Isolation of Bacteria and Detection of Cephalosporin Antibiotics Effects among Patients with UTI in al-hilla City

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Abstract

90 urine samples were collected randomly from patients whose visit the Urology department in Murjan Medical City in Al-Hilla in period between April to July 2020 , the patients included 35 males and 55 females and in age between 17-77 years old. The urine samples divided into two parts , the first part using for general urine examination and the second part using for culture and sensitivity . The results of current study appeared to 35 (39%) males among total patients infected with UTI while 55(61%) females among total patients infected with UTI . In field of effects of age on infection the current results appeared in females the infection of urinary tract increase in young age group (17-27 years) in percentage (33%) in comparison with other age groups (20 %) in (27-37 years) , (16%) in (37-47 years) , (14%) in (47-57 years) , (10%) in (57-67 years) and (7%) in (67-77 years) and in males the results appeared increase the UTI with age , (67-77 years) in percentage (32%) in comparison with other age groups, (3%) in (17-27 years) , (9%) in (27-37 years) , (11%) in (37-47 years) , (20%) in (47-57 years) , (25%) in (57-67 years) . the results of API20 test that using for identification of types of bacteria which cause UTI appeared to 34 isolates of E.coli , 15 isolates of Enterobacter spp. , 18 isolates of Klebsiella spp. , 11 isolates of Pseudomonas spp. , 13 isolates of S.aureus and 4 isolates of Acinetobacter spp. bacteria .In field of antibiotic sensitivity the results appeared the effects of third and fourth generations of cephalosporin more than other generations .

Key Words: *UTI , Cephalosporin antibiotics ' toxicity; healty; urine samples*

Introduction

A urinary tract infection (UTI) is an infection in any part of your urinary system — your kidneys, ureters, bladder and urethra. Most infections involve the lower urinary tract — the bladder and the urethra [(18)] . Women are at greater risk of developing a UTI than are men. Infection limited to your bladder can be painful and annoying. However, serious consequences can occur if a UTI spreads to your kidneys [(8)] .Doctors typically treat urinary tract infections with antibiotics. But you can take steps to reduce your chances of getting a UTI in the first place. Urinary tract infections typically occur when bacteria enter the urinary tract through the urethra and begin to multiply in the bladder. Although the urinary system is designed to keep out such microscopic invaders, these defenses sometimes fail [(2)]. When that happens, bacteria may take hold and grow into a full-blown infection in the urinary tract. The most common UTIs occur mainly in women and affect the bladder and urethra. Infection of the bladder (cystitis). This type of UTI is usually caused by Escherichia coli (E. coli), a type of bacteria commonly found in the gastrointestinal (GI) tract [(7)]. However, sometimes other bacteria are responsible. Sexual intercourse may lead to cystitis, but you don't have to be sexually active to develop it. All women are at risk of cystitis because of their anatomy — specifically, the short distance from the urethra to the anus and the urethral opening to the bladder. Infection of the urethra (urethritis) [(17)]. This type of UTI can occur when GI bacteria spread from the anus to the urethra. Also, because the female urethra is close to the vagina, sexually transmitted infections, such as herpes, gonorrhea, chlamydia and mycoplasma, can cause urethritis [(4).]

Patients

90 urine samples were collected randomly from patients whose visit the Urology department in Murjan Medical City in Al-Hilla in period between April to July 2020 , the patients included 35 males and 55 females and in age between 17-77 years old .

Methodology

The Urine samples in sterile containers transported to the laboratory directly after the collection and each sample which divided into two parts , the first parts to making general Urine examination to indicate the UTI and the second one to making urine culture , the first part of urine which put in centrifuge in 3000 cycle/ 1 Min for 15 Minutes ,after that the precipitate examined under microscope in 40 power to detection pus and bacteria [20] . While the other part of urine sample cultures directly on nutrient agar and MaCconky agar and incubated for 24 hours ,after incubation period the bacterial colonies identified by Api20 test to detect the species of bacteria in urine sample , the antibiotic sensitivity test done [6].

Statistical Analyses

Statistical analysis was done by using SPSS version 20 in which, mean and standard deviation were used as descriptive statistics and analysis of variance with LSD for comparison between groups. P value ≤ 0.05 regarded significant.

Results and Discussion

1-Patients Sex

In current results showed to 35 (39%) males among total patients infected with UTI while 55(61%) females among total patients infected with UTI , and the results agreed with [10]. and the cause belong to the long of urethra in male longer than urethra in female and the bacteria difficultly reaching to the urinary tract and to other part of urinary system while in female there are easy in reaching and spread to all parts of urinary system [5,6].

