

## Appraisal Some Antibiotics Against Uropathogens *Escherichia Coli*: A Cross-Sectional Study

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### Abstract

**Aim of Study:** A cross-sectional study was conducted to do evaluate the effectiveness of some antibiotics on isolates of *Escherichia coli* bacteria causing urinary tract infection.

**Methodology:** This study that aimed to detect effectiveness of some antibiotics on *Escherichia coli* isolates from Alazizya general hospital in Wasit Province during the period from June 2019 to December 2019. A total of 714 clinical samples that were collected from the patient suffering from urinary tract infection in the hospital. A total of 113 *Escherichia coli* isolate were detected and choose five types of antibiotics in order to demonstrate their effectiveness and Statistical analysis by Statistical software package SPSS version 16 was used to analyze the data.

**Results:** These 113 isolates then studied distribution of UTIs by *Escherichia coli* in female (61%) that was more than male infection (39%), and studied Meropenem, Nitrofurantoin, Ciprofloxacin, Cefotaxime and Amoxicillin/clavulanate disc susceptibility test, it was able to detect *Escherichia coli* isolates resistant to Cefotaxime (69.06%) and Ciprofloxacin (65.53%), but with amoxicillin/clavulanate was expressed high degrees of resistance about (91.16%). While all isolates were found highly sensitive to Meropenem (90.28%) and Nitrofurantoin (86.63%), No significant differences ( $p < 0.05$ ) were estimated between antibiotic resistances and gender.

**Conclusions:** High resistances were detected to Amoxicillin/clavulanate, Cefotaxime and Ciprofloxacin which commonly used as empirical treatments for UTIs. This necessitates continuous surveillance for resistance pattern of uropathogens against antibiotics because of this use.

### Recommendations

- Amoxicillin/clavulanate, Cefotaxime and Ciprofloxacin resistant *Escherichia coli* should be taken in consideration when we are working with hospital cross infection.
- Further studies on large scale should be performed in order to study resistant *E. coli* in the whole country.

- Antibiotic prescribing policy should be put under observation and guidance inside and outside hospitals.

**Keywords:** Antibiotics resistance, Escherichia coli, Empirical therapy, UTIS

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## **Introduction**

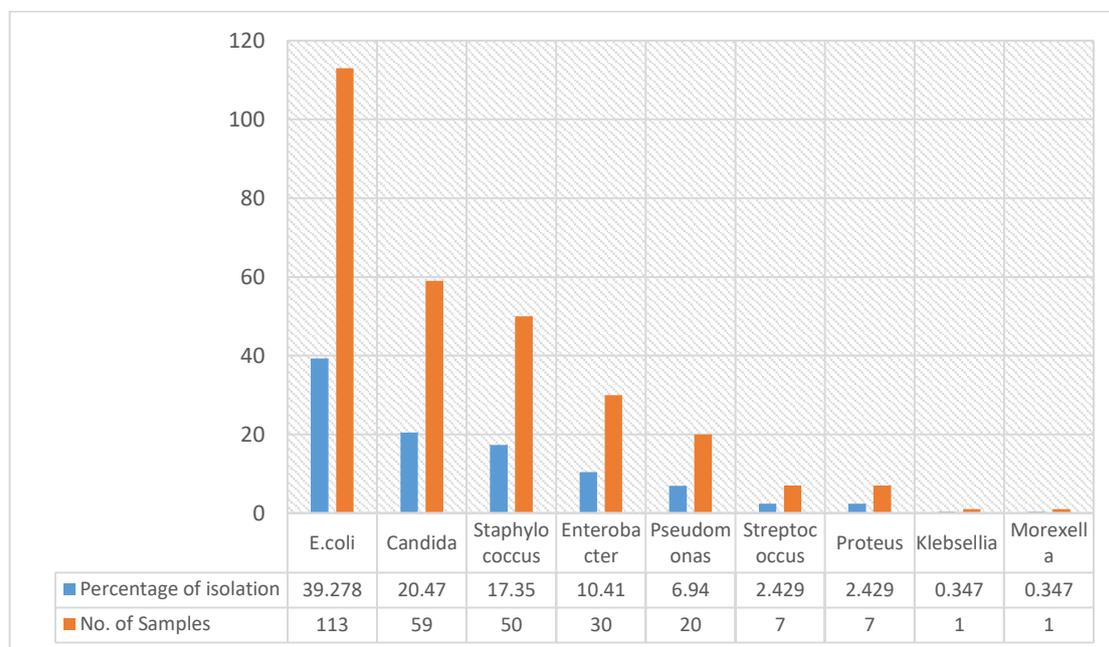
Certainly, the protocols used in treating microbial infections in different clinical samples are almost similar between hospitals and private clinics, and UTIs is one of those diseases that commonly used antibiotics to treat, and the most common antibiotics used in the field of treatment UTIs are Trimethoprim, Sulfamethoxazole,  $\beta$ -lactams, fluoroquinolones and aminoglycosides (1), and the inappropriate use of antibiotics, whether by medical staff or patients, can lead to antibiotic resistance. Therefore, it is important to establish appropriate criteria for treatment with narrow-range antibiotics for the optimum duration to avoid the emergence of strains of resistance to a wide range of antibiotics (2). The fluoroquinolones one of antibiotics that used as the first choice for empiric treatment of UTIs over the past years may be led to increase in  $\beta$ -lactam, sulfamethoxazole and trimethoprim antimicrobial resistance it (3). Perhaps the most common pathogen of UTIs without complications is Escherichia coli, among the Gram-negative bacteria (4). Multidrug-resistant strains of Escherichia coli are a concern because resistance genes can be easily transferred to other strains (5), So that Bacterial resistance can occur by different mechanisms: alterations of the cell permeability, changes in the site of action leading to loss of susceptibility to the antibiotic mediated by the increment of the efflux pump activity and by enzymatic degradation of the antibiotic (4,6). The study aimed to evaluate the effectiveness of some antibiotics on isolates of Escherichia coli bacteria causing urinary tract infection.

