

Resistance Pattern of Levofloxacin against Uropathogens Causing Urinary Tract Infection in Selected Areas of Dhaka city, Bangladesh

Mohammad Asaduzzaman*¹, Md. Zahid Hasan¹, Mst Mahfuza Khatun¹, Md. Jahangir Alam¹, Nazmul Hossain¹, Biswajit Das¹, Farha Matin Juliana² and Runa Asma³,

¹Department of Biochemistry, Primeasia University, Banani, Dhaka, Bangladesh

²Department of Biochemistry and Molecular Biology, Jahangirnagar University, Savar, Dhaka, Bangladesh

³Department of Laboratory Medicine, IBN SINA Diagnostic & Consultancy Center, Badda, Dhaka, Bangladesh

Abstract

A crucial public health problem in developing country like Bangladesh is resistance of antibiotics to different types of bacteria and the rates of these bacterial resistances are changing for various antibiotic therapy. Our aim was to assess the susceptible pattern of Levofloxacin a 3rd generation Quinolone antibiotic against uropathogens. A total of 12943 urine samples were collected in 2016 (Jan-Dec) and out of which 1236 (9.55%) were bacteriologically positive. Among the isolated uropathogens, 95.1% were gram negative and 4.9% gram positive organism. Male were found more prone to get UTI under 10 years and between 51-90 years of age and female were more affected in 10 to 50 years and over 90 years of age group. *E. coli* was the most prevalent (83.9%) isolate followed by *Klebsiella* spp. (6.7%), *Staphylococcus aureus* (2.6%), *Pseudomonas* spp. (2.2%), *Enterococcus* spp. (2.0%) and *Proteus* spp. (1.1%). The most predominant Levofloxacin sensitive organisms were found in male *Enterobacter* spp. (100%) and in female patients *Serratia* spp. (100%), *Citrobacter* spp. (100%) and *Streptococcus* Group B (100%). On the other hand the most predominant Levofloxacin resistant organisms were found in male and female both *Acinetobacter* spp. (100%). Around (61.7%) male and (46.9%) female were found resistant to *E. coli*.

Keywords: Levofloxacin, Quinolone, UTI, Resistance, Uropathogen.

1. Introduction

Antibiotic resistance is an increasing threat to life and morbidity and mortality. Urinary Tract Infection (UTI) is a predominant infection all over the world but it is more prevalent in developing south Asian countries like Bangladesh. Urinary Tract Infection (UTI) represents as one of the most common diseases encountered in medical practices these days and encompasses a broad range of clinical fields that are associated with a common finding of positive urine cultures. Besides every year about 150 million people are affected by UTIs. Worldwide at a cost of about US\$6 billion and even UTIs have demonstrated significant morbidity and mortality (1).

They are the second most common types of infection in humans accounting for 8.3 million doctor's visit annually in USA (2). UTI can be nosocomially ubiquitous in clinical environment so that prevalence rate of uropathogens is being alarmingly accelerated (1). Urinary tract infection is more common in female than male, because of the short length of the urethra and its proximity to anus. Pregnancy and sexual activity also make female more susceptible to UTI. Different factors like age, sex, immunosuppression and urological instruments may affect prevalence of UTIs (3).

The early introduction of effective drugs against bacterial infections in the last century has changed the medical behavior and has significantly reduced the mortality rates due to these agents. Also, the widespread use of antibiotics has induced different mechanisms of bacteria resistance to these drugs (4). Bacterial resistance is naturally developed, being a consequence of bacteria adaptation to the environment. The exposure of microorganisms to different antibiotics increases the selective pressure and favors the development of resistance (5). The etiology of UTIs and the antibiotic susceptibility of urinary pathogens, both in community and hospitals, have been changing over the past years and recently, the antibiotic resistance has become a major global problem (6). A large proportion of uncontrolled antibiotic usage has contributed to the emergence of resistant bacterial infections (7).

However, Levofloxacin is an antibiotic that used to treat a number of bacterial infections including acute bacterial sinusitis, pneumonia, urinary tract infections, chronic prostatitis and some types of gastroenteritis. It is available by mouth, intravenously and in eye drop form (8, 9). Levofloxacin was approved for medical use in the United States in 1996 (8). It is on the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system (10). It is available as a generic medication (8).

