

Article

Antibiotic Profile for Bacteria Isolated from Urinary Tract Infection in Babylon Province

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Abstract: The purpose of this work was to ascertain the antibiotic profile of bacteria extracted from patient urinary tract infections (UTIs) from community urine samples. Commonly including bacterial and, occasionally, fungal or viral infections, urinary tract infections (UTIs) are healthcare concerns. Antibiotic resistance has grown out of the illogical prescribing and usage of antibiotics in UTI therapy. From male and female patients in several hospitals in Babylon province, Iraq, urine samples (152) were gathered with an age range of 1 to 80 years. In 67% of the samples—99/152—the research noted increase. Of the samples, 78% showed gram-negative bacteria; Gram-positive bacteria were recorded in 22%. Among women, the UTI prevalence was 73%; among men, it was 27%. The most prevalent uropathogenic bacteria were *Escherichia coli* (46%, 46/99), followed by, *Staphylococcus aureus* (25%, 25/99), *Enterobacter cloacae* (9, 9/99), *Proteus mirabilis* (6%, 6/99), *Klebsiella pneumoniae* (6%, 6/99), *Streptococcus* (3%, 3/99), *Acinetobacter* (2%, 2/99) *Pseudomonas aeruginosa* (1%, 1/99), and *Serratia marcescens* (1%, 1/99). *Pseudomonas aeruginosa*, *Serratia marcescens*, *Proteus mirabilis*, *Streptococcus* and *Acinetobacter* as being sensitive to imipenem (100%) and *Escherichia coli* (93%), sensitive to cefepime (100%) *Serratia marcescens* and *Acinetobacter*, sensitive to meropenem (100%) *Serratia marcescens* and *Streptococcus*, sensitive to Amikacin (100%) *Acinetobacter* and *Pseudomonas aeruginosa*, sensitive to gentamicin (100%) *Serratia marcescens*, *Acinetobacter* and *Pseudomonas aeruginosa*. sensitive to ciprofloxacin (100%) *Streptococcus*. sensitive to cefotaxime (100%) *Serratia marcescens*. sensitive to levofloxacin (100%) *Serratia marcescens*. and resistant to ceftazidime (100%) *Serratia marcescens*, *Acinetobacter*, *Streptococcus* and *Pseudomonas aeruginosa*. resistant to cefepime (100%) *Pseudomonas aeruginosa*. resistant to meropenem (100%) *Pseudomonas aeruginosa*. resistant to Amikacin (100%) *Serratia marcescens* and *Streptococcus*. resistant to gentamicin (100%) *Streptococcus*. resistant to ciprofloxacin (100%) *Serratia marcescens* and *Pseudomonas aeruginosa*. resistant to Ampicillin/sulbactam (100%) *Serratia marcescens*, *Klebsiella pneumoniae* *Streptococcus*, and *Pseudomonas aeruginosa*. resistant to cefotaxime (100%) *Pseudomonas aeruginosa* and resistant to levofloxacin (100%) *Pseudomonas aeruginosa*.

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1. Introduction

The most often occurring kind of infection globally are urinary tract infections (UTIs). Globally, especially among women, it is the most often occurring health issue. In hospitals and other healthcare environments, urinary tract infections pose a major challenge [1].

Before the age of seven, over 5% of girls and 2% of boys possess infections of the urinary tract (UTIs), so this bacterial infection is a major public health issue and a main source of morbidity in baby boys, women of all ages, as well as older males.

Adherence, toxin synthesis, immunological evasion, and iron acquisition are virulence factors utilized by the most common uropathogens [2].

Together, the organs, tubes, muscles, and nerves that make up the urinary system create, store, and move urine. A pair kidneys, a bladder, both ureters, a couple sphincter muscles, as well as the urethra together make up the urinary system.

Usually called acute cystitis or a bladder infection, a urinary tract infection (UTI) damages the urinary system. Changing the bottom of the urinary system, it is discovered that it is a simple cystitis, a bladder disease; yet, changing the upper urinary tract, it is found to be pyelonephritis, a kidney infection. While lower urinary tract symptoms include pain or frequent urination, pyelonephritis symptoms also include fever and flank discomfort (or both)[3].

A main organism causing UTIs is many bacteria. Gram-positive microbes (GPB) account for 10%–15% of the disease; gram-negative microbes cause 80%–85%.

