MULTIPLE DRUGS RESISTANCE AMONG URINARY TRACT INFECTION PATIENTS IN DUHOK CITY –KURDISTAN REGION –IRAQ

IBRAHIM MOHAMMED ABDULLAH, BSC, MSc*

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ABSTRACT

Background: Anti-microbial resistance could be a major public-health problem worldwide and universal endeavors are required to counteract its rise and the moment most common reason for observational antibiotic treatment. Optimal treatment seems diminish mortality and morbidity in surgical patients and play a crucial part in combating the continuous emergencies of expanding antibiotic resistance. The aim of this study is to study the pathogens and their antibiotic susceptibility in urinary cultures to Central laboratory in Duhok City and to study the rationality of antibiotic treatment urinary tract infection.

Patients and Methods: One hundred fifty-one UTI urine samples (culture positive) were collected from patient of central laboratory. Identified and isolated bacteria were determined by biochemical tests like Gram staining, Indole, oxidase, catalase, methyl red, Voges-Proskauer, citrate utilization, hemolysis, motility; and urea; fermentation and utilization tests of glucose, lactose and sucrose. Sensitivity pattern of isolates was determined against some traditional and conventional antibiotics.

Results:*Staphylococcus aureus* was the most common bacteria (40.4 %) followed by E.coli (31.8%). The overall levels of resistance to commonly used antibiotics were moderate in all pathogens. Amikacin and Nitrofurantoin were generally the antibiotics with lowest rates of resistance. Aminoglycosides and Fluoroquinolones were the most often used antibiotics. In first-line treatment, only 55 % of cases were given at least one antibiotic to which the bacteria were sensitive. A statistically significant higher resistant to both Amoxicillin and Erythromycin were found in cultures from UTI patients (P = 0.02 and P = 0.002).

Conclusions: Commonly encountered bacteria in this study which are *Staphylococcus*, *Escherichia coli* and *Klebsiella* were found to be highly sensitive to Nitrofurantoin, Amikacin and, to lesser extent, to ciprofloxacin, while low sensitivity pattern was recorded against Amoxicillin and Gentamicin, pointing to that antibacterial misuse is the leading cause for their resistance. The most commonly prescribed antibacterial Trimethoprim.

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Keywords: Urinary tract infection, Duhok city, Antibiotic, Infection.

Urinary tract infection (UTI) remains a worldwide therapeutic problem, not only as a nosocomial disease but also as a community-acquired infection[1]. UTI can affect lower and sometime both lower and upper urinary tract the term cystitis has been used to define the lower UTI infection is characterized by symptoms such as dysuria, frequency, urgency, and suprapubic tenderness. The presence of the lower UTI symptoms does not exclude the upper UTI, which is often present in most UTI cases[2]. The types of UTI is classified into uncomplicated and complicated based on their choice of treatment[3].The distribution of antimicrobial susceptibility data of UTI-causing microorganisms changes from time to time and from place to place[4]. The susceptibility data provided by regional microbiology laboratories help

*Assist Lecturer, Department of Medical Laboratory, Shekhan Technical College of Health, Duhok PolytechnicUniversity.
***Correspondence author to:** *Ibrahim M. Abdullah, Ibrahim.muhmmed@dpu.edu.krMobil +9647503514121*

to choose the empirical choice of antimicrobials to treat UTI; however, these conditions are limited to complicate UTI as the samples of uncomplicated UTI were rarely sent to laboratories[5,6]. Generally, the antimicrobial treatment is initiated before the laboratory results, which may lead to the frequent misuse of antibiotics [7]. Since most UTIs are treated empirically, the criteria for the selection of antimicrobial agents should be determined based on the most likely pathogen and its predictable resistance pattern in a geographic area. Therefore, there is a need for periodic monitoring of etiologic agents of UTI and the resistance pattern in the community[8].

MATERIALS AND METHODS

Patients: This study was carried out on urinary tract infection recruited to Central laboratory-in Duhok City, (Kurdistan Region- Iraq). From November 2016 to April 2017. A total of 151 Patients had urinary tract infection were registered in this study.

Study Population: The urine samples of (151) culture positive, who attended the Central laboratory and had clinical evidence of urinary tract infection, determined by treating physicians, were included in this study. The age of patients included in the study ranged from (6-70) years and sex (31 males, 120 females). The patients on antibiotic therapy were excluded from the study.