In addition, Levofloxacin is a broad-spectrum antibiotic that is active against both Gram-positive and Gram-negative bacteria. Like all quinolones, it functions by inhibiting the DNA gyrase and topoisomerase IV (11). Topoisomerase IV is necessary to separate DNA that has been replicated (doubled) prior to bacterial cell division. With the DNA not being separated, the process is stopped, and the bacterium cannot divide. DNA

gyrase, on the other hand, is responsible for super coiling the DNA, so that it will fit in the newly formed cells. Both mechanisms amount to killing the bacterium. Levofloxacin acts as a bactericide (12).

It is the most effective drugs for UTI patients in Bangladesh for treatment of UTI patients. But now a days we see the drugs does not work against uropathogens as before works. Our aim of the study to see the state of susceptibility pattern of Levofloxacin against Urinary Tract Infection patients in selected areas (Badda, Gulshan, Baridhara, Rampura, Doyagonj, Gandaria, Jatrabari, Sayedabad, Dhaka, Bangladesh).

2. Materials and methods

Materials

Study Design:

Study Location: This was a retrospective analysis of laboratory data routinely collected from the microbiology department of IBN SINA Diagnostic & Consultation Center, Badda, Dhaka-1212, Bangladesh from¹ January 1, 2016 to December 31, 2016. The total sample volumes were 12943.

Methods

Sample Collection and Bacteriological Assessment: Early morning midstream urine samples were collected aseptically from 12943 (Male-3638 & female-9305) patients. The urine samples were collected into sterile wide container (China) with screw cap tops. On the label were the name, age, sex and time of collection. All the patients were instructed on how to collect the urine samples aseptically and taken to the laboratory immediately for culture. In the diagnostic laboratory, each well mixed urine sample (1 μ L) was inoculated on MacConkey agar (Oxoid) and Blood agar (Oxoid) media plate under class-II laminar airflow (NUVO Sanaji Malzemelzeni, Imalat Vc Ticaret A.S, Turkey). The inoculum on the plate was streaked out for discrete colonies with a sterile wire loop sterilized by auto loop sterilizer (Germany) following standard procedures. The culture plates were incubated at 37°C by an incubator (Germany) for 48 hours and observed for the growth of bacteria through formation of colonies. All the bacteria were isolated and identified using morphological, microscopy (Japan) and biochemical tests like TSI (HiMedia), MIU (HiMedia) and Simmons Citrate (HiMedia) agar following standard procedures.⁽¹³⁾

Antibiotic Susceptibility Assessment: The disc diffusion technique was used for antibacterial susceptibility testing of the isolates using commercial antibiotics containing discs. We used the commercial antibiotic disc Levofloxacin (5 μ g, Oxoid). Interpretation of results was done using zone sizes. Zones of inhibition for *Enterobacteriaceae*, *P. aeruginosa*, *S. maltophilia*, *Acinetobacter* spp., *Enterococcus* spp., *Streptococcus* spp., *Viridans* Group, β -Hemolytic Group and *S. pneumoniae* ≥ 17 mm was considered sensitive, 14-16 mm intermediate and ≤ 13 mm resistant, for *Staphylococcus* spp. ≥ 19 mm was considered sensitive, 16-18 mm intermediate and ≤ 15 mm resistant. and for *Haemophilus* spp. ≥ 17 mm was considered sensitive. Isolates were classified as either sensitive or resistant based on the definition of the Clinical and Laboratory Standard Institute.⁽¹⁴⁾ Some laboratory stains of known sensitivity of *Staphylococcus aureus* ATCC 29213, *Enterococcus faecalis* ATCC 29212, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853 and *Streptococcus pneumoniae* ATCC 49619 were used as quality control strains for the antimicrobial discs.

Statistical Analysis: Data were assessed using the Statistical Package for Social Science (IBM SPSS Statistics, version 18, IBM Corporation, SPSS Inc. Chicago, III, USA). The Trend chi square test for statistical comparisons between the groups.

3. Results

The total 12943 urine samples collected from patients, 1236 (9.55%) samples were positive and 11707 (90.45%) samples were negative at 2016 (January-December) in selected areas (Badda, Gulshan, Baridhara, Rampura, Doyagonj, Gandaria, Jatrabari, Sayedabad, Dhaka, Bangladesh).

