A COMPARATIVE STUDY OF THE CAUSES OF URINARY TRACT INFECTIONS AND THE PATTERN OF ANTIBIOTIC SENSITIVITY AND RESISTANCE: A STUDY BASED ON GOLESTAN HOSPITAL, IRAN

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ABSTRACT

Background: Urinary tract infection (UTI) are one of the most common diseases in human societies. UTI treatment with antibiotics is usually done before receiving the results of microbiological tests, this treatment can lead to antibiotic resistance also New studies show that microbial species are the causes of urinary tract infections are different because that study of microbial factors causing infection in all geographical areas is necessary. **Result:** A descriptive study was carried out on 400 patients who referred to Golestan Hospital of Ahvaz during 2015-2016 and were hospitalized or out-patient with urinary tract infections. This study describes the relationships between sex, isolated bacterial agents and antibiotic resistance of UTI we have studied 200 patients were inpatients, 80 of them were women (40%) and 120 of them were men (80%), and 200 people were outpatients that 65 (32.5%) of them were men and 135 others (67.5%) were women which gave tes the most common strain in both group was related to Ecoli bacteria. and according to their antibiogram, the highest susceptibility to antibiotics in both genders in outpatients in the first place was related to gentamicin antibiotic. And the highest antibiotic resistance in both genders in the first place was related to Cefalotin antibiotic According to the antibiograms of the inpatients, the highest susceptibility to antibiotics for both genders first was to Meropenem antibiotic and According to their antibiograms, the most resistance to antibiotic for women was resistance to Cefotaxime, and in men the most resistant was to Cefixim. **Conclusion:** Due to differences in the resistance and susceptibility of strains to antibiotics, there is a need for proper selection and appropriate therapeutic treatment.

KEYWORD: Urinary tract; Infections; Antibiotictherapy hospitalized patients; Outpatients.

INTRODUCTION

Urinary tract infection (UTI) is one of the most common diseases in human societies, which there are several factors that cause bacteria's presence (more than 100000 ml) in the urine.[1] UTI treatment with antibiotics is usually done before receiving the results of microbiological tests. This treatment can sometimes lead to antibiotic resistance without reasonable medications prescribing.[2]

The discovery of antibiotics was one of the greatest improvements in modern medicine, but access to and increased use of antibiotics gradually resulted in their microbial resistance. Antimicrobial resistance as a common disease is significantly among Urinary tract infections' (UTIs) patients, and seen as a challenge in the field of urology. Antimicrobial resistance is increasing in all over the world, especially in developing countries. According to the announcement of World Health Organization in 2014, antimicrobial resistance is increasingly a global threat to public health, and all countries are focused on this issue, which is a serious threat to the modern medicin.[3,4,5]

New studies indicate that microbial species that cause urinary tract infections are various in different parts of the world, and the study of microbial factors causing infection in all geographical areas seems necessary.[4,7]

The first major factor in increasing microbial resistance is the inappropriate use of antibiotics. Another one is incorrect and irrational antibiotic recipes. Regarding the time, the appropriate dosage and the way in which it is consumed, are the most important aspect of the reasonable medications prescription. Studies have shown that 30 to 60 percent of antibiotic prescriptions and usage has been inappropriate. Although UTI is a common disease, antibiotics can be easily treated if antibiotics are used rationally. Identification of bacteria which cause UTI and analysis of antibiotic susceptibility pattern is effective in treatment.[3,5]

Increasing the kind of strains has suppressed the successful outcomes of antibiotic treatment; therefore, the rate of relapse in the clinical environment also increases. Term in the expression of urropathogenes is responsible for making resistance to a particular drug. Relapsing, along with resistance, has given serious failures in the management and treatment of UTI. It is assumed that relapse can be managed if the resistance between urine pathogenic infections is reduced. It is necessary to obtain the knowledge of the scientific factors associated with the disease and their relationship with the expression of the drug to resolve potential problems.[8]

The aim of this study is that by providing knowledge related to rate of UTI causing factors' outbreak and also to determine the sensitivity and resistance of strains according to gender and age in inpatients and outpatients with UTI who are referred to Golestan Hospital of Ahvaz from the beginning of October 2015 to the end of September, 2016, start therapy as soon as possible, and wait for the urine culture and antibiogram result regarding to time about 48-48 hours for its determination, according to the correct selection of antibiotic at first, as well as relapsing can be managed.