Sample Collection: Clean catch midstream urine was collected from each patient into a 20mL calibrated sterile screw-capped universal container that was disseminated to the patients. All patients were well instructed on how to collect sample aseptically before sample collection to avoid contaminations. Stated informed consent was obtained from all patients prior to specimen collection.

Sample Processing: A standardized loop method was used for the isolation of bacterial pathogens from urinary samples. A sterile 4.0mm platinum-wired calibrated loop was used which transported 0.001mL of urine. A loopful urine sample was plated, MacConkey agar, and blood agar medium. The inoculated plates were incubated at 37^0C for 24 h and 48 h in negative cases. The number of isolated bacterial colonies was multiplied by 1000 for the estimation of bacterial load/mL of the urine sample. A specimen was measured positive for UTI if an organism was cultured at a concentration of $\geq 10^5$CFU/mL or when an organism was cultured at a concentration of 10^4CFU/mL and >5 pus cells per high-power field were detected on microscopic examination of the urine .

Identification and isolation of bacteria: Identification of bacterial isolates was done on the basis of their cultural and biochemical features. The standard biochemical tests identified gram-negative bacteria and Gram-positive microorganisms were identified with the corresponding laboratory tests: catalase, coagulase, and mannitol test for *Staphylococcus aureus*.

RESULTS

One hundred and fifty-one patients were included in this study (mean age 29.95, SD ± 11.81). All the studied individuals were (31 males, 120 females), **Table** 1.

A total of 151 bacterial isolate included of 71 (47%) Gram negative and 80 (53%) Gram positive were isolated from positive

urine samples. *Staphylococcus aureus* was found the dominant bacteria among all isolated bacteria with the prevalence rate of (40.4%). The second most prevalent isolate was *Escherichia coli* (31.8%) followed by *Klebsiella pneumonia* (10.6%), *Streptococcus* (9.9%), *Pseudomonas aeruginosa* (4%), *Micrococcus. spp* (1.3%) *Eterococcus. spp*. (1.3%), and *Hemophilus spp*. (0.7%).

Table 1: Distribution of Isolated Bacterial Cause UTI.

Bacterial pathogens	Number of Isolates	(%)
Hemophilus	**1**	**0.7**
Enterococcus	**2**	**1.3**
Micrococcus	**2**	**1.3**
Pseudomonas aeruginosa	**6**	**4**
Streptococcus	**15**	**9.9**
Klebsiella Pneumonia	**16**	**10.6**
E.coli	**48**	**31.8**
Staphylococcus aureus	**61**	**40.4**
Total	**151**	**100**

Antibiotic resistant

Antibiotic susceptibility results presented the resistant and susceptible antibiotics for the tested bacteria pathogen. Overall Amoxicillin was found the most resistant drug as 121 (80.1%) uropathogens were found resistant against Amoxicillin. The second most resistant drug was Erythromycin(70%) followed by Tobramycin(67.5%), Trimethoprim(64.2%), Ceftriaxon(60.9%), Tetracyclin(55.6%).However, the lowest drug resistant against all bacteria was Amikacin(24.5%) followed by Nitrofurantin (35.7%), Norfloxacin(38.4%) and Gentamycin(39.07%).

Erythromycin was found the highest resistant drug against 77% *Staphylococcus* followed by Amoxicillin(75.4%) and Ceftriaxon(74.5%); however, both Amikacin and Gentamycin showed the highest sensitivity against 73.8% and 65.5% *Staphylococcus*. 83.3% of *E.coli* were resistant against Amoxicillin and Amikacin was found the most susceptible drug with the rate of 79.2%.

In circumstance of *Klebsiella spp* the highest resistant and susceptible antibiotics were Tobramycin(75%), and Ceftriaxon(62.5%). *Streptococcus spp*. were resistant against Norfloxacinand Ceftriaxon(40% and 66.6%) respectively while sensitive against both (Nitrofurantinand Amikacin). *Pseudomonas* spp. showed 85.7% resistance against both Gentamycin and Ceftriaxon, **Table** 2.