Tabel-1: Distribution table of Urinary Tract Infection (UTI) patients by age groups and gender (n=1236)

Age (Years)	<10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	>90
Male	53	05	19	16	26	38	73	38	05	02
Female	103	83	181	113	149	130	124	56	14	08
Total	156	88	200	129	175	168	197	94	19	10

In our study, table-1 showed the distribution table of urinary tract infection affected patients by their age groups and gender. The highest of the study subjects under goes to the 21-30 years age group (200 patients=181 female + 19 male) and followed by 61-70 years age group (197 patients=124 female + 73 male), 41-50 years age group (175 patients=149 female + 26 male), 51-60 years age group (168 patients= 130 female + 38 male) and <10 years age group (156 patients= 103 female+ 53 male) respectively. Most prevalent frequency of female and male patients affected by uropathogens was found in 21-30 years and 61-70 years age group respectively.

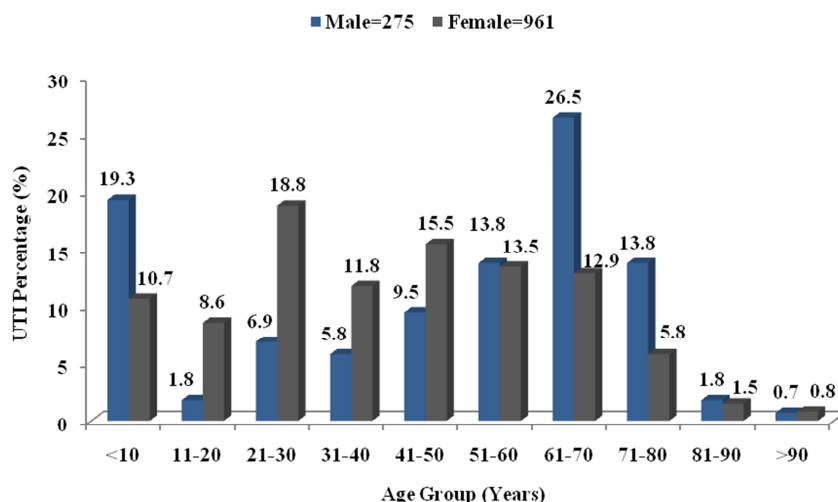


Figure-1: UTI percentage among different age groups of male (N=275) and female (N=961)

The percentage of male patients were more prone besides female patients (19.3% > 10.7%) under 10 years age groups. In between 11-20, 21-30, 31-40 and 41-50 years of age group female UTI infection (8.6%, 18.8%, 11.8% and 15.5% respectively) is higher than male (1.8%, 6.9%, 5.8% and 9.5% respectively). In between 51-60, 61-70, 71-80 and 81-90 years age male infection (13.8%, 26.5%, 13.8% and 1.8% respectively) is higher than female (13.5%, 12.9%, 5.8% and 1.5% respectively). Above 90 years age female infection (0.8%) is higher than male (0.7%) but here number of patients were very few.

Table-2: Distribution of specific uropathogen mediated UTI among UTI patients

Organisms	Percentage (n=1236)		
	Male	Female	Total
<i>E. coli</i>	222(18.0%)	815(65.9%)	1037(83.9%)
<i>Klebsiella</i> spp.	17(1.4%)	66(5.3%)	83(6.7%)
<i>Staphylococcus aureus</i>	5(0.4%)	27(2.2%)	32(2.6%)
<i>Pseudomonas</i> spp.	15(1.2%)	12(1.0%)	27(2.2%)
<i>Enterococcus</i> spp.	8(0.6%)	17(1.4%)	25(2.0%)
<i>Proteus</i> spp.	6(0.5%)	8(0.6%)	14(1.1%)
<i>Enterobacter</i> spp.	1(0.1%)	9(0.7%)	10(0.8%)
<i>Acinetobacter</i> spp.	1(0.1%)	1(0.1%)	2(0.2%)
<i>Serratia</i> spp.	0(0.0%)	2(0.2%)	2(0.2%)
<i>Staphylococcus saprophyticus</i>	0(0.0%)	2(0.2%)	2(0.2%)
<i>Citrobacter</i> spp.	0(0.0%)	1(0.1%)	1(0.1%)
<i>Streptococcus</i> Group B	0(0.0%)	1(0.1%)	1(0.1%)
Total	275 (22.2%)	961 (77.8%)	1236 (100.0%)