METHOD

Study design
The study was done descriptively on 400 patients who were systematically selected from patients with UTI who referred to Golestan Hospital of Ahvaz during the years 2015-16.

Inclusion and exclusion
All outpatients and inpatients that had urine culture test in a Golestan hospital of Ahvaz during the September 2015 to the end of September 2016, and are reported to be positive were included in the study and the patients who had negative culture test were excluded.

Data collection
Patients' information, including age and gender in outpatients and inpatients, and the patient positive urine culture report that has reported the type of strain and antibiotic sensitivity and resistance.

Ethical consideration
Before starting the study the approval of the Jundi shapur University's Ethics Committee has been gotten, and tried to patient information was protected.

Statistical
Data analysis was done by SPSS software version 22. By the way, descriptive information including mean and standard deviation for quantitative data and frequency and percentage for qualitative variables has been extracted using descriptive processes.

Chi-square test is used to consider the relationship between qualitative variables and, if necessary, Fisher's exact test is used.

RESULTS

In this study, we studied 400 patients with UTI, in terms of urinary tract infection and antibiotic resistance, that 200 of them were hospitalized in Golestan Hospital 80 people were women (40%) and 120 people were men (80%), and 200 people were outpatients, 65 of them were men (32.5%) and 135 of them (67.5%) were women which had been tested. In male outpatients with urinary tract infections, 4 factors were caused urinary tract infection, the most common cause of urinary tract infections in theme was Ecoli bacteria that caused 35 cases (54%), and after it was Enterobacter bacteria, which caused 24 cases (37%). Staphylococcus and pseudomonas aeriginosa bacteria, each with causing 3 cases (4.5%), played a role in causing urinary tract infections in male outpatients. (table1).

In female outpatients with UTI, through the done study, Ecoli bacteria was the most common cause of urinary tract infections, accounting for 98% (73%). The second cause was urinary tract infection of bacteria Enrto, which was responsible for (caused) 23 cases (17%). The third cause was Staphylococcus bacteria, which caused 10 cases (7%). The fourth cause was related to pseudomonas aeriginosa bacteria, which caused 2 cases (1.5%). The Klebsiella and Proteus bacteria, each of them with 1 case (0.75%), together are placed in fifth rank of the factors causing urinary tract infection in outpatient women. (table2).

In hospitalized male patients the most common cause of urinary tract infection is Ecoli, which has caused 68 cases (57%). The second most common cause of urinary tract infection is Enterococcus bacteria, which has caused 31 cases (26%). The third factor of causing the urinary tract infection is Staphylococcus bacteria- which causes 10 cases (8%). In the fourth place, there is pseudomonas aeriginosa bacteria, which causes 8 cases (6%). The fifth rank is related to klebsiella bacteria with 2 cases (2%). Proteus bacteria also have the last rank with creating 1 infection (1%). In the done investigated, the most common cause of urinary tract infection in hospitalized women is Ecoli bacteria which is the cause of 52 cases (65%). The second cause of urinary tract infection is related to Enterococcus bacteria, which is cause of 17 cases (21%). The third factor is related to Staphylococcus bacteria, which causes 7 cases (9%). Pseudomonas aeriginosa bacteria is the fourth cause of urinary tract infection, of 3 cases (4%). Acintobacter bacteria is also the cause of 1 case (1%) of urinary tract infections (table 1). In all individuals which has urine culture as an outpatient, susceptibility and resistant to Ceftoxime (CTX), Gentamicin (GM) and Cefalotin (CF) and Ciprofloxacin (CP) and Ceftriaxone (CRO) and Cefixime (CFM) and Co-trimoxazole (SXT),

Clindamycin (CC), Rifampin (RA) and Vancomycin (V) antibiotics were studied. (table3).

Also in patients with urine culture the susceptibility to Ceftoxime (CTX) and Gentamicin (GM) and Cefalotin (CF), Ciprofloxacin (CP), Ceftriaxone (CRO), and Cefixime (CFM) and Co-trimoxazole (SXT), Clindamycin (CC), Rifampin (RA), and Vancomycin (V) and Meropenem (MRO) and Imipenem (IMP) antibodies have been investigated (table 2,3).

Table of prevalence rate of urinary tract infection in terms of gender (Table 1).