Escherichia coli and other Enterobacteriaceae are main etiological agents of urinary tract infections. Among the various species that remaining agents are connected with, the GPB is one. Usually ubiquitous as well as resistant to antibiotics are *Enterococcus*, *Streptococcus agalactiae*, *Bacillus subtilis*, *Streptococcus pyogens*, *Staphylococcus aureus*, *Enterococcus faecalis*, and *Staphylococcus saprophyticus* [4].

Obviously, the best criterion for urinary tract infections examination incorporates test and clinical information. According to the present approaches, the specimen is submitted to urine culture as well as antibiogram treatments following the confirmation and quantification of the existence of bacteria. While the latter studies antibacterial sensitivity, the former helps to identify species. But at least 24 hours of incubation are required for such acts. This extended interval and usually painful symptomatology help to explain why the patient first uses empirical therapy [5].

Although medicines can help cure urinary tract infections, past extensive use of antibiotics without appropriate sensitivity testing has undoubtedly resulted in a rise in the fraction of UTI bacteria resistant to reasonably priced and readily accessible antibiotics. A first step towards evidence-based empirical antibiotic prescription is knowledge of local antimicrobial resistance patterns [6].

Globally threatening human health, healthcare systems, and the availability of efficient therapies for lethal infections is antimicrobial resistance (AR). Because of the declining value of present antibiotics and the dearth of new antibiotics on the market, AR is expected to be the main cause of worldwide death by 2015. Among the anthropogenic causes of antimicrobial resistance include overuse and abuse of antibiotics, erroneous diagnosis, and the preventative use of antibiotics in animal farming. Given antibiotics are commonly used in clinical environments to treat bacterial illnesses, the rise in multidrug-resistant bacterial strains raises serious public health issues [7].

Standard definitions for several types of drug-resistant bacteria are proposed here by an international assembly of department heads from specialized organizations including the European Centre for Prevention and Control of Disease, the Bureau of Infectious Diseases, the Department of Health and Human Services, the Centre for Disease Prevention and Control, and the Division of Epidemiology at Tel Aviv Sourasky Medical Centre. MDR, or multiple drug resistant: Referring to strains in three or more antimicrobial groups not responsive to one or more antibiotic medicines,

Saying microorganisms not sensitive to any of the antibiotic drugs in just either one or two antimicrobial classes, "extensive" or "very" drug resistance (XDR),

"Pan drug resistant" (PDR) Referring to isolates resistant to all listed antibiotics [8].

Globally and in Europe, the greatest resistance rates of uropathogens were seen for fluoroquinolones, cephalosporins, and aminoglycosides, which are the primary types of antimicrobials recommended for treating UTIs. Aminoglycosides and the trimethoprim-sulfamethoxazole combination exhibit moderate yet escalating resistance, trailing behind carbapenems, macrolides, and vancomycin, which demonstrate a fast and concerning rise in resistance levels [9].

2. Materials and Methods

2.1. Sample Collection

Gathering of specimens This study gathered 152 isolates overall from UTIs found in different hospitals in Babylon province between September 2024 and May 2025. Iraq with an age range from 1 to 80 years.

2.2. Culturing and Identification of Bacteria

Isolates (99 isolates) were distributed as follows: *Escherichia coli* (46), *Staphylococcus* (25), *Klebsiella pneumoniae* (6), *Enterobacter cloacae* (9), *Serratia marcescens* (1), *Proteus* (6), *Streptococcus* (3), *Acinobacter* (2), and *Pseudomonas* (1).

After incubation at 37°C, colonial shape on MacConkey agar (HiMedia Laboratories, Mumbai, Maharashtra, India) revealed UTIs isolates. Following product recommendations, isolates were further verified as presumed UTIs using VITEK 2 Compact (bioMérieux, France). For subsequent study, The Brain Heart Infusion Broth (BHIB, HiMedia Laboratories) to 30% glycerol at -20°C housed the UTIs isolates.

2.3. Antibacterial Susceptibility Test

Antibiotic sensitivity was evaluated in relation to this using the disk diffusion test rather than (CLSI, 2022) [10].

Ten antimicrobial discs (Bioanalyze/ Turkey) including Amikacin, Gentamycin, ceftazidime, cefepime, Imipenem, Meropenem, ciprofloxacin, cefotaxime, levofloxacin and Ampicillin/sulbactam were tested against all gram-negative and positive isolates. Mueller-Hinton agar (HiMedia, India) was used for a Kirby Bauer disc diffusion test with antimicrobial sensitivity. After overnight incubation at 37 °C, the findings were found by applying Clinical and Laboratory Standards Institute recommendations for zone of inhibition. rug-resistant bacteria.