Table-2 showed that the most predominant organism *E. coli* 1037(male 222 and female 815) found in UTI patients. According to number or percentage distribution, the second prevalent organism was *Klebsiella* spp. 83 (male 17 & female 66) followed by *Staphylococcus aureus* 32 (male 5 and female 27), *Pseudomonas* spp. 27 (male 15 and female 12), *Enterococcus* spp. 25 (male 8 and female 17), *Proteus* spp. 14 (male 6 and female 8) and *Enterobacter* spp. 10 (male 1 and female 9) respectively. In total bacteriologically positive cases, the most prone organism in male and female were *E. coli* (18.0% and 65.9 %) respectively. Moreover, all the isolated organisms were found highest in female except *Pseudomonas* spp. in contrast male patients. On the other hand the study showed that the total 22.2% male patients and 77.8% female patients were found.

Table-3: Prevalence of different uropathogens among male and female patients

Organisms	Male (n=275)		Female (n=961)	
	Number	Percentage	Number	Percentage
<i>E. coli</i>	222	80.7%	815	84.8%
<i>Klebsiella</i> spp.	17	6.2%	66	6.9%
<i>Staphylococcus aureus</i>	5	1.8%	27	2.8%
<i>Pseudomonas</i> spp	15	5.5%	12	1.2%
<i>Enterococcus</i> spp.	8	2.9%	17	1.8%
<i>Enterobacter</i> spp.	1	0.4%	9	0.9%
<i>Proteus</i> spp.	6	2.2%	8	0.8%
<i>Serratia</i> spp.	0	0.0%	2	0.2%
<i>Staphylococcus saprophyticus</i>	0	0.0%	2	0.2%
<i>Acinetobacter</i> spp.	1	0.4%	1	0.1%
<i>Citrobacter</i> spp.	0	0.0%	1	0.1%
<i>Streptococcus</i> Group B	0	0.0%	1	0.1%
Total	275	100.0%	961	100.0%

In this study, the urinary tract infections of female patients (961) were more prone to male patients (275). In male, the most predominant uropathogen were *E.coli* (80.7%) followed by *Klebsiella* spp. (6.2%), *Pseudomonas* spp. (5.5%), *Enterococcus* spp. (2.9%), *Staphylococcus aureus* (1.8%). In female, the most prevalent uropathogen were *E. coli* (84.8%) followed by *Klebsiella* spp. (6.9%), *Staphylococcus aureus* (2.8%), *Enterococcus* spp. (1.8%), *Pseudomonas* spp. (1.2%). The study noted that female patients were more infected by all of the isolated organism (*E. coli*, *Klebsiella* spp., *Staphylococcus aureus*, *Enterobacter* spp., *Serratia* spp., *Staphylococcus saprophyticus*, *Citrobacter* spp. and *Streptococcus* Group B) except some organisms (*Pseudomonas* spp. and *Enterococcus* spp., *Proteus* spp. and *Acinetobacter* spp.) but here the number were very few.

Table-4: Susceptibility pattern of Levofloxacin against uropathogens among male UTI patients (n=275)

Name of organisms	Sensitive		Resistant	
	Number	Percentage	Number	Percentage
<i>E. coli</i>	85	38.3%	137	61.7%
<i>Proteus</i> spp.	4	66.7%	2	33.3%
<i>Pseudomonas</i> spp.	6	40.0%	9	60.0%
<i>Klebsiella</i> spp.	7	41.2%	10	58.8%
<i>Enterobacter</i> spp.	1	100.0%	0	0.0%
<i>Staphylococcus aureus</i>	3	60.0%	2	40.0%
<i>Enterococcus</i> spp.	5	62.5%	3	37.5%
<i>Acinetobacter</i> spp.	0	0.0%	1	100.0%
Total	111	40.4%	164	59.6%

Table-4 showed that Levofloxacin sensitive against isolated uropathogenic bacteria in total male patients were 40.4% and rest of resistant 59.6%. All of them (100%) *Enterobacter* spp. was sensitive to Levofloxacin but here the numbers were very few. On the other hand the most prevalent resistant organism was *Acinetobacter* spp. (100%) here the numbers were very few also. In contrast of frequency, *E.coli* was the most significant organism which was 38.3 % sensitive and 61.7 % resistant to Levofloxacin. However, the other isolated bacteria's sensitive pattern to Levofloxacin followed by *Proteus* spp.(66.7%), *Pseudomonas* spp. (40.0%), *Klebsiella* spp. (41.2%), *Staphylococcus aureus* (60.0%) and *Enterococcus* spp. (62.5%) and resistant pattern followed by *Proteus* spp.(33.3%), *Pseudomonas* spp. (60.0%), *Klebsiella* spp. (58.8%), *Staphylococcus aureus* (40.0%) and *Enterococcus* spp. (37.5%) respectively.