Sex	Ecoli	Enterobacter	Staph -	Pseudomonas	Klebsiella	Proteus	Acinterobacter	
F (135)	98	23	10	2	1	1		outpatients
M (65)	35	24	3	3				
F (80)	52	17	7	3			1	hospitalized patients
M (120)	68	31	10	8	2	1		
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Resistance and sensitivity table of urinary tract infection causing strains to antibiotics in outpatients (table 2).

Proteus		Klebsiella		Pseudomonas		Staph -		Enterobacter		Ecoli			
M	F	M	F	M	F	M	F	M	F	M	F		
	100			100	100	66.7	60	70.8	65.2	31.4	60.2	R	CTX
	0			0	0	33.3	40	29.2	34.8	68.6	39.8	S	
	0		0	100	50			37.5	39.1	51.4	31.6	R	GM
	100		100	0	50			62.5	60.9	48.6	68.4	S	
			100	100	100			77.2	82.6	91.4	73.5	R	CF
			0	0	0			22.8	17.4	8.6	26.5	S	
				100	100	100	80	62.5	39.1	51.4	37.8	R	CP
				0	0	0	20	37.5	60.9	48.6	62.2	S	
				100	100			66.7	47.8	71.4	50	R	CRO
				0	0			33.3	52.2	28.6	50	S	
	100			100	100			58.3	65.2	77.1	53.1	R	CFM
	0			0	0			41.7	34.8	22.9	46.9	S	
				66.7	50	66.7	60	58.3	47.8	65.4	62.2	R	STX
				33.3	50	33.3	40	41.7	52.2	34.6	37.8	S	
						100	40					R	CC
						0	60					S	
						33.3	40					R	RA
						66.7	60					S	
						0	0					R	V
						100	100					S	

Resistance and sensitivity table of urinary tract infection causing strains to antibiotics in hospitalized patients (table3).

Acinterobacter M	F	Proteus M	F	Klebsiella M	F	Pseudomonas M	F	Staph - M	F	Enterobacter M	F	Ecoli M	F	R/S	
	100	0		100		75	66.7	60	100	83.9	82.4	75	76.9	R	CTX
	0	100		0		25	33.3	40	0	16.1	17.6	25	23.1	S	
	100	0		50		75	0	70		45.2	41.2	22.1	13.5	R	MRO
	0	100		50		25	100	30		54.8	58.8	77.9	86.5	S	
	100	100		100		75	100			54.8	47.1	27.9	25	R	AMK
	0	0		0		25	0			45.2	52.9	72.1	75	S	
	100	100		100		62.5	100			83.9	47.1	57.5	53.4	R	GM
	0	0		0		37.5	0			16.1	52.9	42.5	46.6	S	
	100	100		100		12.5	100	60	42.9	83.9	82.4	67.6	69.2	R	CP
	0	0		0		87.5	0	40	57.1	16.1	17.6	32.4	30.8	S	
	100	100		100		87.5	100			77.4	88.2	58.8	76.9	R	CRO
	0	0		0		12.5	0			22.6	11.8	41.2	23.1	S	
	100	100		100		87.5	100			87.1	82.4	83.3	73.1	R	CFM
	0	0		0		12.5	0			12.9	17.6	16.4	26.9	S	
	100	100		100		75	100	50	42.9	83.9	82.4	70.6	75	R	STX
	0	0		0		25	0	50	57.1	16.1	17.6	29.4	25	S	
									71.4					R	CC
									28.6					S	
								50	57.1					R	R
								50	42.9					S	
								20	14.3					R	V
								80	85.7					S	
	100	100		100		75				74.2	70.6	61.8	75	R	IMP
	0	0		0		25				25.8	29.4	38.2	25	S	

In this study, we divided the hospitalized patients into 3 groups in terms of age that group A is 15 individuals (0-15) (7.5%), group B is (15-60) 105 people (52.5) and group C is over 60 years old with 80 individuals (40). (table4)