2-Age Groups

Table (1): Age group among patients

Age groups	Female No.	percentage	Male No.	Percentage
17-27 years	18	33%	1	3%
27-37 years	11	20%	3	9%
37-47 years	8	16%	4	11%
47-57 years	7	14%	7	20%
57-67 years	5	10%	9	25%
67-77 years	4	7%	11	32%
Total	55	100%	35	100%

In current study table (1) referred to in females the infection of urinary tract increase in young age group (17-27 years) in percentage (33%) in comparison with other age groups (20 %) in (27-37 years) , (16%) in (37-47 years) , (14%) in (47-57 years) , (10%) in (57-67 years) and (7%) in (67-77 years) , and this results showed to decrease of infection with increasing in age , this results agreed with (10). The cause belong to hormonal changes and sexually activation in young in comparison with old female [20]. While the results opposite in males

where the table (2) showed to increase the UTI with age , (67-77 years) in percentage (32%) in comparison with other age groups, (3%) in (17-27 years) , (9%) in (27-37 years) , (11%) in (37-47 years) , (20%) in (47-57 years) , (25%) in (57-67 years) , and the current study agreed with Abraham Soman N. and Miao (2015) . the cause belong to the decrease of immunity and hygiene with age in additional to the chronic disease and some problems in involuntary urination in some old males and prostate infection, each of this reasons help the infection with UTI [10].

3-Bacterial isolates

The current study results referred to differences in genus and species of bacteria which cause UTI, *E.coli* bacteria take the first place in 35% percentage while (15.5%) in *Enterobacter spp.*, (18.5%) in *Klebsiella spp*. , (11.5%) in *Pseudomonas spp.,* (13.5%) in *S.aureus* , (5%) in *Acinetobacter spp.* This current study agreed with [3] .

3-Antibiotic sensitivity

Table (2): Antibiotic sensitivity for First generation

Bacteria	Cefazolin	Cefalothin	Cefaloridine	Cefradine	Cefadroxil
E.coli	-	-	+/-	+/-	-
Enterbacter spp.	+	+/-	-	-	-
Klebsiella spp.	-	-	+	-	-
Pseudomonas spp.	+	-	-	-	-
S.aureus	-	-	-	-	-
Acinetobacter spp.	-	-	-	-	-
Proteus spp.	-	-	-	-	-

In field of antibiotic sensitivity and resistance table (2) referred to using of first generation of cephalosporin antibiotics among all bacterial isolates and the results showed in *E.coli* appear the completely resistance to Cefazolin ,Cefalothin and Cefadroxil antibiotics while moderately sensitivity of Cefaloridine and Cefradine antibiotics .In *Enterbacter spp*.bacteria appeared sensitivity to Cefazolin , moderately sensitivity to Cefalothin and completely resistance to Cefaloridine , Cefradine and Cefadroxil. In *Klebsiella spp*. appeared sensitivity to Cefaloridine while completlt resistance to Cefazolin, Cefalothin, Cefradine and Cefadroxil .

In *Pseudomonas spp*. appeared sensitivity to Cefazolin while appeared completely resistance to Cefalothin, Cefaloridine, Cefradine and Cefadroxil. In *S.aureus* , *Acinetobacter spp.* and Proteus spp. appeared completely resistance to all antibiotics in first generation of cephalosporin . current study agreed with [11,14] .

Table (3): Antibiotic sensitivity for Second generation

Bacteria	Cefaclor	Cefuroxime	Cefotetan	Cefmetazole	Cefprozil
E.coli	+	+	-	-	+/-
Enterobacter spp.	-	-	+	+	+
Klebsiella spp.	-	+/-	-	+	-
Pseudomonas spp.	-	-	-	-	-
S.aureus	-	-	-	-	-
Acinetobacter spp.	+	-	-	-	-
Proteus spp.	-	+	-	+	-

Table (3) referred to using of second generation of cephalosporin antibiotics among all bacterial isolates and the results showed in *E.coli* appear the completely resistance to Cefotetan and Cefmetazole antibiotics while moderately sensitivity of Cefprozil and sensitivity to Cefaclor and Cefuroxime antibiotics .

In *Enterbacter spp.*bacteria appeared sensitivity to Cefotetan , Cefmetazole and Cefprozil , while appeared completely resistance to Cefaclor and Cefuroxime antibiotics . In *Klebsiella spp*. appeared sensitivity to Cefmetazole while completely resistance to Cefaclor, Cefotetan and Cefprozil , and moderately sensitivity to Cefuroxime antibiotic.

In *Pseudomonas spp*. and *S.aureus* bacteria appeared completely resistance to all antibiotics in second generation of cephalosporin. In *Acinetobacter spp.* appeared completely resistance to Cefuroxime Cefotetan, Cefmetazole and Cefprozil , so appeared sensitivity to Cefaclor antibiotic.In Proteus spp. bacteria appeared sensitivity action to Cefuroxime and Cefmetazole antibiotics and completely resistance to other antibiotics in this generation of cephalosporin. current study agreed with [13,14].