Table-5: Susceptibility pattern of Levofloxacin against uropathogens among female UTI patients (n=961)

Name of organisms	Sensitive		Resistant	
	Number	Percentage	Number	Percentage
<i>E. coli</i>	433	53.1%	382	46.9%
<i>Proteus</i> spp.	4	50.0%	4	50.0%
<i>Pseudomonas</i> spp.	7	58.3%	5	41.7%
<i>Klebsiella</i> spp.	43	65.2%	23	34.8%
<i>Enterobacter</i> spp.	8	88.9%	1	11.1%
<i>Staphylococcus aureus</i>	15	55.6%	12	44.4%
<i>Enterococcus</i> spp.	9	52.9%	8	47.1%
<i>Acinetobacter</i> spp.	0	0.0%	1	100.0%
<i>Citrobacter</i> spp.	1	100.0%	0	0.0%
<i>Streptococcus</i> Group B	1	100.0%	0	0.0%
<i>Serratia</i> spp.	2	100.0%	0	0.0%
<i>Staphylococcus saprophyticus</i>	1	50.0%	1	50.0%
Total	524	54.5%	437	45.5%

In our study table-5 showed that Levofloxacin sensitive against isolated uropathogenic bacteria in total female patients were 54.5% and rest of resistant 45.5%. All of them (100%) *Serratia* spp., *Citrobacter* spp. and *Streptococcus* Group B were sensitive to Levofloxacin but here the numbers were very few. On the other hand the most prevalent resistant organism was *Acinetobacter* spp. (100%) but here the numbers were very few also. By contrast of frequency, *E.coli* was the most significant organism which was 53.1 % sensitive and 46.9 % resistant to Levofloxacin. However, the other isolated bacteria's sensitive pattern to Levofloxacin followed by *Proteus* spp.(50.0%), *Pseudomonas* spp. (58.3%), *Klebsiella* spp. (65.2%), *Enterobacter* spp. (88.9%), *Staphylococcus aureus* (55.6%), *Enterococcus* spp. (52.9%) and *Staphylococcus saprophyticus* (50.0%) and resistant pattern followed by *Proteus* spp.(50.0%), *Pseudomonas* spp. (41.7%), *Klebsiella* spp. (34.8%), *Enterobacter* spp. (11.1%), *Staphylococcus aureus* (44.4%), *Enterococcus* spp. (47.1%) and *Staphylococcus saprophyticus* (50.0%) respectively.

4. Discussion

For misuse or abuse of antibiotics, followed by an increase in the bacterial resistance rates, this study aimed to evaluate the pattern of antimicrobial susceptibility of bacteria isolated from patients with UTI seen at the IBN SINA diagnostic center, Badda, Dhaka, Bangladesh. Moreover, we have identified the crucial bacterial species associated with UTI and described the profile of resistance to Levofloxacin. It is important that clinicians are aware of the regional antibiotic resistance rates before initiating experimental antimicrobial therapy for UTI treatment, as it is well-described that urinary infection with a resistant pathogen is more likely to lead to bacteriological/clinical failures (15). In our study, we tested total 12943 urine samples and 1236 (9.55%) were bacteriological positive and 11707 (90.45%) were bacteriological negative found.

In our study we found The highest of the study subjects under goes to the 21-30 years age group (200 patients=181 female + 19 male) and followed by 61-70 years age group (197 patients=124 female + 73 male), 41-50 years age group (175 patients=149 female + 26 male), 51-60 years age group (168 patients= 130 female + 38 male) and <10 years age group (156 patients= 103 female + 53 male) respectively. According to frequency in total infected patients, we saw that mostly female patients are affected by uropathogens in all the age groups in contrast male patients. It was noted that the highest frequency of UTIs observed in women when compared to men, which is often attributed to a shorter urethra that facilitates colonization by these microorganisms.⁽¹⁾ Most prevalent frequency of female and male patients affected by uropathogens was found in 21-30 years and 61-70 years age group respectively. However, there were found significant difference between the age groups and sex of urinary tract infection patients at 5% (P<0.05).

