corresponds with the data obtained by other investigators in our country (Khorshidi et al., 2003). Similar frequency for isolates of *E. coli* has been reported in studies from other countries such as Great Britains and South Croatia. However, different frequency for isolation of *E. co*li has been reported from other countries. (Saderi et al., 2006). Other organisms such as *K. pneumoeae* were the second most UTIs etiology agent. *P. aeroginosae* was an

Table 2. Prevallence of drug resistance in leading gram+negative bacilli isolated from urine.

Antibiotics	*E. coli* (%)	*Klebsiella spp* (%)	*P. aeruginosa* (%)	*Enterobacter spp.* (%)
Tetracycline	62	38	76	33
Amikacin	20	21	13	0.6
Nadixic Acid	48	21	16	33
Gentamicin	20	30	16	13
Nitroforantoin	0.05	68	26	60
Co- trimoxazol	54	34	73	26
Oflaxacin	31	15	23	13
Cefotaxime	32	31	73	46
Ceftizoxime	46	43	0.03	86
Cephalothin	47	46	26	86
Ceftriaxone	28	31	66	46
Ceftazidime	31	32	36	60
Carbenicillin	31	33	46	60
Ampicillin	85	90	13	93

Table 3. Prevallence of drug resiutance in leading Gram+positive cocci isolated from urine.

Antibiotics	*Enteroccus. Faecalis* (%)	*S. aureus* (%)	*Coagulase-negative Staphylococci* (%)
Tetracyclin	76	12	27
Rifampin	76	-	-
Penicillin	73	83	-
Norfloxacin	59	0.03	-
Ampicillin	34	62	54
Ernythromycin	29	0.03	27
Gentamycin	22	0.01	27
Vancomycin	15	0	0
Clindamicin	0.07	0.07	19
Tobramycin	0.02	-	-
Carbenicillin	0.02	0.01	-
Cefixime	0.01	19	-
Amikacin	0.01	0.03	0.09
Co-trimoxazol	-	0.08	0.09
Ceftriaoxne	-	0.06	72
Oflaxacin	-	0.06	-
Cefotaxim	-	0.02	-
Ciprofloxacin	-	0.01	-
Nitrofurantoin	0.07	-	0.09

important uropathogen especially in hospitalized patients. Among gram positive *Cocci, Enterococcus spp* and *S. aureus* were two predominant uropathogens (Orrett et al., 2001; De Francesco et al., 2007).

Most *E. coli* isolate in our study were resistant to ampicillin which resembles other studies (Rashedmarandi et al., 2008; Saderi et al., 200; Khorshidi et al., 2003). However, the majority isolates of *E. coli* were susceptible to other oral drugs commonly used in general practice such as nitrofuratoin. The other effective antibiotic against isolates of *E. coli* was amikacin, 31% isolates of this organism were resistant to ofloxacin. Among the third generation of cephalospourins, ceftriaxonein in comparison to others was effective against *E. coli* isolates. Antibiotic resistance among isolates of *K. pneumoniae* in comparison with *E. coli* was prevalent. Ofloxacin and nalidixic acid were two effective antibiotics against *K. pneumoniae*. Resistance among isolates of *P. aeruginosa* was prevalent except for cefazolin. The best effective antibiotic against *P. aeruginosa* was yielded by

ceftizoxime followed by amikacin.

It was also found out that *Enterococci* accounted a significantly frequency of uropathogens especially in hospitalized patients followed by *S. aureus*. The majority isolates of *Enterococci* had more than 75% resistance to tetracyclin, rifampin and penicillin. Resistance to amino-glycosides also was prevalent among *Enterococci* clindamycin, tobramycin, carbanicillin, cefixime, amikacin and nitrofurantoin which have high efficacy against isolates of *Enterococci.* 15% isolates of *Enterococci* were resistant to vancomycin (Rahbar et al., 2007). The majority orally prescribed antibiotics such as co-trimoxazole, norfloxacin and ciprofloxacin were the most effective antibiotics against *S. aureus.*

Comparison among different studies concerning resistance of uropathogenes to different commonly used antibiotics should be considered in different periods, because of socioeconomically, socioepidemiologically and clinical parameters of target population. In addition, the comparison must be considering the limitation of resistance to antimicrobial which could vary from country to country (Nakhjavani et al., 2007).

In conclusion, our study revealed that bacterial resistance in uropathogens in our hospital continues to be a great problem. Treatment of UTIs should not be advocated, as far as possible, after culture and sensitivity has been performed. This would not only help for proper treatment of patients but would also prevent the indiscriminate use of antibiotics and prevent further development of microbial drug resistance.

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