Table 2: Resistance of Isolated Bacteria against Tested Antibiotics

Antibiotics	Total resistance	%
Amoxicillin	**121**	**80.1**
Tobramycin	**102**	**67.5**
Trimethoprim	**97**	**64.2**
Ceftriaxon	**92**	**60.9**
Tetracyclin	**84**	**55.6**
Cephotaxime	**71**	**44.6**
Gentamycin	**59**	**39.07**
Norfloxacin	**58**	**38.4**
Erythromycin	**56**	**37.1**
Nitrofurantin	**54**	**35.7**
Amikacin	**37**	**24.5**

DISCUSSION

UTI Patients among Age and Gender

Antibiotic resistance is a major clinical problem in treating infections caused by bacteria. The resistance to the antimicrobials has increased over the years and normal intestinal microbial flora became a reservoir for resistant genes[9]. This may be due to an inevitable genetic response to the strong selective pressure imposed by antibacterial chemotherapy, which plays a vital role in the evolution of antibiotic resistance among bacteria. These bacteria then pass the plasmid containing resistant gene among other bacterial cells and species[10]. In this study, one hundred fifty-one samples were collected from Central lab in Duhok City, samples done by Gram staining and biochemical tests. Throughout the study, regarding the distribution of the patients according to gender, shows the gender group of most the patients with UTI was 79.47% females while for the 20.53% male patients which correlate with other findings which show that the rate of UTI is more in females as compared to males [11,12,13].The reason behind this high occurrence of urinary tract infection in females is due to the proximity of the urethra to the anus, shorter urethra, sexual intercourse, incontinence, and bad toilet [14,15]. These results are associated with other studies showing that females are more likely to have UTIs than males during adolescence and puberty [16,17,18].

Bacteria of UTI

In this study, the Gram-positive cocci constituted 53% of the total bacterial isolates while Gram-negative bacilli constituted. (47%), *Staphylococcus aureus*(40.4%) was found the most prevalent gram-positive bacteria in the positive urine samples of UTI. These results agreed with some reports in developing countries[19], while disagreed with others [20]who found *E. coli* to be the leading causative microorganism in community acquired urinary tract infection. This result is differs with reports from other studies[6-21]. Other isolated bacteria from UTI cases in this study were *E. coli* second most frequently isolated organism in UTI then *K. pneumonia* (10.6%), *Streptococcus* spp. (9.9%), *P. aeruginosa*(4%), *Micrococcus spp*(1.3%), *Enterobacter spp.* (1.3%) and Hemophilusspp(0.7%). These findings were correlated with other reports local area find that *Staphylococci* and *Escherichia coli* were the leading cause of UTI proportion for 75% of all isolates. The rates and roles of other pathogens, including *Klebsiella* species (11%), *Enterobacter, Proteus,* and *Streptococci* were responsible for the remaining 6% [6].

Multi Drugs Resistance

Both (Amikacin and Nitrofurantoin) used in this study were found to be the most sensitive drugs against all isolated uropathogens. The sensitivity rate of (Amikacin andNitrofurantoin) among uropathogens was as follows: *Staphylococcus aureus* (Amikacin75% and Nitrofurantoin 64.2%), *E. coli* (Amikacin; 80.5% and Nitrofurantoin; 82.9%), *Streptococcus spp.* (Amikacin; 66.6% and Nitrofurantoin; 73.33%) and *Klebsiella spp*. (Amikacin; 75% and Nitrofurantoin; 75%), however, *Pseudomonas* spp. did not show a high susceptibility to Nitrofurantoin; 42.8% but it was susceptible to Amikacin; 85.7%, the *micrococcus* did not show any susceptibility to (Amikacinand

Nitrofurantoin). These antibiotic susceptibility results correlate with another study conducted in Iraq showed that the tested antibacterial Amikacin and Nitrofurantoin were found to be the most effective against *staphylococcusspp*, *E.coli* and *Klebsiellaspp* which are responsible for 86% of all UTI in this study. This may be explained by low rate of prescription of these drugs[6].

Tested fluoroquinolones in this study showed the moderate resistance among uropathogens as in *S. arueus*; Norfloxacin(58%), but have susceptibility to *P. aeruginosa*; (71.4%), ; however, III generation cephalosporin showed the highest resistance in *S. arueus*; Ceftriaxon(70.5%) and *S. arueus*; Cephotaxime(60%).This rise rate of resistance against fluoroquninolones was also proposed by other studies done in Spain and Iran [23-27] and also by other studies done in India[18].