Table (4): Antibiotic sensitivity for Third generation

Bacteria	Cefixime	Cefdiner	Cefotaxim	Ceftriaxone	Cefodizine	Ceftazidim
E.coli	++	+	+++	+++	+	+
Enterbacter spp.	+++	+	+	+++	++	++
Klebsiella spp.	+++	++	+	+++	+/-	+
Pseudomonas spp.	++	+	++	+++	++	+
S.aureus	+	-	+/-	+	+	-
Acinetobacter spp.	-	-	+/-	+/-	+/-	-
Proteus spp.	+/-	+/-	+/-	+	+/-	+/-

In current study table (4) referred to using of third generation of cephalosporin antibiotics among all bacterial isolates and the results showed in *E.coli* , *Enterbacter spp*. and Pseudomonas spp. appeared sensitivity action for all antibiotics of third generation of cephalosporin . In *Klebsiella spp*. bacteria appeared sensitivity action for Cefixime, Cefdiner, Cefotaxim, Ceftriaxone and Ceftazidim , while moderately sensitivity to Cefodizine. In *S.aureus* bacteria appeared sensitivity for Cefixime ,Ceftriaxone and Cefodizine antibiotics , and completely resistance for Cefdiner and Ceftazidim , while appeared moderately sensitivity for Cefotaxim . In *Acinetobacter spp.* bacteria appeared completely resistance for Cefixime, Cefdiner and Ceftazidim , while appeared moderately sensitivity for Cefotaxim Ceftriaxone Cefodizine antibiotics . In *Proteus spp.* bacteria appeared moderately sensitivity for Cefixime ,Cefdiner, Cefotaxim, Cefodizine and Ceftazidim while appeared sensitivity for Ceftriaxone antibiotics in third generation of cephalosporin. Current results agreed with [9 ; 14] .

Table (5): Antibiotic sensitivity for fourth generation

Bacteria	Cefepime	Cefquinome
E.coli	++	+
Enterbacter spp.	+	+
Klebsiella spp.	+	+/-
Pseudomonas spp.	+	+/-
S.aureus	+/-	-
Acinetobacter spp.	+/-	-
Proteus spp.	+/-	-

Table (5) referred to using of fourth generation of cephalosporin antibiotics among all bacterial isolates and the results showed in *E.coli* and *Enterbacter spp.* bacteria appeared sensitivity action for Cefepime and Cefquinome antibiotics. While *S.aureus ,Acinetobacter spp. and Proteus spp*. bacteria appeared moderately sensitivity for Cefepime and completely resistance for Cefquinome . in *Klebsiella spp.* and Pseudomonas spp. bacteria appeared sensitivity for Cefepime and moderately sensitivity for Cefquinome antibiotics , current results agreed with [9,12].

Table (6): Antibiotic sensitivity for fifth generation

Bacteria	Ceftobioprole	Ceftaroline	Ceftolozane
E.coli	+	+	+
Enterbacter spp.	+	+	+
Klebsiella spp.	++	+	+
Pseudomonas spp.	+	+	+
S.aureus	+/-	+	-
Acinetobacter spp.	+/-	-	-
Proteus spp.	+/-	-	-

In current study table (6) referred to using of fifth generation of cephalosporin antibiotics among all bacterial isolates and the results showed in *E.coli , Enterbacter spp. , Klebsiella spp. and Pseudomonas spp.* bacteria appeared sensitivity action against Ceftobioprole, Ceftaroline and Ceftolozane antibiotics . While *Acinetobacter spp*. and Proteus spp. bacteria appeared moderately sensitivity against Ceftobioprole and completely resistance against Ceftaroline and Ceftolozane antibiotics among fifth generation of cephalosporin. Current study agreed with [18].

Conclusion

The conclusion in current study summarized in following points

Females infected with UTI more than males .

In Females the UTI decrease with age while in males the UTI increase with age.

E.coli bacteria considered the first causative agent of UTI than other bacteria isolated .

Third generation more effect to treat UTI than other generations among cephalosporin antibiotics.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: None