3. Results

The Age-Based Frequency Distribution of UTI Patients Figure 1 displays the frequency distribution of UTI patients by age. The age range of those affected was 1 year to over 60. However, the majority of patients in this study were between the ages of 21 and 30.

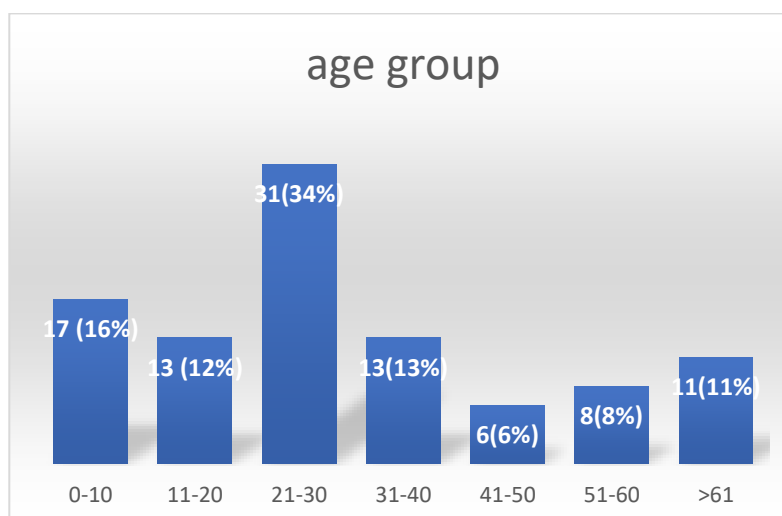


Figure 1. display of the incidence spreading of patients with UTI according to oldness.

3.1. Distribution of UTI Patients' Frequencies Considering Gender

One hundred UTI patients were included in the current investigation. 73% of UTI patients were female, compared to 27% of male patients, see Figure 2.

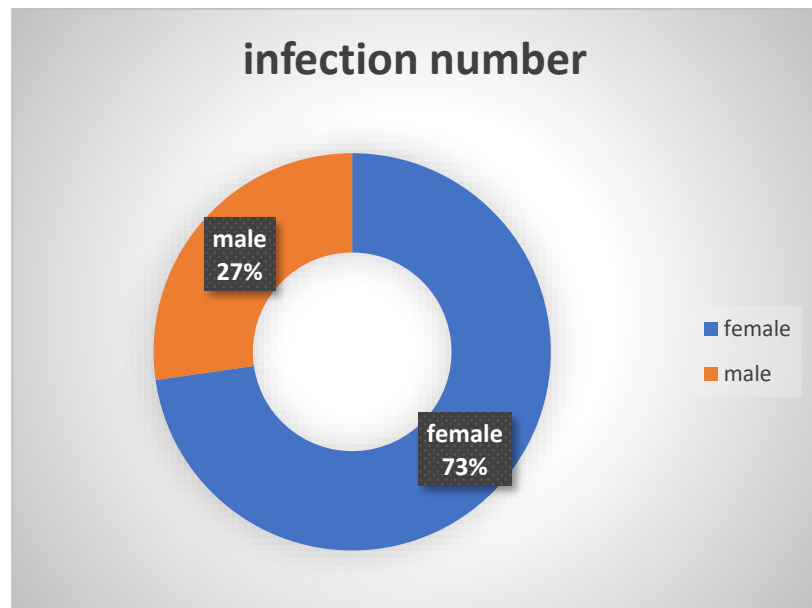


Figure 2. Explaining the spreading of patients with UTI based on sex.

3.2. The proportion of bacteria isolated from UTI patients

Only 99 (67%) of the 100 samples tested positive for the presence of significant bacteria, according to the culture results. 53 (33%) of the samples, however, did not exhibit bacterial growth. Figure 3 displayed the bacterially isolated related UTI.

