

# **Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq**

Luma Hikmat Kareem

College of medicine\University of wasit

## **Abstract**

The study aimed to isolate some of the causes of bacterial inflammation of the urinary tract in humans. The study included two axis: the first axis to included bacterial causes inflammation of the urinary tract, while the second axis know that sensitivity and resistance of this causes to antibiotics. Collected (150) urine samples from patients were suffering for UTI from the educational Karama hospital in the Al- Kut city, for the period from August-2013 to February -2014.

All samples were subject to the tested and cultural of microorganisms and biochemical tested for the purpose of diagnosis. Showed (56) Samples from this total cases (150) (37.3%) were bacterial isolation, while given (94) samples a negative result to isolation of bacteria by percentage (62.7%). Recorded *Escherichia coli* highest among causes of bacterial urinary tract where isolated from (29) cases was (51.5%). The *Klebsiella spp.* was Second arrangement and isolated from (16) cases (28.5%) then was *Pseudomonas aeruginosa* was isolated from (6) cases (10.6%), and finally recorded *Staphylococcus aureus* and *Proteus spp.* have been isolated from (3) cases only (5.2%) for each one.

The test sensitivity of antibiotics was make for all bacterial that is isolates and the results showed that *E.coli* gave the highest percentage of resistance to the antibiotic Ampicillin (22 cases 75.8%) and the highest percentage of sensitivity of were antibiotic gentamicin (4 cases only 13.8%), while given (12 cases 75%) of the *Klebsiella spp.* Resistance to the antibiotic Ampicillin, and with the same time, the *Staphylococcus aureus* bacteria and *Proteus spp.* totally resistant at the percentage (100%) to the antibiotic Ampicillin. Finally *Pseudomonas aeruginosa* its owner highest percentage resistance to most antibiotics used in this study.

**Keywords :**Bacterial Infection , Urinary Tract ,Antibiotics, AL-Kut City

## **INTRODUCTION**

Urinary tract infections (UTI) are one of the most common infectious diseases, and nearly 10% of people will experience a UTI during their lifetime, [1,2]. UTI are the most common infections after upper respiratory tract infections [3]. The infections may be symptomatic or asymptomatic,

## **Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

and either type of infection can result in serious sequelae if left untreated [4]. Urine may contain pus (a condition known as pyuria) as seen from a person with sepsis due to a urinary tract infection.

Lower urinary tract infection is also referred to as a bladder infection. The most common symptoms are burning with urination and having to urinate frequently (or an urge to urinate). People experiencing an upper urinary tract infection, or pyelonephritis, may experience flank pain, fever, or nausea and vomiting in addition to the classic symptoms of a lower urinary tract infection [5]. Rarely the urine may appear bloody [6] or contain visible pyuria (pus in the urine) [7]. Although several different microorganisms can cause UTI including fungi, and viruses, bacteria are the major causative organisms and are responsible for more than 95% of UTI cases (8). *Escherichia coli* is the most prevalent causative organism of UTI is solely responsible for more than 80% of these infections, with *Staphylococcus aureus* being the cause in 5–10. %.[9] Other bacterial causes include: *Klebsiella spp.*, *Proteus spp.* And *Pseudomonas aeruginosa* [6,10].

An accurate and prompt diagnosis of UTI is important in shortening the disease course and for preventing the ascent of the infection to the upper urinary tract and renal failure [11]. Treatment of UTI cases is often started empirically. Therapy is based on information determined from the antimicrobial resistance pattern of urinary pathogens. However because of the evolving and continuing antibiotic resistance phenomenon regular monitoring of resistance patterns is necessary to improve guidelines for empirical antibiotic therapy [12,13]. This study aims to determine the causative agents of UTI and their susceptibility patterns to commonly used antibiotics in patients from the AL-Kut city.

### **MATERIAL & METHODES**

#### **Samples**

Urine samples were collected from 150 patients who were suffering from UTI from both sexes (95 samples from females and 55 samples from males) and different age groups (1-60 years). These samples were collected from the Al - Karama educational hospital in the city of Al-Kut south of Baghdad. The time lapsing extended from 01/08/2013 to 01/02/2014. The urine samples were collected from adult patients by using cleaned and sterilized test tubes, either from children under 3 years have been using sterile urine bags. Midstream Samples were collected for patients under aseptic condition. The specimen was centrifuged at 3000 r.p.m. for 10 minutes. The supernatant fluid was decanted and the sediment was used.