Another study in Spain also showed a reduced susceptibility of E. coli isolates from UTI patients to fluoroquinolones (16%) [23]. This low susceptibility due to the use of antibiotics may be unrestricted. In many studies, it has been shown that the guiding habits of physicians are of antibiotic resistance to this group of antibiotics [24-25].For these organisms, drugs with inhibitors like Augmentin may be tried but such drugs should be reserved for the last line of treatment. The alarming result in this study is the resistance to third-generation cephalosporin; the highest resistance was seen against Ceftriaxon(71.61%) followed by Cephotaxime(67.74%) among all bacteria's. The possible explanation behind this situation is that the third-generationcephalosporin has been in use for a long period and must have been abused and over time, organisms have developed resistant mechanisms due to changing their mode of action[26].

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REFERENCES

1- Kalsi J, Arya M, Wilson P, Mundy A. Hospital-acquired urinary tract infection. International journal of clinical practice.2003; 57 (5):388–91.

2- Sobeland JD. Urinary Tract infections in Mandell. Douglas and Bennett's Principles and Practice of Infectious Diseases. Churchill Livingstone, Philadelphia, Pa, USA, 7th edition; 2010. Pp.(957–985).

3- Sabra SM, Abdel-Fattah MM. Epidemiological and microbiological profile of nosocomial infection in Taif hospitals KSA. In: World Journal of Medical Sciences. 2012;vol.(7), no.(1), pp.1–9.

4- Okonko IO, Ijandipe LA, Ilusanya OA, Donbraye-Emmanuel OB, Ejembi J, Udeze AO, Egun OC, Fowotade A, Nkang AO. Incidence of urinary tract infection (UTI) among pregnant women in Ibadan South-Western Nigeria. African Journal of Biotechnology. 2009; vol.(8), no.(23), pp.6649–6657.

5- Al-Badr A, Al-Shaikh G. Recurrent Urinary Tract Infections Management in Women. In: Sultan Qaboos University Medical Journal. 2013; Aug; 13(3): 359–367.

6- Al´os JI, Epidemiology and etiology of urinary tract infections in the community,Antimicrobial susceptibility of the main pathogens and clinical significance of resistance. Enfermedades Infeciosasy Microbiology´ıaCl´ınica. 2005; vol.(23), no.4, pp.3–8.

7- McNulty CA, Richards JM ,Livermoreetal DM. Clinical relevance of laboratory-reported antibiotic resistance in acute uncomplicated urinary tract infection in primary care . Journal of Antimicrobial Chemotherapy. 2006; vol. (58), no. 5, pp. 1000–1008.

8- Car J. Urinary tract infections in women: diagnosis and management in primary care. British Medical Journal. 2006; vol.(332), no.7533,pp.94–97.

9- Tambekar DH, Dhanorkar DV, Gulhane SR, Khandelwal VK, Dudhane MN. Antibacterial susceptibility of some urinary tract pathogens to commonly used antibiotics. African Journal of Biotechnology; 2006; vol. (5), no. 17, pp. 1562–1565.

10- Okeke IN, FayinkaST,LamikanraA. Antibiotic Resistance in Escherichia coli from Nigerian Students 1986-1998. Emerging Infectious Diseases. 2000; 6:393–396.

11- Chakraborty SP, KarMahapatra S, Roy S. Biochemical characters and antibiotic susceptibility of *Staphylococcus.aureus* isolates. Asian Pacific Journal of Tropical Biomedicine. 2011; 1(3): 192-196.

12- Al Benwan K, Al SweihN, Rotim VO. Etiology and antibiotic susceptibility patterns of community- and hospital-acquired urinary tract infections in a general hospital in Kuwait. Medical Principles and Practice.2010; vol. (19), no. 6, pp. 440–446.

13- Devan P, Ramchandra SS. Distribution and Antimicrobial Susceptibility Pattern of Bacterial Pathogens Causing Urinary Tract Infection in Urban Community of Meerut City, India. International Scholarly Research Notices microbiology .2013; Volume 2013, Article ID 749629, (13) page.

14- Sood S, Gupta R. Antibiotic resistance pattern of community acquired uropathogens at a tertiary care hospital in Jaipur, In: Rajasthan. Indian Journal of Community Medicine; 2012 vol. 37, no.1, pp. 39–44.

15- Ochei J, Kolhatkar A. Diagnosis of infection by specific anatomic

sites/antimicrobial susceptibility tests.in Medical Laboratory Science Theory and Practice reprint .6th edition. New Delhi, India :McGraw-Hill; 2007 .p. 615–643,788–798.