## **MATERIALS AND METHODS**

We performed cross-sectional sampling of the prevalence of bacterial species in hospital with investigate the efficacy of some antibiotics , the results of 714 bacterial cultures collected from urine samples for patient suffering from urinary tract infection for the period between June 2019 - December 2019 in Alazizya general hospital in Wasit Province, where the results of 267 samples positive for microbial culture obtained 288 A bacterial isolate, so that the largest is due to Escherichia colibacteria, which is of 113 bacterial isolates. The effectiveness of antibiotics was evaluated on all of these isolates and the importance of what was observed to choose five types of these antibiotics in order to demonstrate their effectiveness and Statistical analysis by Statistical software package SPSS version 16 was

used to analyze the data. gender, organisms causing UTIs, and its antibiotic sensitivity and resistance were included as variables in the model.

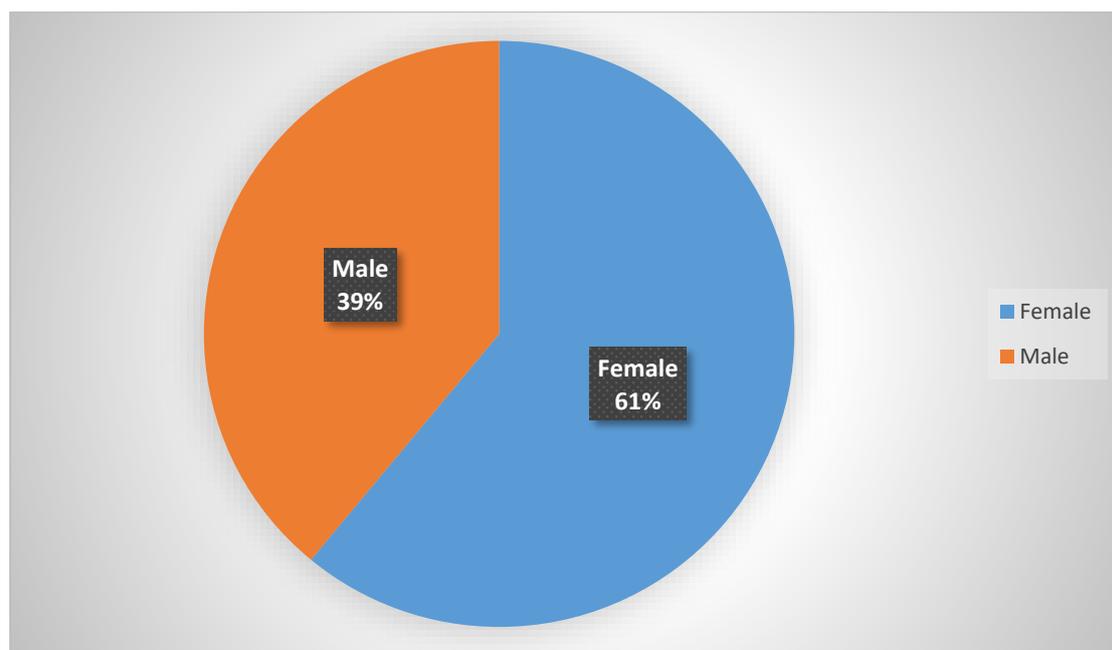
### Results and discussion



**Figure (1):** Distribution of bacterial population from urinary tract infection according to number and percentage.

We report a cross-sectional study to test the hypothesis that the uropathogens bacteria has strength day after day to widely spectrum of antibiotics. A total of 267(37.39%) urine samples isolates as a positive culture while 