## **Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

### **Cultures media**

All cultures media had been used are dissolve and sterilized in autoclave at a temperature 121 C° and under the pressure of 15 pounds/inch<sup>2</sup> for 20 minutes. After sterilization the culture media distributed in sterile petri dishes and kept at a temperature 4 C<sup>0</sup> until use. Cultures media used are:

- Blood agar .
- Nutrient agar .
- Nutrient broth .
- MacConkey agar .

### **Reagents**

- Oxidase test reagent .
- H<sub>2</sub>S test reagent .
- Nitrate reduction reagent .
- Vogas Proskauere reagent .
- Kovacs reagent .

### **Gram's stain**

It was used to differentiate between the isolated organisms into the classical Gram positive and Gram negative isolates [14]. All urine samples were inoculated on blood agar as well as MacConkey agar and incubated at 37C<sup>0</sup> for 24 hours. Gram negative and gram positive bacteria were identified by standard biochemical tests [8,11] .

### **Sensitivity to antibiotics for bacterial isolates that causes UTI**

Media used for antibiotic sensitivity test:

- Mueller Hinton agar and broth (Oxoid).
- Sensitivity disk: 30 µg "Oxoid"

The isolates bacteria were tested for Sensitivity of antibiotics by using ( Kirby – Bauer) method[15] . And bacteria being considered sensitive or resistant according to the specifications as mentioned in the standard method [16] .

## **RESULTS AND DISCUSSION**

Microbial infection of the urinary tract is one of the most common infectious diseases in world wide. In this study, of 150 patients from whom urine sample were taken only 56 cases (37.3) % ( 37 females and 19 males) had a bacterial urinary tract infection. while 94 cases 62.7% ( 58 females and 36 males) have given negative culture of bacterial isolation as in table ( 1 ).

**Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

**Table (1): The positive & negative results of UTI Samples cultures.**

Sex	Positive culture for urine sample	Negative culture for urine sample	Total %
Female	37	58	95(63.3%)
Males	19	36	55 (36.7 %)
Total%	56 (37.3)%	94 (62.7)%	150

Bacterial isolates after cultured on the media had been diagnosed by Special characteristics and biochemical tests. The characteristics of isolates were macroscopic and microscopic as following:

- *E.coli* negative for gram stain, coccobacilli, non-hemolytic ,lactose fermenter Therefore the colonies appear on the MacConkey in pink color.
- *Klebsiella spp.* rod gram negative, non- spore forming non- lactose fermented, non-motile, capsulated and the colonies are mucoid.
- *Pseudomonas aeruginosa* are cocci, gram negative, non- spores forming, non- lactose fermented, oxidase positive and it is produce special green pigment on culture media.
- *Staphylococcus aureus*are gram positive, cocci, non- spores forming and it is hemolytic on blood agar.
- *Proteus spp.* rod gram negative, motile, non- spores forming, showing the swarming Phenomenon and non- lactose fermented the colonies appear on the MacConkey in yellow color. [17].

In this study five types of bacterial agents can be isolated from urine samples of patients . *E.coli* is the predominant isolated pathogen from this study 29 cases 51.5 %.Whereas the prevalence of UTI due to *Klebsiella spp.* 16 cases (28.5) % and followed by *Pseudomonas aeruginosa* 5 cases (10.6) % as well as the UTI due to *Staphylococcus aureus* and *Proteus Spp.* were 3 cases ( 5.2) % for each one only.

**Table (2): Types of bacteria that isolated from urine samples.**

Isolated bacteria from UTI samples	Cases number	%
<i>E. coli</i>	29	51.8
<i>Klebsiella spp.</i>	16	28.5
<i>Pseudomonas aeruginosa</i>	5	8.9
<i>Staphylococcus aurous</i>	3	5.4
<i>Proteus spp.</i>	3	5.4
	56	100

**Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

**Table (3) :Frequency of isolated bacteria from positive urine samples according to patient Age groups.**

Organism	Age (years)						Total
	1-10	11-20	21-30	31-40	41-50	51-60	
<i>Escherichia coli</i>	2 33.3%	6 75.0 %	11 64.7 %	5 45.5 %	3 75.0%	2 20.0 %	29 51.8%
<i>Klebsiella Spp.</i>	1 16.7 %	2 25.0 %	3 17.6 %	4 36.3 %	1 25.0%	5 50.0 %	16 28.6%
<i>Pseudomonas aeruginosa</i>	2 33.3%	0 0.0 %	0 0.0 %	1 9.1 %	0 0.0 %	2 20.0 %	5 8.9%
<i>Staphylococcus aureus</i>	0 0.0 %	0 0.0 %	1 5.9 %	1 9.1 %	0 0%	1 10.0 %	3 5.4%
<i>Proteus spp.</i>	1 16.7%	0 0.0 %	2 11.7 %	0 0.0 %	0 0.0 %	0 0.0 %	3 5.4%
Total	6 10.7 %	8 14.3%	17 30.4%	11 19.6 %	4 7.1 %	10 17.9%	56 100.0%