16- Orrett FA, Davis GK. A comparison of antimicrobial susceptibility profile of urinary pathogens for the years, 1999a and 2003. In: West Indian Medical Journal; 2006, vol. 55, no. 2, pp. 95–99.

17- Kolawole AS, Kolawole OM, Kandaki-Olukemi YT, Babatunde SK, Durowade KA, Kolawole CF. Prevalence of urinary tract infections (UTI) among patients attending Dalhatu Araf Specialist Hospital .In: Nigeria. International Journal of Medicinal Medical Sciences.2009; vol. 1, no.5, pp. 163–167.

18- Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in J N M C Hospital Aligarh, India. In: Annuals of Clinical Microbiology and Antimicrobials. 2007; vol. 6), article 4.

19- Shaifali. I, Gupta U, Mahmood. S. E, and Ahmed J .Antibiotic susceptibility patterns of urinary pathogens in female out patients. In: North American Journal of Medical Sciences. 2012; vol. 4, no(4), pp. 163–169.

20- Rana M Kh. Antibacterial susceptibility of commonly encountered uropathoens in Alhussain teaching hospital –Thi-Qar province: retrospective study.Thi-Qar In: Medical Journal (TQMJ).2010 ;Vol (4) No(2):(74-81).

21- Abubakar EM. Antimicrobial susceptibility pattern of pathogenic bacteria causing urinary tract infections at the Specialist Hospital, Yola, Adamawa State. In: Nigeria. Journal of Clinical Medicine Research .2009; vol. 1, no. 1, pp. 001–008.

22- Sabharwal. ER. Antibiotic susceptibility patterns of uropathogens in obstetric patients. In: North American Journal of Medical Sciences. 2012;vol. 4, pp. 316–319.

23- Gobernado M, Vald´es L,Al´os JI,Garc´ıa –Rey C, Dal-R´e R, Garc´ıa-de-Lomas J. Antimicrobial susceptibility of clinical Escherichia coli isolates from uncomplicated cystitis in women over a 1-year period in Spain. In: Revista Espa˜nola de Quimioterapia.2007; 20, no. 1, pp. 68–76.

24- Kahlmeter G. An international survey of the antimicrobial susceptibility of pathogens from uncomplicated urinary tract infections: the ECO.SENS project. In: Journal of Antimicrobial

Chemotherapy. 2003; vol. 51, no. 1, pp. 69–76.

25- Goossens H, Ferech M, Vander Stichele R, Elseviers M. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. The Lancet. 2005;vol.() 365, no. 9459, pp. 579–587.

26- Manjunath GN, Prakash R, AnnamV, Shetty K. The changing trends in the spectrum of the antimicrobial drug resistance pattern of uropathogens, which were isolated from hospitals and community patients with urinary tract infections in Tumkur and Bangalore. In: International Journal of Biological and Medical Research. 2011 ;vol. (2), no. 2, pp. 504–550.

27- Nasim K, Gholamreza E D, Sahba S. Antimicrobial susceptibility patterns of community-acquired uropathogens in Tehran, Iran. The Journal of Infection in Developing Countries. 2010; 4(4):202-206.

ثوختة

گەلەک دەرمانین ب بەرخودانی دناف نەخوشین توشی هە وە کردنی کوئەندامین میزە رو ل باژیری دهوکی ل کوردستانی عیراق

ئیَشەکی ونارمانج: هەوەکردنی کوئەندمین میزەرو ئیک ل زورترین ئیشین هەوەکردنی یە و پلا دووی دهیت ل ئەگەرین بکارئینانا ئەنتیبایوتیک. باشترین چارەسەرو دی نساغی ومرنی دی کیم کات و رولەکی سەرکی د ی هەبیت دژی دروستبونی بەرخودانی بەکتریا دژی ئەنتیبیوتیکا. ئارمانجا فی فەکولینی بو دەستنیشانکرنا جورین بەکتریا وجورین ئەنتیبیوتیکا ل نمونین میزی .

ریَکیَن ظەکولینیَ:150 نمونین میزی هاتینە کومکرن ل نەخوشین سەردانا تاقیگەها مەلبەندی ل باژیری دهوکی کرینە. هەمی نموونە هاتینە پشکنین ب ریکا بکارئینانا بویاغین گرام و اندول,اوکسیدوز, کتەلیز,میتایل رید ,بکارئینانا ستریت ,یوریا . پشکنین هاتینە کرن بو جورین ئەنتیبایوتکا کاردەکەن لەسەر بەکتریین هاتینە دیتین.