In the figure we saw the percentage of male patients were more prone in contrast female patients (19.3% > 10.7%) under 10 years age groups. Our finding is supported by the fact that uncircumcised male infants appear to be at increased risk of UTIs in the first three months of life. In a study of 100 otherwise healthy infants ranging in age from five days to eight months and admitted to the hospital because of a first known UTI. Most of the UTIs in infants younger than three months of age were in male, but female infants predominated thereafter (16). We also found in between 11-20, 21-30, 31-40 and 41-50 years of age group female UTI infection (8.6%, 18.8%, 11.8% and 15.5% respectively) is higher than male (1.8%, 6.9%, 5.8% and 9.5% respectively). In between 51-60, 61-70 , 71-80 and 81-90 years age male infection (13.8%, 26.5%, 13.8% and 1.8% respectively) is higher than female (13.5%, 12.9%, 5.8 % and 1.5% respectively). Above 90 years age female infection (0.8%) is higher than male (0.7%) but here number of patients were very few. The most predominant age group was 21-

20 years in female patients. Incidence of infection in female increases directly with sexual activity and child-bearing. In the women, 25-30% of women between 20-40 years of age will get UTIs. The anatomical relationship of the female urethra and the vagina makes it liable to trauma during sexual intercourse as well as bacteria been massaged up the urethra into the bladder during pregnancy and child birth. It has been reported in several studies that women who are sexually active, and especially if they use contraceptives, foams, gels, diaphragm and spermicides which are known to promote greater colonization of the vagina are at higher risk of developing UTIs (1). Furthermore, another mechanism that could explain the lower frequency of UTI in men would be the prostatic fluid, which has antibacterial substances (17). We got 961 (77.8%) female and 275 (22.2%) male patients. However, there were found significant difference between the percentage of age groups and sex of urinary tract infection patients at 5% ($P < 0.05$).

Table-2 showed that the most predominant organism *E. coli* 1037 (male 222 and female 815) found in UTI patients. According to number or percentage distribution, the second prevalent organism was *Klebsiella* spp. 83 (male 17 & female 66) followed by *Staphylococcus aureus* 32 (male 5 and female 27), *Pseudomonas* spp. 27 (male 15 and female 12), *Enterococcus* spp. 25 (male 8 and female 17), *Proteus* spp. 14 (male 6 and female 8) and *Enterobacter* spp. 10 (male 1 and female 9) respectively. In total bacteriologically positive cases, the most prone organism in male and female were *E. coli* (18.0% and 65.9 %) respectively. There is fecal contamination of periurethral area, then the bacteria spreads on ascending through the bladder and causes cystitis. These infections of the lower urinary tract, in some cases, can affect the kidneys and cause acute pyelonephritis, which consequently may result in bacteremia and sepsis (18). Moreover, all the isolated organisms were found highest in female except *Pseudomonas* spp. in contrast male patients. On the other hand the study showed that the total 22.2% male patients and 77.8% female patients were found. Moreover, there were found significant difference between the isolated organism and sex of urinary tract infection patients at 5% ($P < 0.05$).

In this study, the urinary tract infections of female patients (961) were more prone to male patients (275). In male, the most predominant uropathogens were *E. coli* (80.7%) followed by *Klebsiella* spp. (6.2%), *Pseudomonas* spp. (5.5%), *Enterococcus* spp. (2.9%), *Staphylococcus aureus* (1.8%). In female, the most prevalent uropathogen were *E. coli* (84.8%) followed by *Klebsiella* spp. (6.9%), *Staphylococcus aureus* (2.8%), *Enterococcus* spp. (1.8%), *Pseudomonas* spp. (1.2%).. Several studies have shown that *Escherichia coli* is the major bacterial species associated with UTIs, and *Klebsiella pneumoniae* is the second most important bacteria in this type of infection (19). The study noted that female patients were more infected by all of the isolated organism (*E. coli*, *Klebsiella* spp., *Staphylococcus aureus*, *Enterobacter* spp., *Serratia* spp., *Staphylococcus saprophyticus*, *Citrobacter* spp. and *Streptococcus* Group B) except some organisms (*Pseudomonas* spp. and *Enterococcus* spp., *Proteus* spp. and *Acinetobacter* spp.) but here the number were very few. However, there were found significant difference between the percentage and frequency of isolated organism and sex of urinary tract infection patients at 5% ($P < 0.05$).