Analysis of the frequency of isolated bacteria according to the age revealed that in children( 1-10 years) *pseudomonas* and *Escherichia coli* infections are more prevalent whilst in older age groups ( 51-60 years) *Klebsilla spp.* are more prevalent as shown in table 3 .

According to the sensitivity test, we found that *E. Coli* as the predominant cause of UTI , showed the highest percentage of resistance to Ampicillin ( 22cases% 75.8) and the lowest resistance to Gentamycine ( 4 cases% 13.8) .*Klebsiella spp.* As the second most prevalent pathogen of UTI displayed and similar resistance pattern and were resistance to Ampicillin in ( 12 cases %80) and resistance to Ciprophalxine ( 1 case% 6.7). *Pseudomonas aeruginosa* showed the highest antibiotic resistance rate for almost antibiotic that used in this study, all isolations cases of *Staphylococcus aureus* and *proteus spp.* Were resistance for Ampicillin (3 cases % 100). as in table (4) .

**Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

**Table (4) :- Resistance rate of isolated bacteria from positive urine samples to commonly used antibiotics**

Organism	N	Antibiotic						
		GEN	CIP	NAL	SXT	CEP	AMP	OXA
<i>E-Coli</i>	29	4 13.8%	6 20.7%	9 31.0%	20 60.0%	18 62.0%	22 75.8%	7 24.1%
<i>Klebsiella spp.</i>	16	3 18.75%	1 6.25%	5 31.25%	10 62.5%	7 43.75%	12 75%	2 12.5%
<i>Pseudomonas aeruginosa</i>	5	4 80%	3 60%	5 100%	5 100%	4 80%	5 100.0%	3 60%
<i>Staphylococcus aureus</i>	3	0	0	1 33.3%	0	3 100%	3 100%	0
<i>Proteus spp.</i>	3	0	0	1 33.3%	1 33.3%	2 66.6%	3 100%	0
Total	56	11	10	21	36	34	45	12
		19.6%	17.9%	37.5%	64.3%	60.7%	80.4%	21.4%

N, number of isolates ; GEN , gentamicin , CIP , ciprofloxacin ; NAL , nalidixic acid ; SXT , trimethoprim - sulfamethoxazole ; CEP , Cephalexin ; AMP , Ampicillin ; OXA, Oxacillin .

Our result show lower urinary tract infection rate of (36.7) % in males that less than females. The reason for this may be due to the higher number of women than men in this study and because males are less prone to UTI ,and possibly because of their longer urethra and the presence of prostate in males which is produce secretions which slow the growth of these bacteria in male [5,18,19] . Enterobacteriaceae are the predominant pathogens followed by gram positive cocci. This findings are consistent with reports published from other countries [20- 22].

Our study, as with previous studies, shows that *E.coli* is the predominant etiology of UTI [15]. The reason for the increase infection by *E.coli* that consider as normal flora which found naturally in human intestines which facilitates transition easily from the rectum to the urinary tract due to pollution and poor hygiene, and they opportunist bacteria are that exploit the weakness the body's immunity of body and cause infection [10,23] . Also it's very high microbial resistance rate to antibiotics, whereas the highest percentages of susceptibility were seen for Gentamicin 56.2% [24]. Also in this study the results of isolated *Pseudomonas aeruginosa* from some cases of UTI is corresponds with the results of [7,23] , this resistance for antibiotic test is higher than found in other report [25,26].

Most cases of UTI due to *Pseudomonas aeruginosa* were in patient over

## **Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

50 years of age and under 10 years of age. This indicates that this bacterium is a weak immunological condition in this age [18]. *Staphylococcus aureus* is an important bacterial agent and was responsible for 5.4% of UTI cases in this study. These results compatible the results of [7] and differ from other studies that found higher percentage of this bacteria may be causes UTI [27] . Also *Proteus spp.* were isolated from some cases of UTI 5.4 % which is similar to results of other reports from other countries (18).