447(62.61%) as a negative culture were isolated from 714 urinary tract infection was collected. The result of this study showed the pathogen isolates and their respective percentage occurrence in (Figure1), positive culture included Escherichia coli showed the organism was isolated from 113 sample, by Escherichia coli(39.278%) was the most prevalent followed by Candida spp. (20.47%) isolated from 59 sample, Staphylococcus spp. (17.35%) from 50 sample, and Enterobacter spp. (10.41%) from 30 sample, Pseudomonas spp. (6.94%) from 20 sample, while Streptococcus spp. and Proteus sp. (2.429%) from 7 sample and finally Klebsellia and Morexella (0.347%) from one sample as shown in (Figure1). Perhaps urinary tract infections caused by the presence and growth of microbial mostly bacterial infection in the urinary tract, in addition UTIs is one of common infectious disease in communities (7)

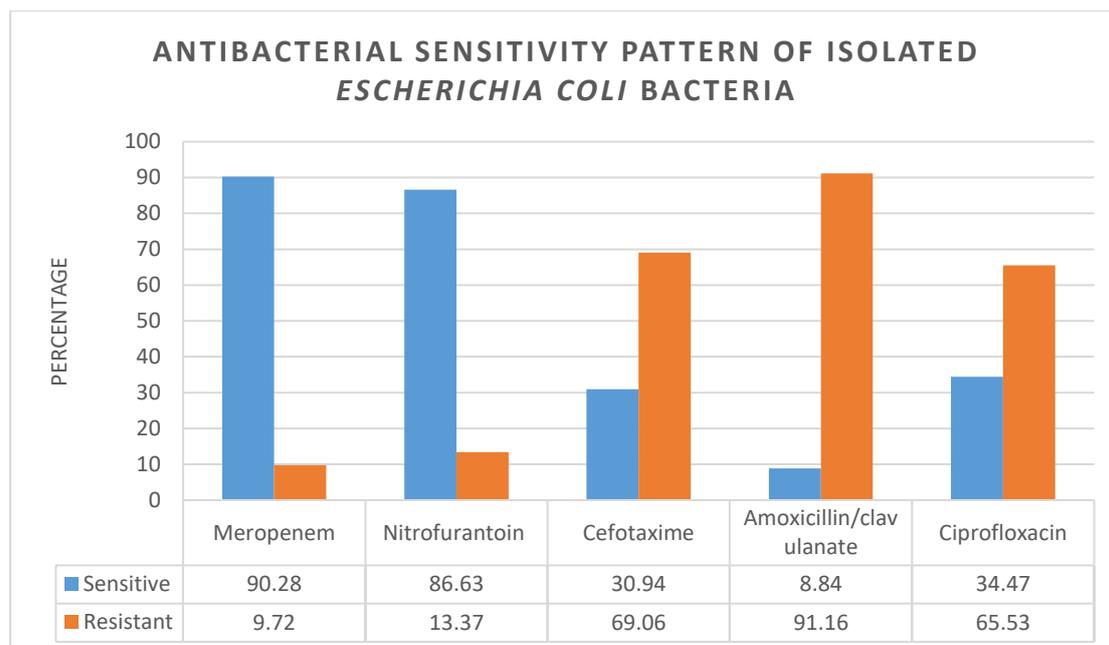
Escherichia coli is still the most common pathogen for pathogens isolated from urine culture of patients(8), So that Escherichia coliis considered as the most predominant cause of both community and nosocomial UTIs (9). and possess more virulence-associated factors (VFs) that help them in attaching to, invading of the host that include toxins, adhesins, siderophores, protective polysaccharide coatings, invasins and all virulence-associated factors detect in vivo virulence (10).