The most common strains causing urinary tract infection in the A age group were Ecoli bacteria, which are caused 9 cases (60%). The second most common cause of urinary infection is Enterococcus bacteria, which is caused 3 cases (20%). The third cause is related to Staphylococcus bacteria - which is caused 2 cases (13%), and Psudo bacteria is cause of 1 case (7%). The most common causes of urinary tract infections in the B age group are the Ecoli bacterium which is the cause of 67 cases (64%). The second cause is Enterococcus bacteria, which is cause of 25 cases (24%). The third cause of urinary tract infection is related to Staphylococcus bacteria - which is cause of 8 cases (7%). Pseudomonas aeriginosa was in fourth place with 2 cases (2%). Acintobacter, klebsiella and proteus bacteria each caused 1 (1%) urinary tract infection. The most common strains causing urinary tract infection in the C age group is Ecoli, which is cause of 44 cases (55%). The second cause was Enterococcus bacteria, which is cause of 20 cases (25%). The Pseudomonas aeriginosa bacterium is cause of 8 cases (10%). Staphylococcus bacterium was also cause of 7 cases (9%). the klebsiella bacterium was also found to be the cause of 1 case (1%). Also, the resistance and sensitivity of urinary tract infection strains to antibiotics were investigated according to age group. (table5).

Prevalence table for different age groups (table4)

	Ecoli	Enterobacter	Staph -	Pseudomonas	Acinetobacter	Klebsiella	Proteus
GroupA 0-15	60%	20%	13%	7%			
GroupB 15-60	64%	24%	8%	2%		1%	1%
GroupC >60	55%	25%	9%	10%		1%	
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Prevalence rate of urinary tract infection table for different age groups (table 4).

Pseudomonas	Staph -	Enterobacter	Ecoli		
100	50	66.7	77.80	R	CTX
0	50	33.3	22.2	S	
100		33.3	22.2	R	MRO
0		66.7	77.8	S	
100		66.7	33.3	R	AN
0		33.3	66.7	S	
100		66.7	44.4	R	GM
0		33.3	55.6	S	
100	50	33.3	33.3	R	CP
0	50	66.7	66.7	S	
100		33.3	11.1	R	CRO
0		66.7	88.9	S	
100		0	88.9	R	IPM
0		100	11.1	S	
100		66.7	88.9	R	CFM
0		33.3	11.1	S	
100	50	100	55.6	R	STX
0	50	0	44.4	S	

Resistance and sensitivity table of the strains causing urinary tract infection to antibiotic in terms of age group (table5).

Acinetobacter	Proteus	Klebsiella	Pseudomonas	Staph -	Enterobacter	Ecoli		
100	0	100	100	87.5	80	76.4	R	CTX
0	100	0	0	12.5	20	23.6	S	
100	0	100	100		40	14.9	R	MRO
0	100	0	0		60	85.1	S	
100	0	100	100		48	25.4	R	AN
0	100	0	0		52	74.6	S	
100	0	100	100		72	58.2	R	GM
0	100	0	0		28	41.8	S	
100	0	100	100	37.5	84	71.6	R	CP
0	100	0	0	62.5	16	28.4	S	
100	0	100	100		76	67.5	R	CRO
0	100	0	0		24	32.5	S	
100	0	100	100		68	68	R	IPM
0	100	0	0		32	32	S	
100	0	100	100	62.5	80	74.6	R	CFM
0	100	0	0	37.5	20	25.4	S	
100	0	100	100	87.5	88	71.6	R	STX
0	100	0	0	12.5	12	28.4	S	
							R	CC
							S	
				62.5			R	RA
				37.5			S	
							R	V
							S	

Klebsiella	Pseudomonas	Staph -	Enterobacter	Ecoli		
100	62.5	77.4	90	75	R	CTX
0	37.5	22.6	10	25	S	
100	37.5		50	22.7	R	MRO
0	62.5		50	77.3	S	
100	75		55	27.3	R	AN
0	25		45	72.7	S	
100	62.5		70	54.6	R	GM
0	37.5		30	45.4	S	
100	87.5	42.5	90	70.5	R	CP

0	12.5	57.5	10	29.5	S	
100	87.5		95	77..3	R	CRO
0	12.5		5	22.7	S	
100	75	61.3	90	61.5	R	IPM
0	25	38.7	10	38.5	S	
100	87.5	84.1	95	84.1	R	CFM
0	12.5	15.9	5	15.9	S	
100	75		75	77.3	R	STX
0	25		25	22.7	S	
		51			R	CC
		49			S	
		24.7			R	RA
		75.3			S	
		14.3			R	V
		85.7			S	

DISCUSSION

Urinary tract infection (UTI) is one of the most common diseases in human societies, which there are several factors that cause bacteria's presence (more than 105 ml) in the urine. UTI treatment with antibiotics is usually done before receiving the results of microbiological tests(1). This treatment can sometimes lead to antibiotic resistance without prescribing reasonable medications.(2)

The aim of this study is to provide knowledge related to the prevalence of urinary tract infection rate and also to determine the sensitivity and resistance of strains according to gender and age group in outpatients and inpatients with urinary tract infection that can start treatment as soon as possible and wait for the urine culture and antibiogram result determination, with respect to time span of about 48-72 hours, regarding to the correct selection of antibiotics also can be managed relapse initially.