ئەنجام: بەکتریا ستافیلوکوکاس اوریس ل 40.4% و ئی کولای ل 31.8%نمونیین میزی نەخوشا هاتیە دیتین. بەرخودان دژی ئەمیکاسین ونایتروفیوراتوین ل کیمترین ریژا بو. زورترین ئەنیبایوتیک هاتیە بکارئینان ل جورین امینوگلایکوساید و فلوروکوینولون. بەردخودان دژی اموکسیسلین واتروماییسین ب ریژا زوور هاتیە دەست نیشان کرن.

دەرئەنجام:زورترین بەکتریا هاتیە دەست نیشان کرن ستافیلوکوکاس , ئی کولای, کلیبزلا و ئەنتبایوتیکین کاردەکات ب پلا ئیکی نایتروفیورانتوین و ئەمیکاسین و پلا دووی سپروفلوکساسین, ل پلا دیماهی ئەنتیبایوتیکا کو گەلەگ دهیتە بکارئینان بو چارەسەریا هەوکردنی وەکو نالیدیسیک اسید, اموکسیسلین. بکتریم و جنتاماسین.بکارئینانا ئەنتبایوتیک ب شیوەکی هەلە ئەگەرین سەرەکی یا دروستبوونا بەرخودانی یە.

الخلاصة

المضادات الحيوية المتعددة مقاومة لدى بين مرضى اللتهاب مسالك البولية في مدينة دهوك / كردستان ـ العراق.

الخلفية والأهداف: يمكن أن تكون مقاومة المضادات البكترية مشكلة رئيسية في مجال الصحة العامة في جميع أنحاء العالم ، كما أن هناك حاجة إلى مساعٍ عالمية للتصدي لظهورها وسبب ظهور الأكثر شيوعًا المضادات الحيوية. افضل علاج يمكن أن يقلل من الوفيات والمراضة يلعب دورا حيويا في مكافحة الزيادة المستمرة لمقاومة المضادات الحيوية.

المواضيع و طرق البحث:دراسة مسببات اللتهاب مسالك البولية وحساسيتها لمضادات الحيوية لمرضى في مختبر الصحة المركزي في مدينة دهوك ودراسة العلاج بالمضادات الحيوية.تم جمع 151 عينه البول من المختبر المركزي. تم تحديد البكتيريا والمعزولها عن طريق الاختبارات الكيميائية الحيوية مثل ضبغة غرام ، الإندول ، أوكسيديز ، الكاتلاز ، الأحمر الميثيل ، فوجس-بروسكاور ، استخدام سترات ، انحلال الدم ، الحركة. واليوريا اختبارات التخمر والاستفادة من الجلوكوز واللاكتوز والسكروز. تم تحديد نمط حساسية من العزلات ضد بعض المضادات الحيوية التقليدية والتجارية .

النتائج:كانت *Staphylococcus aureus*الأكثر شيوعا (40.4 ٪) تليها E.coli (31.8 ٪). كانت معدلات المقاومة لمضادات الحيوية شائعة متوسطة في جميع مسببات الأمراضية . كان المضادات الحيوية Amikacin و Nitrofurantoinأقل معدلات المقاومة. كانت Aminoglycosides و Fluoroquinolones أكثر المضادات الحيوية المستخدمة. في علاج الخط الأول ، تم إعطاء 55 ٪ فقط من الحالات فيه حساسة من مضادات الحيوية لبكتيريا. ووجدت عن طريق علاقة إحصائية بانه Amoxicillin و Erythromycin لها أعلى مستويات المقاومة من قبل البكتريا المسببة التهابات المسالك البولية (P= 0.02 و P = 0.002).

الاستنتاجات:وجد أن البكتيريا الشائعة في هذه الدراسة هي*Staphylococcus* ,*E scherichia coli* و*Klebsiella*شديدة الحساسية Amikacin ، Nitrofurantoin ، وإلى حد أقل ل Ciprofloxacin ، في حين تم كانت نسبة الحساسية ل Amoxicillinو Gentamicin ، مما يشير إلى هذه مضادات البكترية لها سوء الاستخدام هو السبب الرئيسي ظهور مقاومة . الأكثر شيوعا وصفه مضاد للجراثيم Trimethoprim.