Treatment of urinary tract infections is becoming more complicated with an increase of the number of resistant strains to antibiotics and prevalence of antibiotic resistance mechanisms. Table-4 showed that Levofloxacin sensitive against isolated uropathogenic bacteria in total male patients were 40.4% and rest of resistant 59.6%. All of them (100%) *Enterobacter* spp. was sensitive to Levofloxacin but here the numbers were very few. On the other hand the most prevalent resistant organism was *Acinetobacter* spp. (100%) here the numbers were very few also. In contrast of frequency, *E. coli* was the most significant organism which was 38.3 % sensitive and 61.7 % resistant to Levofloxacin. However, the other isolated bacteria's sensitive pattern to Levofloxacin followed by *Proteus* spp. (66.7%), *Pseudomonas* spp. (40.0%), *Klebsiella* spp. (41.2%), *Staphylococcus aureus* (60.0%) and *Enterococcus* spp. (62.5%) and resistant pattern followed by *Proteus* spp.(33.3%), *Pseudomonas* spp. (60.0%), *Klebsiella* spp. (58.8%), *Staphylococcus aureus* (40.0%) and *Enterococcus* spp. (37.5%) respectively. In our study also saw that the percentage of resistant of most of the organisms in male were higher than sensitive which is highly alarming message. There were no significant difference among the susceptibility pattern of Levofloxacin, isolated organism and sex of the patients at 5% ($P > 0.05$).

In our study Table-5 showed that Levofloxacin sensitive against isolated uropathogenic bacteria in total female patients were 54.5% and rest of resistant 45.5%. All of them (100%) *Serratia* spp., *Citrobacter* spp. and *Streptococcus* Group B were sensitive to Levofloxacin but here the numbers were very few. On the other hand the most prevalent resistant organism was *Acinetobacter* spp. (100%) but here the numbers were very few also. By contrast of frequency, *E. coli* was the most significant organism which was 53.1 % sensitive and 46.9 % resistant to Levofloxacin. However, the other isolated bacteria's sensitive pattern to Levofloxacin followed by *Proteus* spp.(50.0%), *Pseudomonas* spp. (58.3%), *Klebsiella* spp. (65.2%), *Enterobacter* spp. (88.9%), *Staphylococcus aureus* (55.6%), *Enterococcus* spp. (52.9%) and *Staphylococcus saprophyticus* (50.0%) and resistant pattern followed by *Proteus* spp.(50.0%), *Pseudomonas* spp. (41.7%), *Klebsiella* spp. (34.8%), *Enterobacter* spp. (11.1%), *Staphylococcus aureus* (44.4%), *Enterococcus* spp. (47.1%) and *Staphylococcus saprophyticus* (50.0%) respectively. In our study also saw that the percentage of resistant of most of the

organisms in male were higher than sensitive which is highly alarming message. There were no significant difference among the susceptibility pattern of Levofloxacin, isolated organism and sex of the patients at 5% ($P>0.05$).

The knowledge on the regional pattern of bacterial resistance is critical to guide the medical staff to choose an appropriate antibiotic for the treatment of UTI patients (20). Bacterial resistance has become a public health issue and has increasingly been associated with risk factors that put life in danger (1). Awareness is needed of both the population and health professionals about the importance for the correct use of antibiotics, and it is mandatory to take into account the result of antibiotics susceptibility tests. The Levofloxacin use should be performed only after the microbial susceptibility confirmation, and it is necessary to find other alternatives for the empirical treatment. The bacterial resistance prevention can be performed through control measures that limit the spread of resistant bacteria and the rational use of antimicrobial policy.

5. Conclusion

In conclusion, the results showed that there was a high prevalence of occurrence of urinary tract infection among patients of areas (Badda, Gulshan, Baridhara, Rampura, Doyagonj, Gandaria, Jatrabari, Sayedabad, Dhaka, Bangladesh). Most of the bacteria were resistant to Levofloxacin which is highly alarming message for human being. To prescribe Levofloxacin antibiotic should follow the antibiotic guidelines in order to prevent emergence of multi drug resistant organisms.