In this study we evaluated 400 patients with urinary tract infection, of which 200 individuals were inpatients that 80 were females (40), and 120 were males(80), and 200 individual were outpatients, 65 were male (32.5%), and 135 others were female (67.5%). Because the Urinary tract infection without systemic complications were higher in inpatient females due to the specific conditions of women's anatomical system which is, same as other studies, but while urinary tract infection with systemic complication in male is more common it is reported more in hospitalized males.

In our study of outpatients the most common cause of urinary tract infections in men and women is associated with Ecoli bacteria, which, was the same as other studies, such as Hisham and colleagues,(8) the Ecoli bacteria, has have the highest prevalence.

According to their antibiograms, the highest rate of sensitivity to antibiotics in men, in the first place is related to Gentamicin (48.6%) and then to Ciprofloxacin (48.6%) and Co-trimoxazole antibiotic (34.6%). In women, in first place is antibiotic in Gentamicin (68.4%) and then related to Ciprofloxacin (62.2%), and Ceftriaxone antibiotic (50%), and the highest antibiotic resistance rate in both genders in the first place is related to in the Cefalotin antibiotic which has been 91.4 %n men and 73.5%in women.

Also, in Habibi's study,[9] according to the results of the antibiogram test, the highest bacterial resistance to Ampicillin, Cefalotin and Co-trimoxazole is related to 74.2%, 68.1% and 54.0%. In addition, the highest bacterial sensitivity to Amikacin, Nitrofurantoin and Gentamicin was 79%, 77.8% and 74.5%, respectively.

In a study in northwest of Iran, Farajnia and colleagues,[13] the most sensitivity to bacteria Amikacin, Ciprofloxacin and Gentamicin, were, 96.6%, 95.1% and 92.9%, respectively.

Also, in a study by Astal et al.[11] and McIsaac et al,[12] like our study, there was bacterial sensitivity to Ciprofloxacin and other antibiotics, Al-Mijalli,[16] has been reported in the study with the highest rates of resistance to Ceftriaxone and Cefalotin, which is similar to many other studies.

Given the fact that the rate of resistance and sensitivity to antibiotics is changing in different regions over time, this necessitates extensive studies in different regions.

Also, in our study, Enterobacter strain was in the second place that its sensitivity in men to Gentamicin was 62.5% and to Cefixime was 41.7% and to Co- trimoxazole was 41.7% and in women sensitivity to Gentamycin 60.9%, Ciprofloxacin 60.9%, and Ceftriaxone 52.2% are the most common strain.

In hospitalized patients, the most common cause of urinary tract infection in men and women was Ecoli bacteria. According to their antibiograms, the most sensitivity rate for both genders in the first place was to Meropneme antibiotic which has been 77.9% in men and 86% in women. In the second place, there is Amikacin antibiotic, which sensitivity to it is 72.1% in men and

75% in women and in the third place there is Gentamicin antibiotic, which the sensitivity rate in men has been 42.5% and in women has been 46.6% and in the second cause was Enterobacter that the sensitivity to Meropneme antibiotic in women has been 58.8% and 54.8% in men. And in the second place there is Amikacin antibiotic with 45.2% in men and 52.9% in women and in the third place there is Gentamicin antibiotic which has been 52.9% for women and there is Imipneme with 25.8%. in men.

According to the antibiogram, for Ecoli the highest resistance to antibiotics for women was to Cefotaxime 76.9% and then to Ceftriaxone 76.9,% and in men the highest resistance was to Cefixime 83.5%.

