

Effect of some antimicrobial agents on isolated bacteria from patients with urinary tract infection in Kurdistan Region

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Rukia Al-Barzinji*

Sazan Esmahil **

Shukria Sulaiman ***

Shler Gh. Raheem****

ABSTRACT

Background and Objectives: Urinary tract infection (UTI) defines as a condition in which the urinary tract is infected with a pathogen causing inflammation. UTI affects all age groups, but women are more susceptible than men, it is the second most common form of infection. This study was designed to isolation and identification of common uropathogenic bacteria and determining the sensitivity of infectious urinary isolated strains to different antimicrobial agents.

Methods: This study included 350 patients (125 males and 225 females) with sign and symptoms of UTI, who were referred to the Teaching Hospital in Erbil and Sulaimania cities, from March till May 2007. Also, 25 healthy individuals were included in the study as a control group. Api tests and several biochemical tests were used for identification different isolated bacteria from UT.

Results: The bacterial cultivations revealed positive results for 119 (34%) urine specimens, 56 (47.05 %) in males and 63 (52.94 %) in females compared to control group (0%). The highest percentage of infection was observed in females in age group (20-39) years (44.44%). The highest rate of uropathogenic isolates was *E. coli* 53 (41.08%) followed by *S. aureus*, *Proteus sp.*, *Klebsiella sp.*, *Enterobacter sp.*, and *Pseudomonas sp.* 23(17.82%), 23(17.82%), 11(8.52), 10(7.75) and 9(6.97) respectively. The uropathogenic bacterial isolates showed different susceptibility to antimicrobial agents, ciprofloxacin was the most efficient to inhibit UTI.

Conclusions: Incidence of UTIs in females is more than in males with a higher rate in the 20-39 years age group. *E. coli* was the commonest pathogenic bacteria isolated from urinary tract.

Key words: Bacteria, UTI, Antimicrobial agents.

INTRODUCTION:

A urinary tract infection is an infection caused by microorganisms mainly bacteria that may affects any part of the urinary tract, it is one of the most common nosocomial infections in hospitalized patients¹⁻². UTIs are more common in males than in females infant, this is most likely due to the higher incidence of congenital genitourinary disorders in males³⁻⁴. Moreover uncircumcised males have a higher incidence than circumcised males⁵. In contrast UTIs are more frequent in females

than males at all ages with the exception of neonatal period⁶. In addition incidence is highest in sexually active adolescent females, sometimes related to sexual intercourse, since the vagina is adjacent to the urethra in women⁷. Furthermore, postmenopausal women with diabetes have higher risks of UTI⁸. Uropathogenic *E. coli* cause 90% of UTI in anatomically-normal, unobstructed urinary tracts⁹. It typically colonizes the gastrointestinal tract of humans within few hours after birth. Some clones of it can acquire specific virulence attributes with adaptation to

* Dept. of Microbiology, College of Medicine, Hawler Medical University .

** Dept. of Biology, College of Science, Koya University .

*** Dept. of Microbiology, College of Medicine, Hawler Medical University .

**** Dept. of Microbiology, College of Medicine, Hawler Medical University

new niches². Other organisms include *Proteus sp.* a motile Gram-negative bacterium, is a principal cause of UTI in patients with functional or anatomical abnormalities of the urinary tract¹⁰. *Klesiella sp.* accounts for 6 to 17% of all nosocomial UTIs¹¹. *Pseudomonas aerogenosa* is the major human pathogen. UTIs caused by *P.aeroginosa* are hospital-acquired and related to urinary tract catheterization, instrumentation or surgery, also it can invade the bloodstream from the urinary tract. In addition, *Enterobacter sp.*, may cause UTIs and sepsis¹⁰. The choice of antibacterial drugs should be based on the results of urine culture and sensitivity testing, with regard to certain factors like age, clinical severity, location of infection, presence of structural abnormalities, and allergy to certain drugs¹². Large numbers of antimicrobial agents are used in the treatment of UTI¹³. The objects of this research work are to investigate isolation and identification of common uropathogenic bacteria and determining the susceptibility of infectious urinary isolated strains to different antimicrobial agents.

MATERIALS AND METHODS:

Urine samples had been taken randomly from 350 patients (inpatients and outpatients) who were suffering from signs and symptoms of UTIs attending Hawler and Sulaimani Teaching Hospitals and 25 apparently healthy individuals were considered as a control group, during the period from March to May 2007. For bacteriological examination MacConkey and blood agar were used. Plates were streaked with a measured drop of urine. The plates were incubated for 24-48 hours at 37°C, and the suspected colonies were cultured on nutrient agar for obtaining a pure culture. Api tests and several biochemical tests were used for identification different isolated bacteria from UT. The antimicrobial susceptibility tests were carried out as described by Bauer *et al.*,¹⁴. Muller-Hinton agar was prepared according to the

manufacturer's directions and should be immediately cooled in 50°C water bath. The cooled medium is then poured into sterile Petridish plates and left to solidify. The antimicrobial discs were placed on the inoculated plate and pressed firmly into the agar with sterile forceps to ensure complete contact with the agar. After incubation period the relative susceptibility of the organism to the antimicrobial agents was demonstrated by a clear zone of growth inhibition around the antimicrobial disc¹⁵. Each zone size is interpreted by referring to an interpretative chart which is recommended by national committee for clinical laboratory standards into sensitive, intermediate, and resistant¹⁶.

