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Isolation and Diagnosis of Bacteria Causing UTIs in Samarra City and Testing their Susceptibilty to Antibiotics

Maeda Mohammed Abdulkhaleq [1]
Osama Nadhom Nijris [2]
[1-1] Dept of Analysis Pathological, college of Applied Sciences,University of *Samarra, Iraq*
Corresponding author email:[1] *st.aps12*@uosamarra.edu.iq
[2] Usama.n@uosamarra.edu.iq

Abstract

Urinary tract infections (UTIs) are among the most common bacterial infections, affecting 150 million individuals globally, UTI is frequently more common in female than in male, therefor, itis crucial to comprehend the primary microorganisms causing UTIs and their corresponding patterns of antibiotic susceptibility , the objective of this research was isolation and diagnosis of bacteria in adult patients with UTI in samarra city and testing their susceptibilty to antibiotics ,120 urine samples were collected from adult males and female with urinary tract infections from Samarra General Hospital of different age groups 15-65 ,Urine samples were cultured on Blood Agar and MacConkey Agar medium and diagnosed by Biochemical tests and the Susceptibilty of the bacteria to antibiotics was studied**,**the results of urine cultures taken from adult male and females with UTI revealed that 53 samples had bacterial growth 53 and samples did not show any bacterial growth, Grams Stain results also revealed that Gram-negative bacteria 71.69 % outnumbered Gram-positive bacteria 28.31%, the results of diagnosing bacterial isolates according to culture characteristics and biochemical tests showed the presence of nine different types of bacteria:*Escherichia coli* ,*Staphylococcus aureus, Klebsiella pneumonia, proteus vulgaris, Staphylococcus epidermidis* , *Pseudomonas aeruginosa* and *proteus.mirabilis, Staphylococcus saprophyticus* ,*Citrobacter.frundi*i, the results revealed that all bacterial species were 100% resistant to both Rafampin and Vancomycin except for *S.aureus* which showed resistance to the above mentioned antibiotics by 85.7%, the results also showed that most bacterial species were sensitive to Doxycycline [10] which is the best antibiotic used in this study.

Key words:- UTIs, Isolation and Diagnosis bacteria، Antibiotics Susceptibilty.

عزل وتشخيص البكتريا المسببة لالتهاب المسالك البولية في مدينة سامراء واختبار حساسيتها للمضادات الحساسية

مائدة محمد عبدالخالق[1]
أسامة ناظم نجرس[2]
[1-1] قسم التحليلات المرضية ، كلية العلوم التطبيقية ، جامعة سامراء
st.aps12@uosamarra.edu.iq1 Usama.n@uosamarra.edu.iq2

المستخلص: تعد التهابات المسالك البولية من أكثر أنواع العدوى البكتيرية شيوعًا، حيث تؤثر على 150 مليون فرد على مستوى العالم، وغالبًا ما تكون التهابات المسالك البولية أكثر شيوعًا لدى الإناث منها لدى الذكور، لذلك من الضروري فهم الكائنات الحية الدقيقة الأولية المسببة لالتهابات المسالك البولية وأنماط حساسيتها للمضادات الحيوية المقابلة لها، وكان الهدف من هذا البحث عزل وتشخيص البكتيريا لدى المرضى البالغين المصابين بالتهابات المسالك البولية في مدينة سامراء واختبار حساسيتهم للمضادات الحيوية، تم جمع 120 عينة بول من الذكور والإناث البالغين المصابين بالتهابات المسالك البولية من مستشفى سامراء العام من مختلف الفئات العمرية 15-65 عامًا، تمت زراعة عينات البول على وسط Blood Agar و MacConkey Agar وتم تشخيصها عن طريق الاختبارات الكيميائية الحيوية وتم دراسة حساسية البكتيريا للمضادات الحيوية، كشفت نتائج مزارع البول المأخوذة من الذكور والإناث البالغين المصابين بالتهابات المسالك البولية أن 53 عينة بها نمو بكتيري ولم تظهر العينات أي نمو بكتيري، كما كشفت نتائج صبغة جرام أن البكتيريا سالبة الجرام تفوقت البكتيريا موجبة الجرام بنسبة 71.69% على البكتيريا موجبة الجرام بنسبة 28.31%، وأظهرت نتائج تشخيص العزلات البكتيرية حسب الخصائص الثقافية والاختبارات الكيميائية الحيوية وجود تسعة أنواع مختلفة من البكتيريا وهي: *Escherichia coli* ,*Staphylococcus aureus, Klebsiella pneumonia, proteus vulgaris, Staphylococcus epidermidis* , *Pseudomonas aeruginosa* and *proteus.mirabilis, Staphylococcus saprophyticus* ,*Citrobacter.frundi*i وأظهرت النتائج أن جميع الأنواع البكتيرية كانت مقاومة بنسبة 100% لكل من رافامبين وفانكومايسين باستثناء المكورات العنقودية الذهبية التي أظهرت مقاومة للمضادات الحيوية المذكورة أعلاه بنسبة 85.7%، كما أظهرت النتائج أن معظم الأنواع البكتيرية كانت حساسة للدوكسيسيكلين 10 وهو أفضل مضاد حيوي استخدم في هذه الدراسة.