**Figure (2):** Distribution of uropathogen Escherichia coli isolate according to their gender

From Figure(2) we can see the distribution of UTI that caused by Escherichia coliisolates in female (61%) that was more than male infection (39%), may be because of risk factors specific to women for UTIs, Female anatomy woman has a shorter urethra than a man so that bacteria must travel to reach the bladder, Sexual active women and After menopause, a decline in circulating estrogen causes changes in the urinary tract that make you more vulnerable to infection.(11-12) , While the greater length of the male urethra than female , and the antibacterial activity of prostatic fluid in men (13).

The global prevalence of antibiotic resistance by UTIs A cause for concern. As much of the previous studies on the pathogen of urinary tract infections and sensitivity to antibiotics, (8)



**Figure (3)** Antibiotic susceptibility test for *Escherichia coli* isolates.

From 714 samples received in the Laboratories of Imam Al-Hussein Medical-City, 113 *Escherichia coli* strains were isolated. All the isolates were screened for susceptibility to antimicrobials, including commonly used Meropenem, Nitrofurantoin, Ciprofloxacin, Cefotaxime and Amoxicillin/clavulanate. From Figure (3) It was confirmed that all *Escherichia coli* isolates were found to be resistant to Cefotaxime (69.06%), Ciprofloxacin (65.53%), but also expressed high degrees of resistance to Amoxicillin/clavulanate (91.16%). While all isolates were found high sensitive to Meropenem (90.28%), Nitrofurantoin (86.63%). By following up the results for a period of six months and as explain in Figure (3), the antibiotic Meropenem and Nitrofurantoin proved their high effectiveness in eliminating the *Escherichia coli* bacteria causing urinary tract infection And what has been noticed the repeated use of the Amoxicillin/clavulanate and Cefotaxime despite its inefficiency in eliminating bacteria, as well as the Ciprofloxacin that increased the resistance of bacteria to it , because ciprofloxacin is widely used due to its excellent activity against Gram-negative bacteria, however misuse of this antibiotic including its prophylactic use has led to a gradual increase in rates of antimicrobial resistance(14).The main reason for this high resistance of bacteria is that they have efficient flow pumps that excrete antibiotics outside the cell and eliminate their harmful effect on the cell by changing The permeability of the outer membrane and addition to produce some enzymes (15,16), And Amoxicillin – clavulanic acid (AMC) is one of the most consumed antimicrobial agents in many countries, principally for

respiratory and urinary tract infections (17). While by the results observed amoxicillin-clavulanate resistance of *Escherichia coli* evaluated by some mechanisms include hyperproduction of the chromosomal class Cb-lactamase of *Escherichia coli* and production of oxacillinases, and the production of TEM-derived enzymes whose  $\beta$ -lactamase activities are no longer inhibited by clavulanate. However, all these mechanisms which are able to generate amoxicillin-clavulanate resistance in *Escherichia coli* (18), Finally the most of the *Escherichia coli* isolates of urinary tract infections possess the enzyme beta lactamase M-CTX which has a high affinity to resistant Cefotaxime (19,20).

**Conclusions:** High resistance was observed to Amoxicillin/clavulanate, Cefotaxime and Ciprofloxacin which commonly used as empirical treatments for UTIs, limiting their clinical use. This necessitates continuous surveillance for resistance pattern of uropathogens against antibiotics.

#### **Recommendations**

Amoxicillin/clavulanate, Cefotaxime and Ciprofloxacin resistant *Escherichia coli* should be taken in consideration when we are working with hospital cross infection.

Further studies on large scale should be performed in order to study resistant *Escherichia coli* in the whole country.

Antibiotic prescribing policy should be put under observation and guidance inside and outside hospitals.

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