RESULT:

This study was carried out on 350 patients complaining of signs and symptoms of UTI, the study also included 25 apparently healthy individuals as controls. Only 119 patients (34%) were positive for aerobic bacterial infections whereas 231 patients (66%) had no bacterial infection Figure (1) urine of control group were negative for bacterial cultures (0%). Regarding the sex and age, Out of 119 patients with positive bacterial cultures UTI 56(47.05%) were males and 63(52.94%) were females. There is a significant difference in the UT incidence of bacterial infections regarding sex and age (Table 1). The incidence of bacterial infection in first group (1-9 years) in males was significantly higher than in females in the same age group ($p < 0.01$). In the third age group (20-39 years) the incidence of UTI among females was significantly higher than males ($p < 0.01$). In the last age group 40 years and above the incidence of UTI in females were significantly more in females than males ($p < 0.01$). The percentage of bacterial isolates from 119 patients with UTI and their frequencies in pure and mixed cultures is presented in (Table 2), Figure (2). *E. coli* was the most prevalent organism isolated in this study with total number 53 (41.8%)

(isolates, 3(30 %) in mixed culture and 50 (42 %) in pure culture. *S.aureus* 23 (17.82%) isolates were a second commonest pathogen for UTIs, 22(18.48 %) in pure culture and 1(10 %) in mixed culture. *K.oxytoca* was the least frequently isolated bacteria 1(0.77%) isolate in pure culture. The rate of *P. aeruginosa* isolates were 9 (6.97%). Table (3) summarizes the most effective antimicrobial agents used against uropathogenic bacterial isolates. The most

effective drug against all isolates in this study was ciprofloxacin in percentages (100, 100, 90, 70, 70 and 66.66%) for *proteus sp.*, *Enterobacter sp.*, *S. aureus* and *Pseudomonas sp.* respectively. On the other hand *E. coli* was mostly sensitive to ofloxacin 100%. Furthermore all isolates were resistant to other antimicrobial drugs such as lincomycin, cephalothin and erythromycin.

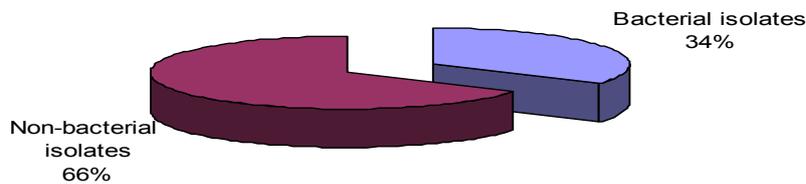


Figure 1: Percentage of bacterial isolates from UT infected patients

Table 1: Percentage of UTI in relation to age and gender

Age (years)	Sex	
	Female	Male
1-9	5 (7.93%)	23 (41.07%)
10-19	8 (12.69%)	7(12.5%)
20-39	28 (44.44%)	8 (14.28%)
>40	22 (34.92%)	18(32.14%)
Total	63	56
Chi-square	P<0.01	

Table 2: Isolated bacterial profiles recovered from 119 patients with UTI.

Bacterial isolates	Pure culture		Mixed culture		Total	
	No.	%	No.	%	No.	%
<i>Escherichia coli</i>	50	42	3	30	53	41.08
<i>Staphylococcus aureus</i>	22	18.48	1	10	23	17.82
<i>Proteus mirabilis</i>	18	15.12	2	20	20	15.5
<i>Enterobacter aerogenes</i>	10	8.40	-	-	10	7.75
<i>Klebsiella pneumonia</i>	8	6.72	2	20	10	7.75
<i>Pseudomonas aeroginosa</i>	7	5.88	2	20	9	6.97
<i>Proteus vulgaris</i>	3	2.32	-	-	3	2.32
<i>Klebsiella oxytoca</i>	1	0.84	-	-	1	0.77
Total	119	92.24	10	7.75	129	34

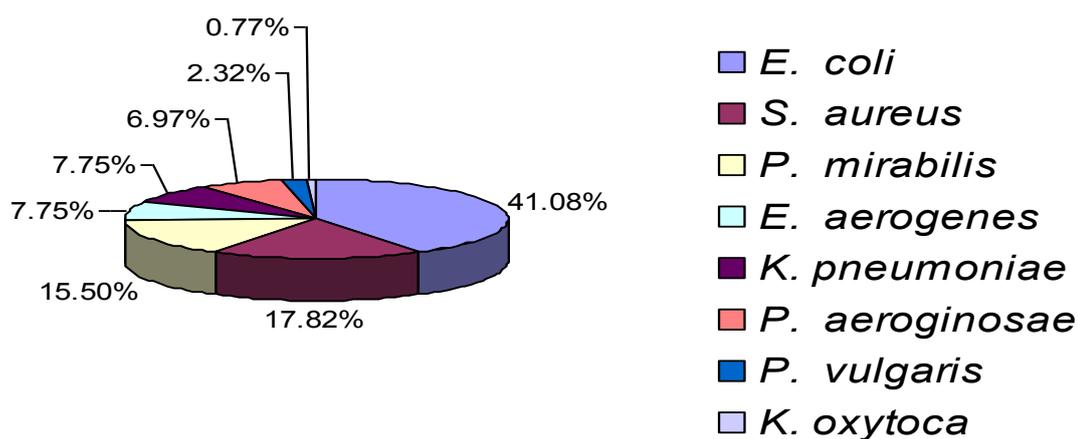
**Figure 2:** Distribution of different isolates of uropathogenic bacteria