كلمات مفتاحية : UTIs, Isolation and Diagnosis bacteria, Antibiotics Susceptibilty

1-Introductions

Urinary tract infection (UTI) is an infection in any part of human urinary system; kidney, ureters,bladder and urethra and usually causes a significant burden among the individuals (1) female are at greater risk than male of developing UTI as it affects half of all women in their lifetime and one-fourth have recurrent infections, these infections can be painful to bladder and serious consequences if occurred and spreads to kidneys,(2,3) Most of UTI treatment treated with antibiotic due to bacterial infections, Moreover, annually 150 million people are suffering worldwide along with a rise in health care cost , making it necessary to divert the attention to this disease(4)

The majority of studies found that gram-negative bacteria (5,6,7)were a common cause of UTI cases rather than gram-positive(8,9,10), which are in line with the present study, It could be because gram-negative bacteria have specific virulence factors, such as adhesion proteins and distinctive structures(11,12), which make it easier for them to connect to uroepithelial cells and cause a high prevalence of UTIs, the most common urinary pathogens that are Gram-negative are *Escherichia coli*, *Klebsiella spp., Pseudomonas spp., and Proteus spp*., these bacteria are also known as Gram-positive bacteria, and they are linked to UTIs by *Staphylococcus aureus, Staphylococcus saprophyticus, Enterococcus faecalis,* and *Staphylococcus epidermidis. Citrobacter spp., Morganella*

morganii, Acinetobacter spp., and *Streptococcus spp*.(13) are less common bacteria that cause UTIs.

It is commonly recognized that over 95% of urinary tract infections are caused by a single species of bacteria, *E. Coli* is the most common organism that causes acute infections , according to several research conducted in Iraq(5,12).

UTIs are among the most common infections, and they tend to affect female more than male because approximately 60% of female are expected to get one at some point in their lives , the frequency rate of UTI is also influenced by other factors, such as age, history of antibiotic use, hospitalization, and catheterization(14).

Antibiotics are organic substances produced by microorganisms or generated in labs, they are often isolated from bacteria or fungi and possess the ability to stop the development, devastation, or death of other species(8), antibiotics primarily function by preventing and altering the cell wall, obstructing the synthesis of proteins and DNA, and preventing metabolism, since the discovery of naturally occurring antibiotics obtained from microbiological sources, resistance has rapidly emerged, often shortly after they were initially employed in therapeutic settings, some of the antibiotic susceptibility and resistance in bacteria can be attributed to structural variations between Gram-positive and Gram-negative bacteria(5), antibiotics are categorized as either bacteriocidal, which kills germs, or bacteriostatic, which inhibits or stops bacterial proliferation , therefore, the purpose of this study was to determine which bacteria are linked to UTIs in adult patients and to investigate the bacteria's susceptibility to certain medications.

Aim of the study

1-Isolation and diagnosis of bacteria causing urinary tract infections.

2-Classified UTIs in patients according to age and gender.

3- testing their susceptibilty to antibiotics in Samarra City.