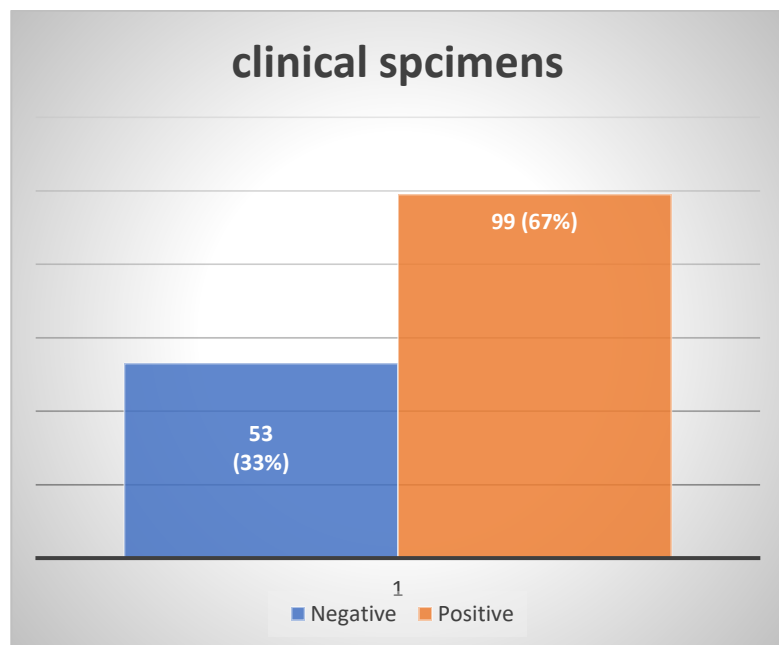


Figure 3. Distribution of microorganisms that cause UTIs.

This study's detailed analysis The most common bacteria were *E. coli* (64.0%), *Staphylococcus* and *Enterococcus cloaca* (9%), *Proteus* and *Klebsiella* (6%, 2.88%), *Streptococcus* (3%), *Acintobacter* (2%), and *Pseudomonas* (1%).

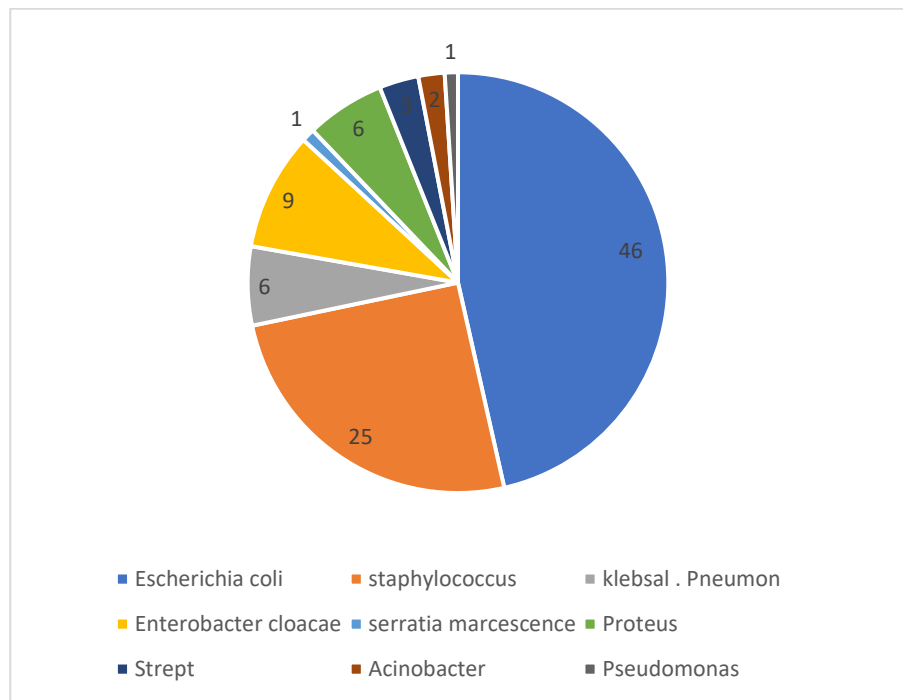


Figure 4. Pie chart showing distribution of patients with urinary tract infection according to causative agent.

Table 1. The percentage of bacterial pathogens isolated from urinary tract infections that exhibit resistance (R) to antimicrobial treatments.

Antibiotic	<i>Escherichia Coli</i>	<i>Staphylococcus</i>	<i>Klebsal . Pneumon</i>	<i>Enterobacter Cloacae</i>	<i>Serratia Marcescens</i>	<i>Proteus</i>	<i>Strept</i>	<i>Acinobacter</i>	<i>Pseudomonas</i>
Ceftazidime	43%	76%	83%	56%	100%	67%	100%	100%	100%
Cefepime	43%	32%	83%	56%	0%	67%	67%	0%	100%
Imipenem	7%	12%	33%	22%	0%	0%	0%	0%	0%
Meropenem	37%	8%	66%	33%	0%	50%	0%	50%	100%
Amikacin	54%	44%	50%	33%	100%	50%	100%	0%	0%
Gentamicin	28%	52%	66%	11%	0%	50%	100%	0%	0%
Ciprofloxacin	65%	20%	66%	22%	100%	33%	0%	50%	100%
Ampicillin/ Sulbactam	70%	60%	100%	33%	100%	67%	100%	50%	100%
Cefotaxime	59%		66%	44%	0%	67%	33%	50%	100%
Levofloxacin	52%	48%	50%	44%	0%	50%	67%	50%	100%