Also, Akram et al.[10] in a study about patients with urine infection used Imipneme of β-lacum antibiotics that had the highest coverage against E. coli (100%), and after it was Amikacin (49%) and a broad spectrum of Cephalosporins (15 -45%). Additionally, high power of Fluoroquinolone against E. coli has been observed. In a study, Biloway et al,[14] like us, isolated bacterial from urinary tract infections, showed that the highest prevalence of resistance was to Nalidixic Acid (90%) and Ceftriaxone and Cefixime (83.4%) antibiotics.[15]

CONCLUSION

Urinary tract infections are known as a burden for health centers, regardless of whether a condition is curable, long-term and without prescription use is one of the most important causes of antibiotic resistance and is a serious and urgent threat. And for rational prescription of antibiotics and identifying the appropriate therapeutic strategies in to resolve the problem of each region of the country, appropriate patterns should be used antibiotic s and appropriate.

REFERENCES

1. Jalalpoor S, Mobasherizadeh S. Frequency of ESBLs in Escherichia coli and Klebsiella pneumoniae strains isolated from hospitalized and out-patients with urinary tract infection in selective centers in Esfahan (2009-2010). Razi Journal of Medical Sciences, 2011 Jun 15; 18(85).
2. Wilson ML, Gaido L. Laboratory diagnosis of urinary tract infections in adult patients. Clinical infectious diseases, 2004 Apr 15; 38(8): 115.
3. Bonadio M, Meini M, Spitaleri P, Gigli C. Current microbiological and clinical aspects of urinary tract infections. European urology, 2001; 40(4): 439-45.
4. Farrell D, Morrissey I, De Rubeis D, Robbins M, Felmingham DA. AUK multicentre study of the antimicrobial susceptibility of bacterial pathogens causing urinary tract infection. Journal of infection, 2003 Feb 1; 46(2): 94-100.
5. Grude N, Tveten Y, Kristiansen BE. Urinary tract infections in Norway: bacterial etiology and susceptibility. A retrospective study of clinical isolates. Clinical microbiology and infection, 2001 Oct; 7(10).
6. Mokhtarian H, Ghahramani M, Nourzad H. A study of antibiotic resistance of Escherichia coli isolated from urinary tract infection. The Horizon of Medical Sciences, 2006 Sep 15; 12(3): 5-10.
7. Flores-Mireles AL, Walker JN, Caparon M, Hultgren SJ. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. Nature reviews microbiology, 2015 May; 13(5): 269.
8. Hisham D, Safdar OY, Shalaby M, Sabbahi M, Ashgar M, Shafi R, Binmahfoodh D, Khizindar D. Evaluating antimicrobial resistance patterns of the etiological agents of urinary tract infections. Australasian Medical Journal (Online). 2018; 11(2): 96-106.
9. Habibi-Asl B, Asghari R, Rezaee MA, Mohammad-Zadeh A, Abri R. Evaluation of etiologic agents and antimicrobial resistance pattern of urinary tract infections in the northwest of Iran.
10. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in JNMC Hospital Aligarh, India. Annals of clinical microbiology and antimicrobials, 2007 Jan; 6(1): 4.
11. Astal ZY, Sharif FA Relationship between demographic characteristics and community-acquired urinary tract infection. EMHJ, 2002; 8: 164-171.
12. McIsaac WJ, Mazzulli T, Moineddin R, Raboud J, Ross S Uropathogen antibiotic resistance in adult women presenting to family physicians with acute uncomplicated cystitis. Can J Infect Dis Med Microbiol, 2004; 15: 266-270.
13. Farajnia S, Alikhani MY, Ghotaslou R, Naghili B, Nakhlband A. Causative agents and antimicrobial susceptibilities of urinary tract infections in the northwest of Iran. Int J Infect Dis, 2009; 13(2): 140-4. DOI: 10.1016/j.ijid.2008.04.014.
14. BILVAYEA S, DEZFOOLIMANESH Z, TOHIDNIA MR, SHEIKHI F. Prevalence and antibiotic susceptibility pattern of bacterial agents isolated from urinary tract infections in hospitalized elderly patients in Imam Khomeini hospital, Kermanshah (2009-2013).
15. Chongtham U, Yengkokpam C, Lokhendro H. Bacterial uropathogens in urinary tract infection and antibiotic susceptibility pattern of patients attending JNIMS Hospital, Imphal. Journal of Evolution of Medical and Dental Sciences, 2013 Dec 16; 2(50): 9769-75.
16. Al-Mijalli SHS. Bacterial Uropathogens in Urinary Tract Infection and Antibiotic Susceptibility Patternin Riyadh Hospital, Saudi Arabia. Cell Mol Med, 2017; 3: 1.