2 - Material and methods

Collecting samples

120 urine samples from patients with UTI were collected between December 2, 2024 to April 4, 2025, from Samarra General Hospital, the patients' ages ranged from 15 to 65 years old, and control group was 30 urine samples were collected from healthy patients who did not have a UTI based on the clinical examination of the urinary tract infection.

Clinical examination of Urine samples

Urine samples collected from patients with UTI according to the method described by Cheesbrought(15), urine samples were then seeded onto blood agar medium and MacConkey agar medium and the plates were incubated under aerobic conditions at 37°C .

Diagnosis of bacteria

Patients' urine samples were collected from the midstream in a sterile container,the samples were centrifuged, and the sediment was cultured primarily on nutrient agar, blood agar and MacConkey, mannitol salt agar using the diffusion plate technique, and incubated for 24 hours at 37°C,all microorganisms isolated from positive cultures ($\geq 10^5$ colony-forming units/ml(16).

Biochemical tests

Biochemical tests were performed according to Dela Maza *et al.*,(17) for the diagnosis of bacterial isolates:Oxidase test, Catalase test, Indol Production test, Methyl red test, Citrate Utilization test, Hemolysin production test and Mannitol Fermentation Test.

Antibiotics susceptibility test

Antibiotic susceptibility testing was performed for eight types of antibiotics: Rifampicin, Amikacin, Ceftazidime, Vancomycin, Ciprofloxacin, Doxycycline, Ceftriaxone and Nitrofurantoin, on the bacterial isolates under study and the disc diffusion method according to the Baure-Kirby method described by the World Health Organization (WHO)(18), and to know the resistant, sensitive and moderately susceptibility bacteria to antibiotics were compared with CLSI(19).

2-Results

Urine Culture from patients with UTIs

The results of urine culture taken from 120 urine samples with UTI whose ages were between 15-65 years in Samarra General Hospital and cultured on blood agar medium, MacConkey agar medium, EMB medium and mannitol agar medium, as the results revealed that 53 samples 44.16% had bacterial growth and 67 samples 55.83% did not show any bacterial growth.

Diagnosing Bacterial Isolates

Bacteria isolated from urine samples of patients with UTI were characterised according to culture and phenotypic characteristics on blood agar , MacConkey agar , eosin blue methylene blue EMB medium and some biochemical tests, the results showed that 53 bacterial isolates were obtained, of which 15 were Gram-positive and 38 were Gram-negative .

The results presented in Table 1 revealed the findings of Gram staining for the bacterial isolates, it was found that 15 bacterial isolates were Gram-positive, representing 28.31%, while 38 isolates were identified as Gram-negative, accounting for 71.69%.

Table 1: The Percentage of Gram-positive and Gram-negative bacterial isolates.

Types of bacterial isolates	Numbers	Percentage	P-Value
Gram stain positive isolates	15	28.31%	P <0.001
Gram stain negative isolates	38	71.69%	
Total	53	100	

This study showed that a 53 bacterial isolates were obtained from urine samples of UTI patients, these isolates of several bacterial species include: *E.coli*, *P.aergenosia* , *K. pneumonia*, *P. mirabilis*, *P. vulgaris* and *C. freundii* and Gram positive organisms including: *S. aureus*, *S. epidermidis* and *S. saprophyticus*, the numbers and percentages of these bacterial species are represented in table 2 and figure 1 below:

Table 2: The number and percentages of bacterial isolates from cultures.

NO	Bacteria	Frequency	Percentage (%)
1.	***E.Coli***	15	28.30%
2.	***P.aergenosia***	7	13.20%
3.	***P.mirabilis***	4	7.54%
4.	***P.vulgaris***	10	18.87%
5.	***C.frundii***	1	1.89%
6.	***K.pneumonia***	1	1.89%
7.	***S.aureus***	7	13.21%
8.	***S.saprophyticus***	7	13.21%
9.	***S.epidermidis***	1	1.89%
10.	***Total***	53	100

Escherichia coli was identified as the most prevalent uropathogen, isolated in 28.30%, followed by *Proteus spp.* 26.41%, *Pseudomonas aeruginosa* 13.20%, and both *Citrobacter freundii* and *Klebsiella pneumoniae*1.89%, while among Gram-positive organisms, *Staphylococcus spp*. were the most frequently isolated, accounting for 28.31% of the total cultures.