According to the sensitivity test , we found that 80.4% of isolated bacteria were resistance to Ampicillin, 64.3% were resistance to trimethoprim-salfamethoxazole, 60.7% were resistance to Cephalexin, while 37.5% were resistance to nalidix acid , only 21.4% were resistance to Oxacillin and 19.6% were resistance to Gentamycin, finally 17.9% were resistance to ciprofloxacin .The resistance to  $\beta$ -Lactam antibiotics like penicillin , cephamycins, carbapenems..etc is due to the possibility of these bacteria to produce  $\beta$ - Lactamase enzymes that provide resistance by breaking the antibiotics' structure.

The regional variations of resistance to antibiotics may be explained in part by different local antibiotic practice. This influence of excessive and /or in appropriate antibiotic - resistance strains, particularly broad-spectrum agents prescribed empirically has been demonstrated. Reducing the number of a particular antibiotic can lead to decrease in resistance rates [27].

In conclusion we found that most common microorganism causing UTI in our province, (Al-Kut city ) was *E.coli* and most best common antibiotic was gentamycin followed by ciprofloxacin. These results show that the antimicrobial resistance pattern of the causes of UTI are highly variable.

Finally we think that there is a necessity to do a culture and sensitivity test before the usage of any antibiotics and there is an urgent need to creation of special commonly that can achieve the monthly report for the favorite antibiotic according to the culture and sensitivity for the most common infections in their locality.

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## **Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

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## **Bacterial Causes of Urinary Tract Infection in Human and Sensitivity of Antibiotic in AL-Kut City-Iraq .....Luma Hikmat Kareem**

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## البكتريا المسببة لإصابات المسالك البولية في الإنسان وحساسيتها

### للمضادات الحيوية في مدينة الكوت -العراق

لمى حكمت كريم

كلية الطب/ جامعة واسط

#### الخلاصة

هدفت هذه الدراسة إلى عزل بعض المسببات الجرثومية لحالات الإصابة بالتهاب المجاري البولية في الإنسان. تضمنت الدراسة محورين : تناول المحور الأول المسببات الجرثومية للتهاب المجاري البولية , فيما تناول المحور الثاني معرفه حساسية ومقاومه تلك المسببات الجرثوميه للمضادات الحيوية. تم جمع (150) عينه إدرار من أشخاص كانوا يعانون من التهاب المجاري البولية من مستشفى الكرامة التعليمي في مدينه الكوت للمدة من اب 2013 عام لغاية شباط عام 2014 .

خضعت جميع العينات للفحوصات الزرعية والمجهرية والكيموحيويه لغرض تشخيصها. أظهرت (56) حاله عزلا جرثوميا موجبا من مجموع الحالات العام (150) وبنسبه 37.3 % بينما أعطت (94) حاله نتيجة سالبه للعزل الجرثومي وبنسبه 62.7%. سجلت الاشريكية القولونية *Escherichia coli* المرتبة الأولى بين المسببات الجرثومية للتهاب المجاري البولية حيث عزلت من (29) حاله وبنسبه (51.5) % . جاءت بكتريا الكلبسيلا *Klebsiella spp.* الثانية في الترتيب وعزلت من (16) حاله وبنسبه (28.5) % بعدها كانت الزائفة الزنجارية *Pseudomonas aeruginosa* وعزلت من (6) حالات وبنسبه (10.6) % , وأخيرا سجلت المكورات العنقودية *Staphylococcus aureus* وجراثيم البروتيس *Proteus spp* قد عزلت من (3) حالات فقط وبنسبه (5.2) % لكل منهما.

اجري اختبار حساسية المضادات الحيوية لجميع العزلات الجرثومية وأظهرت النتائج إن الاشريكية القولونية *Escherichia coli* أعطت أعلى نسبة مقاومه للمضاد الحيوي الامبسلين (22) حاله وبنسبه (75.8) % وأعلى نسبة حساسية كانت لمضاد الحيوي الجنتاميسين (4) حالات فقط بنسبه (13.8) % بينما أعطت (12) حاله وبنسبه (75) % من جراثيم الكلبسيلا *Klebsiella spp* مقاومه للمضاد الحيوي الامبسلين , وبنفس الوقت كانت جراثيم المكورات العنقودية *Staphylococcus aureus* وجراثيم البروتيس *Proteus spp.* مقاومه كليا وبنسبه (100) % للمضاد الحيوي البنسلين فيما كانت جراثيم الزائفة الزنجارية *Pseudomonas aeruginosa* صاحبه النسبة الأعلى لمقاومه اغلب المضادات الحيوية المستعملة في الدراسة.

الكلمات المفتاحية : الإصابات البكتيرية , إصابات المسالك البولية , مدينة الكوت .