6. References

- 1-Jahangir Alam, Farha Matin Juliana, Md Rahimgir, Mohammad Nazir Hossain, Babry Fatema and Mohammad Asaduzzaman (2017). "Resistance Pattern of Ciprofloxacin against common Uropathogens in Selected Area of Dhaka city, Bangladesh." *IOSR Journal of Nursing and Health Science(IOSR-JHNS)*. 6: 5: 52-57.
- 2-Annabelle TD and Jennifer AC (1999). Surveillance of pathogens and resistance patterns in urinary tract infection. *Phil J Microbial Infect Dis*.28:11-14.
- 3-Iqbal T, Naqvi R and Akhter SF. (2010). Frequency of urinary tract infection in renal transplant recipients and effect on graft function. *J Pak Med Assoc*. 60: 10: 826-829.
- 4-Silveira GP, Nome F, Gesser JC, Sá MM, Terenzi H (2006). Estratégias utilizadas no combate a resistência bacteriana. *Quím Nova*. 29: 844-855.
- 5-Santos NQ (2004). A resistência bacteriana no contexto da infecção hospitalar. *Texto Contexto Enferm*. 13:64-70.
- 6-Savita Jadhav, Arif Hussain, Savita Devi, Ashutosh Kumar, Sana Parveen, Nageshwari Gandham, Lothar H. Wieler, Christa Ewers and Niyaz Ahmed (2011). Virulence characteristics and genetic affinities of multiple drug resistant uropathogenic *Escherichia coli* from a semi urban locality in India. *PLoS One*. 6: 3 :ee18063.
- 7-Grude N, Tveten Y and Kristiansen BE (2001). Urinary tract infections in Norway: bacterial etiology and susceptibility, a retrospective study of clinical isolates. *Clin Microbiol Infect*. 7:543-547.
- 8-Retrieved from <https://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+8028>
- 9-Retrieved from <https://thehealthscience.com/topics/levofloxacin-ophthalmic-medical-facts-drugscom>
- 10-Retrieved from http://www.who.int/medicines/publications/essentialmedicines/EML2015_8-May-15.pdf
- 11-Drlca K and Zhao X (1997). DNA gyrase, topoisomerase IV, and the 4-quinolones. *Microbiol Mol Biol Rev*. 61: 3: 377-392.
- 12- Ernst M, Gerd G, Heyo KK, Monika SK and Monika SK (2012). *Mutschler Arzneimittelwirkungen: Textbook of Pharmacology and Toxicology*.
- 13-Cheesborough M (2006). District Laboratory practice in Tropical Countries, Cambridge United Press, UK, part 2 , 7-106.
- 14-Clinical and Laboratory Standard Institute (2006). Methods for the Dilution Antimicrobial Susceptibility Tests for Bacteria. That Grow Aerobically. Approved Standards, Seventh Edition (M07), Villanova pp. MO 7-A 7.
- 15-Zhanel GG, Hisanaga TL, Laing NM, DeCorby MR, Nichol KA, Weshnoweski B, Johnson J, Noreddin A, Don E.Low DE, Karlowsky JA, Hoban DJ (2006). Antibiotic resistance in *Escherichia coli* outpatient urinary isolates: final results from the North American Urinary Tract Infection Collaborative Alliance (NAUTICA). *Int J Antimicrob Agents*.27: 6: 468-475.
- 16-Ginsburg CM, McCracken GH Jr (1982). Urinary tract infections in young infants. *Pediatrics*. 69:409-412.
- 17-Soares LA, Nishi CY, Wagner HL (2006). Isolamento das bactérias causadoras de infecções urinárias e seu perfil de resistência aos antimicrobianos. *Rev Bras Med Fam Com*. 2:84-92.
- 18-Mobley H (2016). Measuring *Escherichia coli* Gene Expression during Human Urinary Tract Infections. *Pathogens*. 5: 1: 7.
- 19-Ako-Nai AK, Adeyemi FM, Aboderin OA, Kassim OO (2005). Antibiotic resistance profile of staphylococci from clinical sources recovered from infants. *Afr. J. Biotechnol*. 4: 8: 816-822.

-
- 20- Md. Jahangir Alam, Sharmin Jahan Mousumi, Rasel Rana, Md. Shariful Islam, Mst. Suraiya Akter, Farha Matin Juliana, Mohammad Johirul Islam, Mohammad Nazir Hossain , Babry Fatema , Runa Asma and Mohammad Asaduzzaman (2017). Ceftriaxone Resistance Patterns of Uropathogens Isolated From Urinary Tract Infection Patients in Selected Areas of Dhaka City, Bangladesh. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*. 6: 5 (Ver. IX): 28-34.