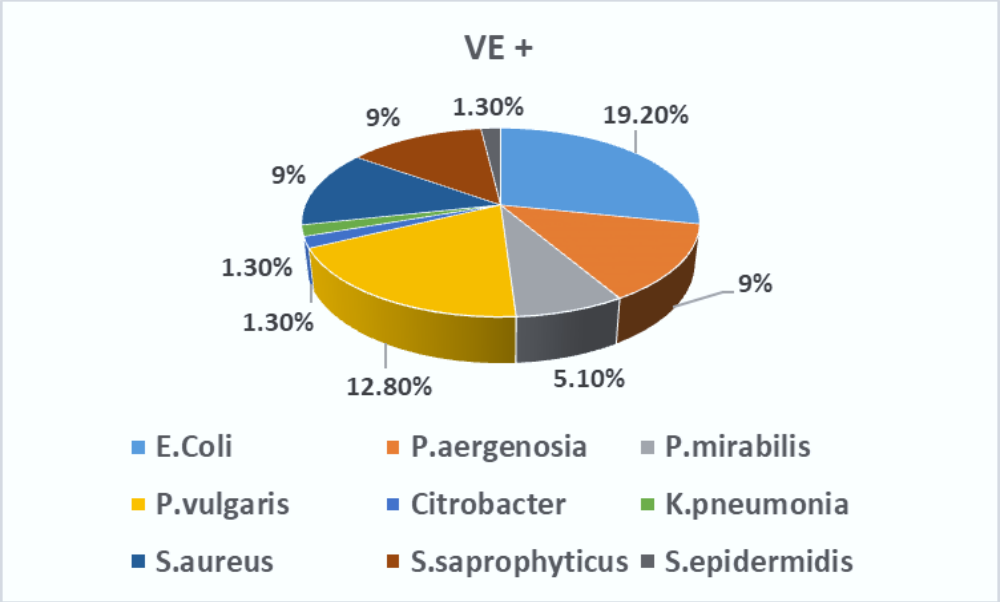

Figure 1:The percentages of bacterial isolates .

The classification of UTIs according to Gender and Age

This study demonstrates that the majority of participants were higher in females (74.17%) than in males (25.83%), also the incidence rates of UTIs between age groups 15-65 years were as follow, the highest incidence rate was 41.67% between age group 25-34 year, followed by 20.83% with age group 15-24 year, and the lowest rates were 16.67%,12.5%,8.3% with age groups 35-44,45-54, and >55year respectively and these results are presented in table 3 and 4 below:

Table 3: Classified UTI in patients according to age.

Age groups	Number	Percentage (%)
15-24	25	20.83%
25-34	50	41.67%
35-44	10	16,67%
45-54	15	12.5%
>55	20	8.3%
Total	120	100

Females are more susceptible than males, as gender, i.e., women's physiology, plays a role in the inflammatory response, followed by the remaining ages, where different rates were recorded, infection rates vary by age, and in general, infection rates were higher in females than in males, this may be due to differences in innate responses to infection with age, this may be due to hygiene practices and socioeconomic norms, bacterial isolates and their species may play a role in the disparity in infection rates across ages, this may be due to

inflammatory and immune functions, and the disparity between studies is due to differences in study design, sample type, sample size, and geographic location.

Table 4: Numbers and Percentages by Age Groups in Males and Females

Age Groups	Males		Females	
	N	%	N	%
15-24	1	3.2%	24	26.97%
25-34	3	9.7%	47	52.81%
35-44	3	9.7%	7	7.9%
45-54	9	29.0%	6	6.7%
>55	15	48.4%	5	5.6%
Total	31	100	89	100

Cultural Characteristics of Bacterial Isolates

The culture properties of the bacterial species isolated from the urine of UTI patients are displayed in Table 5 on several culture media, including Mannitol Salt agar, Eosine Methylene Blue ("EMB"), Blood agar and MacConkey agar.

Table 5 : Shows the culture characteristics of the bacterial species.