The antibiotic sensitivity patterns of the identified bacterial isolates showed that *E. coli* had 70%, 65%, 59%, resistance to Ampicillin/sulbactam and ciprofloxacin, cefotaxime respectively. Enterococcus showed equal 56% resistance to ceftazidime and cefepime. *Klebsiella pneumoniae*, *Proteus mirabilis*, *Serratia* and *Pseudomonas* spp. showed resistance to Ampicillin/sulbactam. *Serratia* spp., *Streptococcus* spp., *Acinobacter* and *Pseudomonas* spp. showed 100% resistance to ceftazidime.

Staphylococcus aureus showed resistant to ceftazidime 76%. *Streptococcus* spp. showed 100% to Amikacin, Gentamicin, Ampicillin/sulbactam. *Proteus mirabilis* showed

10% equal resistance to ceftazidime, cefepime, Ampicillin/sulbactam pseudomonas showed 100% resistance to ceftazidime, cefepime, meropenem, ciprofloxacin, Ampicillin/sulbactam, cefotaxime and levofloxacin.

Table 2. Proportion (%) of bacterial pathogens isolated from urinary tract infections that exhibit sensitivity (S) to antimicrobial agents.

Antibiotic	<i>Escherichia Coli</i>	<i>Staphylococcus</i>	<i>Klebsal . Pneumon</i>	<i>Enterobacter Cloacae</i>	<i>Serratia Marcescense</i>	<i>Proteus</i>	<i>Strept</i>	<i>Acinobacter</i>	<i>Pseudomonas</i>
Ceftazidime	43%	76%	83%	56%	100%	67%	100%	100%	100%
Cefepime	43%	32%	83%	56%	0%	67%	67%	0%	100%
Imipenem	7%	12%	33%	22%	0%	0%	0%	0%	0%
Meropenem	37%	8%	66%	33%	0%	50%	0%	50%	100%
Amikacin	54%	44%	50%	33%	100%	50%	100%	0%	0%
Gentamicin	28%	52%	66%	11%	0%	50%	100%	0%	0%
Ciprofloxacin	65%	20%	66%	22%	100%	33%	0%	50%	100%
Ampicillin/ Sulbactam	70%	60%	100%	33%	100%	67%	100%	50%	100%
Cefotaxime	59%		66%	44%	0%	67%	33%	50%	100%
Levofloxacin	52%	48%	50%	44%	0%	50%	67%	50%	100%

The results of antibiotic susceptibility showed that the isolated bacteria were highly sensitive to cefepime, meropenem , Amikacin and gentamycin (100%) followed by (93%) imipenem and less sensitive to ceftazidime, Ampiciline/sulbactam. 57%,67% respectively.

4. Discussion

One of the most prevalent and dangerous diseases of the human urinary system that may develop in both community and hospital settings is urinary tract infection (UTI).

The most common method of treating UTIs is empirical, and the pathogen type and anticipated patterns of antibiotic resistance are used to decide the selection criteria for antimicrobial agents. Therefore, it is necessary to regularly check the bacteria that cause UTIs and their pattern of antibiotic susceptibility in the area [11].

Compared to the other age groups, a greater proportion of patients are between the ages of 21 and 30, as seen in figure (1). [12,13] supported this conclusion, however [14] disagreed. These results are supported by the documented statement that the elderly adult group had a greater rate of UTIs than other age groups. It was shown that the risk factors for increased UTI in the elderly population differed from those in the younger group. [15] Magelino The use of urinary catheters, age-related immune function abnormalities, and concomitant conditions such as cancer, diabetes, neurological illnesses, and stroke were the primary risk factors. Previous history of urinary tract infections, nosocomial infections, poor urine flow, significant urine retention that compromises renal and kidney defense systems [16].

The current analysis revealed agreement with It has been shown in earlier research that UTIs are more common in women than in men worldwide, particularly in South Asian, Asian, and African nations. [17,18] Women's shorter urethra, which is located very close to the vagina and anal orifice, hormonal changes during menopause, bacterial exposure during sexual activity from a partner, the use of contraceptive methods, and

engaging in sexual activity using both the vagina and anal orifice could all be contributing factors to the higher prevalence of UTIs in female patients [19].