Table 3: The most effective antimicrobial agents used in uropathogenic bacterial isolates

Bacterial isolates	No.	Antibiotic sensitivity%											
		GM.	Te.	VA.	AM.	E.	KF.	L2.	Ak.	NA.	Of.	Tb.	CFX.
<i>E. coli</i>	10	0	20	0	0	0	0	0	20	40	100	40	70
<i>Pseudomonas sp.</i>	10	20	0	10	0	0	0	0	70	0	10	0	70
<i>Proteus sp.</i>	5	0	20	0	20	0	0	0	40	60	40	20	100
<i>Enterobacter sp.</i>	4	25	25	0	0	0	0	0	25	50	75	0	100
<i>Klebsiella sp.</i>	6	0	50	0	0	0	0	0	16.6	50	16.6	16.6	66.6
<i>S. aureus</i>	10	40	30	50	ND	0	0	0	20	0	ND	ND	90

ND = not done, GM = Gentamycin, Te = Tetracycline, VA = Vancomycin, AM = Ampicillin, E = Erythromycin, NA = Nalidixic acid, KF = Cephalothin, L2 = Lincomycin, AK = Amikacin, Of = Ofloxacin, Tb = Tobramycin, CFX = Ciprofloxacin.
No. = total number of tested bacteria

DISCUSSION:

Only 119 patients (34%) were positive for aerobic bacterial infections whereas 231 patients (66%) had no bacterial infection fig. (1) However the percentage of UTI in other studies were (75.42%) and (61%) respectively¹⁷. The failure of urine samples to give growth may be due to the effect of antimicrobial drugs which had been given to the patients during the time they spent in hospital and treatment of patients with wide spectrum antimicrobials. In addition, using the outer sterilizer solutions had a great effect on reducing the rate of the bacterial isolations¹⁸. Other reasons of bacterial growth failure in urine samples could be to anaerobic bacteria, mold and other bacteria that can not be isolated by conventional methods used in this study and may need special technique for their isolation and growth¹⁸. Out of 119 patients with positive bacterial cultures UTI 56 (47.05%) were males and 63(52.94%) were females. this result is in agreement with report of Al-Salammi¹⁹. Females may get UTI through sexual intercourse or from the bowel due to shortness of the female urethra and its close location to the perineal region. Thus, the organisms ascend to the urinary tract. Also absence of prostatic secretion and pregnancy are risk factors for UTI, therefore female have more chances of developing UTI than males²⁰. There is a significant difference in the UT incidence of bacterial infections regarding sex and age Table (2). The incidence of bacterial infection in first group (1-9 years) in males was significantly higher than in females in the same age group. This results were in agreement with results of Al-Salayi⁶ and Tawfiq²¹. They reported that in uncircumcised boys bacteria established in the perpetual sac and provide a source of ascending infection²². The increase frequency in age group (20-39years) could be due to frequency of sexual intercourse²³. In the last age group 40 years and above the incidence of UTI in females were more in females than males

because after menopause period UTI may become more common in females due to the decrease in estrogen and reduced antimicrobial activity of genitourinary secretions²⁴. On the other hand the high UTI incidence in males 32.14% may be due to enlargement in prostate gland in old age group. Lam *et al.*,²⁵ in their study reported that 70% of men have the risk of UTI after 60 years of age. *E. coli* was the most prevalent organism isolated in this study with total number 53 (41.8%) isolates, 3 (30 %) in mixed culture and 50(42 %) in pure culture. This result agrees with that obtained by Bukharie and Saeed²⁶ and Al-Salammi¹⁹ 58% and 71% respectively, while Hryniewicz *et al.*,¹³ reported 73%. The higher incidence of *E. coli* may be due to its colonization from feces or perineal region and ascend from the urinary tract to the bladder⁹. The variations in previous results might have been due to sample sizes, different communities of these studies and development of bacterial resistance as a result of the frequent usage of the antimicrobial drugs²⁷. Ciprofloxacin was the most effective drug against all bacterial isolates and *E. coli* was mostly sensitive to ofloxacin. This result was close to the findings of both Al-Salayi⁶ and Al-Salammi,¹⁹ who reported that ciprofloxacin is the most effective drug. Bukharie *et al.*,²⁶ reported nalidixic acid as the most effective antimicrobial agents. The effectiveness of such antimicrobial agents could be explained by the fact that these drugs are used less frequently than others and that they have a broad spectrum of activity. The prevalence of antimicrobial resistance in urinary pathogens in this study might be due to indiscriminate use of antimicrobial drugs¹⁰.

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