Type of bacteria	MacConkey agar	Blood agar	EMB	Mannitol Salt
E. coli	Round, small, pink-coloured, dry colonies	Greyish-white and moist	Green metallic sheen	-
S. aureus	No growth	White colonies	No growth	Yellow
K. pneumonia	Pink, mucous and large colonies	Greyish Larg white	Purple colonies and mucus	-

S.saprophyticus	No growth	White/Cream colonies	No growth	Pink
S. epidermidis	No growth	White colonies	No growth	Pink
P. aeuroginosa	Pale in colour	Flat Creamy colonies	Colorless	-
P.vulgaris	Pale in colour	Clear colonies	Colorless	-
P.mirabilis	Pale in colour	Clear colonies	Colorless	-
C.freundii	Pink to red and mucous	Gray colonies	Purple colonies	-

Biochemical Characteristics of Bacterial Isolates

Several chemical and biological tests were conducted to diagnose bacterial isolated from patients with urinary tract infections, the bacteria were diagnosed based on what was mentioned by Brown and Smith *et al*.,(20) and Temmerman *et al*., (21), table 6 shows the biochemical tests on Gram-negative bacterial isolates, which included *Citrobacter.freundii* , *K. pneumonia, E.coli, P.aeruginosa., p.mirabilis, P.vulgaris*, the results showed that all tested isolates were Gram-negative, and all gave a positive result with the catalase test, all isolates showed a positive test in the citrate test, except for *E. coli,* which showed a negative result, all isolates gave a negative result with the oxidase test except P.aeruginosa gave a positive result and this is consistent with the findings of researchers Darwish, (22) and Al-Azzawi (23)stated, and all isolates showed a positive result for Methyl Red test except *P.aeruginosa,and, K.pneumonia* bacteria showed Positive results, table 7 shows the biochemical tests on Gram-positive bacteria, the results revealed that all of these isolates, including , *S.epidermidis, S.aureus* and *S.saprophyticus*, were Gram-positive and at the same time, were negative for the oxidase test, as for the catalase test, the result appeared positive for both *S.aureus* and *S.epidermidis* and *S.saprophyticus*, a likewise, as for the mannitol salt fermentation , the result was positive only for S.aureus as the color of the medium changed from pink to yellow.

NO	Bacterial Species	I	M	V I	C	CAT	OXIDASE	KIS agar	H2S	U	M
1.	***E.coli***	+	+	-	-	+	-	**A\A^{G}**	-	-	-
2.	***P.aurgenosia***	-	-	-	-	+	+	**K\K**	-	-	+

3.	***P.mirabils***	-	+	-	+	+	-	**K\A^{G}**	+	+	+
4.	***P.vulgaris***	+	+	-	+	+	-	**A\A^{G}**	+	+	+
5.	***C.freundi***	-	+	-	+	+	-	**A\A^{G}**	+	**V**	+
6.	***K.pneumonia***	-	-	+	+	+	-	**A\A^{G}**	-	+	-
I: Indole, **M:** Methyl red, **VI:** Voges proskaur, **C:** Citrate utilization, **CAT:** Catalse, **KIS:** Kligler Iron Sugar , **+:** Positive, **-:** Negative, **V:** Variable, **G:** Gas, **A:** Acidic, **K:** Alkaline,**M**:Motility											

Table 6: The Biochemical Tests Results of Gram Negative Bacteria .

Table 7 : The Biochemical Tests Results of Gram Positive Bacteria

NO	BACTERIAL SPECIES	CAT	COAGULASE	MANNITOL FERMENTION	NOVOBIOCIN RESISTANCE
1.	***S.aureus***	+	+	+	+
2.	***S.Saprophyticus***	+	-	-	-
3.	***S.epidermidis***	+	-	-	+
+: Positive, **-:** Negative, **CAT:** Catalse					

Bacterial Susceptibilty to antibiotics

The results shown in Table 8 showed that several different types of antibiotics were tested against bacterial species isolated from patients with UTI, the results revealed that all bacterial species were 100% resistant to both Rifampicin ^{30} and Vancomycin ^{30} except for *S.aureus* which showed resistance to the above mentioned antibiotics by 85.7%, the results also showed that most bacterial species were sensitive to Doxycycline^{10} which is the best antibiotic used in this study.