Funding: Self-funding

References

1. Abraham, Soman N.and Miao, Yuxuan. "The nature of immune responses to urinary tract infections". Nature Reviews. Immunology. (2015). 15 (10): 655–663.
2. Chneeweiss J., Koch M., Umek W. "The human urinary microbiome and how it relates to urogynecology". Int Urogynecol J. (2016). 27 (9): 1307–12.
3. Colgan, R; Nicolle, LE; McGlone, A; Hooton, TM (15 September 2006). "Asymptomatic bacteriuria in adults". American Family Physician. 74 (6): 985–90.
4. Detweiler K, Mayers D, Fletcher SG. "Bacteruria and Urinary Tract Infections in the Elderly". The Urologic Clinics of North America (Review). (2015). 42 (4): 561–8.
5. Dielubanza, EJ; Schaeffer, AJ. "Urinary tract infections in women". The Medical Clinics of North America. (2011).95 (1): 27–41.
6. Goldstein, I; Dicks, B; Kim, NN; Hartzell, R. "Multidisciplinary overview of vaginal atrophy and associated genitourinary symptoms in postmenopausal women". Sexual Medicine. (2013). 1 (2): 44–53.
7. Hooton and Thomas M. "Uncomplicated Urinary Tract Infection". New England Journal of Medicine. (2012). 366 (11): 1028–1037.
8. Icolle and Lindsay E. "Urinary Tract Infections in Special Populations". Infectious Disease Clinics of North America. (2014). 28 (1): 91–104.
9. Köves, B; Cai, T; Veeratterapillay, R; Pickard, R; Seisen, T; Lam, TB; Yuan, CY; Bruyere, F; Wagenlehner, F; Bartoletti, R; Geerlings, SE; Pilatz, A; Pradere, B; Hofmann, F; Bonkat, G; Wullt, B (25 July 2017). "Benefits and Harms of Treatment of Asymptomatic Bacteriuria: A Systematic Review and Meta-analysis by the European Association of Urology Urological Infection Guidelines Panel". European Urology. 72 (6): 865–868.
10. Lane, DR; Takhar, SS. "Diagnosis and management of urinary tract infection and pyelonephritis". Emergency Medicine Clinics of North America. (2011). 29 (3): 539–52.
11. Lane, DR; Takhar, SS. "Diagnosis and management of urinary tract infection and pyelonephritis". Emergency Medicine Clinics of North America. (2011).29 (3): 539–52.
12. Maill, Fiona M.; Vazquez, Juan C. (7 August 2015). "Antibiotics for asymptomatic bacteriuria in pregnancy". The Cochrane Database of Systematic Reviews (8): CD000490.
13. Moore, Ainsley; Doull, Marion; Grad, Roland; Groulx, Stéphane; Pottie, Kevin; Tonelli, Marcello; Courage, Susan; Garcia, Alejandra Jaramillo; Thombs, Brett D. (8 July 2018). "Recommendations on screening for asymptomatic bacteriuria in pregnancy". Canadian Medical Association Journal. 190 (27): E823–E830.
14. Owens, Douglas K.; Davidson, Karina W.; Krist, Alex H.; Barry, Michael J.; Cabana, Michael; Caughey, Aaron B.; Doubeni, Chyke A.; Epling, John W.; Kubik, Martha; Landefeld, C. Seth;

Mangione, Carol M.; Pbert, Lori; Silverstein, Michael; Simon, Melissa A.; Tseng, Chien-Wen; Wong, John B. (24 September 2019). "Screening for Asymptomatic Bacteriuria in Adults". JAMA. 322 (12): 1188–1194.

15. Ramos, Jorge A.; Salinas, Diego F.; Osorio, Johanna; Ruano-Ravina, Alberto. "Antibiotic prophylaxis and its appropriate timing for urological surgical procedures in patients with asymptomatic bacteriuria: A systematic review". Arab Journal of Urology. (2016).14 (3): 234–239.
16. Ramos, Jorge A.; Salinas, Diego F.; Osorio, Johanna; Ruano-Ravina, Alberto (September 2016). "Antibiotic prophylaxis and its appropriate timing for urological surgical procedures in patients with asymptomatic bacteriuria: A systematic review". Arab Journal of Urology. 14 (3): 234–239.
17. Salvatore S, Salvatore S, Cattoni E, Siesto G, Serati M, Sorice P, Torella M. "Urinary tract infections in women". European Journal of Obstetrics, Gynecology, and Reproductive Biology. (2011).156 (2): 131–6.
18. Salvatore S, Salvatore S, Cattoni E, Siesto G, Serati M, Sorice P, Torella M. "Urinary tract infections in women". European Journal of Obstetrics, Gynecology, and Reproductive Biology. (2011). 156 (2): 131–6.
19. Sendi, P; Borens, O; Wahl, P; Clauss, M; Uçkay, I (2017). "Management of Asymptomatic Bacteriuria, Urinary Catheters and Symptomatic Urinary Tract Infections in Patients Undergoing Surgery for Joint Replacement: A Position Paper of the Expert Group". Journal of Bone and Joint Infection. 2 (3): 154–159.
20. Simerville JA, Maxted WC and Pahira JJ. "Urinalysis: a comprehensive review". American Family Physician. (2005). 71 (6): 1153–62.
21. Woodford, H. and George, J. "Diagnosis and management of urinary infections in older people". Clinical Medicine. (2011).11 (1): 80–3.