Furthermore, women's hormonal changes during the menstrual cycle play a crucial role in making them more vulnerable to UTIs. The age distribution between males and females seems to have a certain statistical relevance [20].

The results of the current study are in line with the majority of research, which indicated that Gram-negative bacteria, not Gram-positive bacteria, are the most frequent cause of UTIs. This is justified by the high concentration of Gram-negative bacteria in the intestine as well as the presence of distinctive virulence factors in these bacteria, such as their distinct structural makeup or the presence of particular adhesion proteins, which help the bacteria adhere to urinary epithelial cells and speed up the spread of urinary tract infections [21,22].

E. coli is the most common cause of UTIs because it has a number of virulence factors that it uses to attach itself to, invade, and harm the host, such as adhesins, toxins, iron acquisition factors, lipopolysaccharide capsules, and other invasins. The current study revealed that the most common organism encountered in the study was *Escherichia coli* (64.0%). This finding is consistent with studies conducted in different parts of the world [23].

This was comparable to what was achieved. [24] attainment 58%, this particular bacteria has been shown to be the primary reason of urinary tract infections, so its increased prevalence and the recurrence of infections make it especially important [25]. *Enterococcus* has been described as the second leading cause of UTIs 9% this result align with [26], *Proteus. Mirabilis* represented 6(99) came next *Proteus. Mirabilis* and *Klebsella pneumonia* 6(99) This outcome ran counter to that of a research carried out by [27]. From Gram-positive bacteria recovered from urinary tract infections samples, *Staphylococcus* spp. Was the most common species than *Streptococcus* (25%). And correspondingly, 3%). This outcome is in line with the results of other research the outcome of present research agreement with regard to According to earlier research, *S. aureus* is among the most often occurring Gram-positive bacterial kinds UTIs [28]. *Streptococcus* spp. With a 3% prevalence of fewer detected gram positive bacteria in this research This outcome totally agreed Jameel 2019 (2), finding 3.88% and marginally agreed with [29]. Hadi et al. (2014) obtained substantially greater results when the rate of *Streptococcus* spp. Was 1.0% by [30].

Tektook et al, noted 13.7% of *Streptococcus* species. A major clinical issue in treating infections, particularly UTIs, is antibiotic resistance. Over time, resistance to drugs has grown; the evolution of resistance differs between nations too; all bacterial isolates having a sensitivity 100% to Imipinem Numerous studies conducted all over support these findings [31].

Since the types of bacteria identified in the research exhibited minimal levels of resistance to these antibiotics, they are seen as one of the better alternatives even if this may be a decent sign of their efficiency.

Since bacteria, especially Gram-negative, showed higher levels of resistance to antibiotics with a beta-lactam ring in their structure, carbapenem antibiotics including meropenem and imipenem have become the drugs of choice to treat UTIs that express resistance to treatment by other antibiotics. They lack beta-lactam rings in their structure [32].

The present investigation did, however, record reports of resistance to carbapenems (imipenem). Therefore, health-conscious authorities have to be mindful of developing antibiotic resistance that can make treatment of UTI and/or other bacterial infections a big problem. Data details to help choose suitable therapies [33, 34].

Studies of great relevance include those focused on the assessment of Resistance rates to antibiotics in identified human groups since These findings ought to alert the health authorities about resistance to infection treatment. Studies on antibiotic resistance have to

be conducted concurrently with incorrect antibiotic usage in some groups. Unmanaged and unregulated use of antibiotics induces Resistance patterns must be varied over infectious bacteria as time passes and the formation of genetic alterations in pathogenic bacteria generating resistance develops consistently over time. First-line choice in UTI treatment is non-beta lactam antibiotics imipenem, amikacin, and ciprofloxacin as they tend to be more active against uropathogens *E. coli*.

5. Conclusion

The findings showed that urinary tract infections affect women more sensitively than they do men. Moreover, women with urinary tract infections often are younger than men with UTIs. Commonly found gram-negative bacteria abound, and *E. coli* is the main offender causing urinary tract infections. Still the best therapy for most bacteria causing urinary tract infections is imipenem. One feasible therapy choice are meropenem and gentamycin. Regarding antibiotics in Iraq, the research advised using both culture data and a dynamic standard established from annual updating of sensitivity reports.

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