Table 8: Bacterial Susceptibilty to Antibiotics

Type of Bacteria	Isolations	Type ofAntibiotic											
		Rifampicin 30			Ceftazidime 30			Vancomycin 30			Ciprofloxacin 10		
		S	I	R	S	I	R	S	I	R	S	I	R
E. coli	**15**	**0**	**0**	**100 %**	**20 %**	**0**	**80%**	**0**	**0**	**100 %**	**40 %**	**0**	**60 %**

S. aureus	7	14.3 %	0	85.7 %	0	0	100 %	14.3 %	0	85.7 %	28.6 %	0	71.4 %
K. pneumonia	1	0	0	100 %	0	0	100 %	0	0	100 %	0	100 %	0
S.saprophyticus	7	0	0	100 %	0	100 %	100 %	0	0	100 %	28.6 %	0	71.4 %
S. epidermidis	1	0	0	100 %	0	100 %	0%	0	0	100 %	0	100 %	0
P. aeuroginosa	7	0	0	100 %	0	0	100 %	0	0	100 %	0	0	100 %
C.freundii	1	0	0	100 %	0	100 %	0%	0	0	100 %	100 %	0	0
P.vulgaris	10	0	0	100 %	20 %	0	80%	0	0	100 %	0	50%	50 %
P.mirabilis	4	0	0	100 %	50 %	0	50%	0	0	100 %	50 %	0	50 %

Type of Bacteria		Doxycycline 10			Ceftriaxone 10			Nitrofurantoin F-100			Amikacin 10		
		S	I	R	S	I	R	S	I	R	S	I	R
E. coli	15	20%	0	80 %	0	20 %	80%	20%	0	80%	6.7 %	0%	93.3 %
S. aureus	7	71.4 %	28.6 %	0	28.6 %	0	71.4 %	0	71.4 %	28.6 %	71.4 %	0	28.6 %
K. pneumonia	1	0	100 %	0	0	100 %	0	0	0	100 %	0	100 %	0
S.saprophyticus	7	71.4 %	28.6 %	0	0	0	100 %	28.6 %	0	71.4 %	28.6 %	0	71.4 %
S. epidermidis	1	100 %	0 %	0%	0	0	100 %	0	100 %	0	0	0	100 %

P. aeuroginosa	**7**	**0**	**28.6 %**	**71.4 %**	**0**	**0**	**100 %**	**0**	**0**	**100 %**	**14.3 %**	**0**	**85.7 %**
C.freundii	**1**	**0**	**0**	**100 %**	**0**	**0**	**100 %**	**0**	**100 %**	**0**	**0%**	**0%**	**100 %**
P.vulgaris	**10**	**0**	**0**	**100 %**	**0**	**0**	**100 %**	**0**	**0**	**100 %**	**0**	**20%**	**80 %**
P.mirabilis	**4**	**0**	**0**	**100 %**	**50 %**	**0**	**50%**	**0**	**0**	**100 %**	**0**	**50%**	**50 %**

S:Sensitive **, I:**Intermediate **, R:**Resistance.

The higher resistance profile of *p.aerginosia* , was to ceftriaxone ,ceftazidime 100% ,ciprofloxacin nitrofurantoin ,vancomycin , Rifampicin (100%), the prevalent gram-positive uropathogens with high resistance to Ceftazidime,Vancomycin (100%), Furthermore, around 97% of the isolated Staphylococcus spp. were sensitive to Doxycyclin and Amikacin.

4- Disscussion

According to the results of Table 1and 2 , the incidence of UTI in patients is clear and these results are consistent with Vian *et al*.,(24) who reported the incidence of UTI caused by bacterial infection 49% in urine samples taken from 120 adult patients with UTI, these results are not consistent with the study of Mays,(25) who reported that the incidence of UTI caused by bacterial infection in patients was 60.58%, the results of Gram's staining of bacteria agree with Al-Zaidi *et al*.,(26) who found that the percentage of Gram-negative bacteria isolated 65.5% is higher than Gram's -positive bacteria , Al-Shahrani and Belali (27) provided an explanation for the predominance of Gram-negative bacteria in this study, stating that these bacteria's special structures enable them to adhere to the surface of urinary epithelial cells, preventing their removal through urinary dialysis. This adhesion then permits the bacteria to proliferate and invade tissues, ultimately resulting in invasive infections like pyelonephritis, the results of bacterial isolation and diagnosis of the isolates are consistent with Mays,(25)and Wang *et al*.,(28) who showed that *Escherichia coli* is at the forefront of urinary tract infections in adult patients , followed by Staphylococcus spp. and *proteus spp*. , khan *et al*., found that *Escherichia coli* dominated the bacterial isolates with 27.71%, the reason for the predominance of *E. coli* is due to the virulence factors that these bacteria possess, such as toxins, adhesins, fimbriae and pili that allow them to adhere to the urinary epithelium (the epithelial tissue lining the urinary tract), which protects the bacteria during urinary elimination and allows the bacteria to multiply and

invade the urinary epithelium(29) The reason for the high presence of *E. coli* is attributed to the ability and adaptation of these bacteria to live in the urinary tract and tolerate unfavorable conditions, in addition to possessing multiple virulence factors, including adherence, capsule formation, toxins, and lysis enzymes (30).

Age is one of the most important factors that play a major role in urinary tract infections, and the decline the immune system plays a major role, in the current study, the patient groups were divided according to age groups into five groups, which shows the prevalence of urinary tract infections in different age groups, the results of our study showed that the highest incidence of urinary tract infections was among the age groups 25-34, where the number was 50 and a percentage of 41.67%, the findings of the current study are agreement with the research conducted by Al-Zaidi *et al*. (26)in Salah Al-Din Province, which reported that females constituted the majority of UTI cases, accounting for 70%, while males represented 30% of a total of 3,562 urine samples, females are generally more susceptible to urinary tract infections than males due to anatomical and physiological differences in the urinary system (31).

The results of our study showed that the highest incidence acute, chronic, and recurrent urinary tract infections, was among those aged 25–34, with 50 cases, representing 41.67%, this finding is consistent with the research study by Kurniawati and Auliyanah (32), which recorded a rate of 39.3%, UTIs are more common in males at older ages, showed that the highest incidence of urinary tract infections, was among those aged 45-54 and above 55, the most important causes are prostatic hyperplasia, loss of prostatic fluid, and kidney stones, prostate enlargement impedes urine flow, increasing the risk of infection, the elderly are more susceptible due to their frequent hospitalizations and weakened immunity (33), the results also showed that the 15-25 age group accounted for 26.97% a result inconsistent with Ali and AL-Dujaili (34), where the percentage was 58.9%, while agree with Ismail , (35) with 35% that the high rates at these ages may be due to frequent sexual activity, which leads to the spread of contaminated isolates to the area, this is one of the most important risk factors for recurrent urinary tract infections, self-diagnosis without an appropriate prescription and delayed treatment, menstruation, the hormonal changes associated with menstruation, and marriage also increase the risk (36).

One of the reasons for the widespread use of antibiotics is the spread of bacterial resistance to antibiotics and the development of this resistance, which is due to mutations in the genetic material and these mutations appear in mutant and resistant strains randomly (37).

Most bacterial species are resistant to Rifampicin and Vancomycin due to mutations, which in turn have developed bacterial resistance to these antibiotics, it has been established that a mutation in the rpoB gene, which encodes a β-

subunit in bacterial DNA, is responsible for both the formation of Rifampicin resistance and Rifampicin resistance itself,(38) regarding the antibiotic Doxycycline,de Macedo *et al*. (39)found that bacterial species isolated from UTI are 87% sensitive to this antibiotic.

The higher resistance profile of *p.aerginosia*, was to Ceftriaxone ,Ceftazidime , Ciprofloxacin, Nitrofurantoin ,Vancomycin , Rifampicin 100%, while the prevalent gram-positive uropathogens with high resistance to Ceftazidime, Vancomycin with 100%, Furthermore, *Staphylococcus spp.* were sensitive to Doxycyclin and Amikacin.

The results of this study were close to the research study by Mays, (25) conducted in Samarra City, where *E.coli* resistance to vancomycin and ciprofloxacin with 95%, 55% respectively, while sensitive to Nitrofurantoin and Amikacin with 65%, 50% respectively.

As reviewed in Bedenic and Mestrovic,(40), Gram-negative bacteria becoming an increasing threat to public health because of their ability to acquire genes located on transferable plasmids that code for extended-spectrum β-lactamases (ESBLs), these enzymes are capable of hydrolyzing third-generation cephalosporins and monobactams but not carbapenems (41), also there are a multitude of different resistance mechanisms among uropathogens that are more or less widespread depending on the local epidemiological context (42).

This study showed highly resistant of *K.pneumonia* isolate to ceftriaxone , ceftazidime ,nitrofurantoin, vancomycin and Rifampicin, while intermediate susceptible to ciprofloxacin and Amikacin with 100% and Sensitive to Doxycyclin, this results are different to the research study by Mohammed *et al*., (43) conducted in Kirkuk City of the total 17 isolates with 26%.

The results of the current study are compatible with Naji and Awadh,(44) findings as they documented that most *p. mirabilis* isolates were resistance to Vancomycin with 100%.

The study findings compatible to research study by Mahdii,(45), recorded that all *P. vulgaris* isolates were sensitive to ciprofloxacin 100% .

The bacterial isolate *C.freundii* was highly resistance to Vancomycin, Cefixime, Amikacin 100% additionally, *Citro.freundii* was highly sensitive toward Nitrofurantoin, Ciprofloxacin 100%, the study results are different in compration to study conducted in Babylon City by Ali and Aljanaby,(46), as they recorded resistance percentages of 50% for Amikacin against *C. freundii* isolates.

Our study showed that *S.aureus* is consistent with the research study by Mhana and Aljanaby,(47), they revealed sensitivity rate of 22% for Ciprofloxacin, there are relative mechanisms is one of these is the strains with the tetM gene are resistant to all antibiotics of the doxycycline group (48), *Staphylococcusaureus*

notorious for its capacity to become resistant to antibiotics, and its development of multi-drug resistance is a global problem.

The study results showed that *S.saprophyticus* were resistance to vancomycin with 100% ,Amkacin and Nitrofurantoin with 71.4%, while sensitive to Ciprofloxacin with 100% these rates close to the research study by Mays, (25) in Samarra City.

The current antibiotics resistance profile of *S.saprophyticus* highlight the increased resistance percentages of these isolates in Samarra region which may regard to the various virulence factors expressed by *Staphylococcus spp* such as surface proteins, biofilms, exoenzymes, exotoxins, and exfoliative toxins, also Biofilm formation is the most important virulence factor as it participates in pathogenicity by increasing the resistance of the constituent microbes to antibiotics and host defenses, as studies founded that the biofilm producers Staphylococcus spp were resistant to multiple antibiotics (49).

The study findings are compatible to study conducted by Khalil, 2020, he recorded sensitivity rate of 25% for ciprofloxacin against *S.epidermidis* isolates, also the study findings were different to Ramadan *et al*.,(50), as they showed susceptibility rate ofNitrofurantoin 29% and Ciprofloxacin 71% in their study.

5- Conculsions

1. The incidence of urinary tract infections was higher in females than in males.
2. The results showed a higher incidence of Gram-negative bacteria than Gram-positive bacteria.
3. E. coli was the most abundant of the Gram-negative isolates, while S aureus was the most abundant of the Gram-positive bacteria.
4. The incidence of urinary tract infections in patients is related to several factors, the most important of which are age and gender.
5. The results revealed that all bacterial species were resistant to both antibioticus Rifampicin and Vancomycin, with the exception of S. aureus, which was resistant to both these antibiotics ,all bacterial species were sensitive to the antibiotic doxycycline, which was the best antibiotic used in this study.

Conflict of interest

The researcher declares that there is no conflict of interest in preparing this research. Thank.

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Recommendations

Conduct a study to identify other causes of urinary tract infections, such as fungi, anaerobic bacteria, parasites, and viruses, and study the sensitivity of bacteria to other antibiotics, as well as conduct a study of synergism between antibiotics and their role in inhibiting antibiotic-resistant bacteria**.**

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