DOI: 10.36347/sjams.2017.v05i02.013

Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2017; 5(2A):369-372 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com

Original Research Article

Study of the Bacterial Isolates and Their Susceptibility Pattern to the Selected Quinolones among Diabetic Patients with Urinary Tract Infections in a Tertiary Care Hospital, Chennai

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Abstract: Urinary tract infections is one of the most frequent infections that occurs worldwide. Diabetes mellitus has deleterious effects on the genitourinary system that renders Diabetic patients more vulnerable to UTI. Fluroquinolones are widely used class of antimicrobial agents for the treatment of UTI. The study is aimed to validate the different uropathogens in patients with DM and their susceptibility or resistance to quinolones. The study population comprised of a total of 200 diabetic patients with UTI. Identification was done by gram staining, culture methods and biochemical tests. Antibiotic susceptibility test to the selected quinolones was done by using Kirby Bauer's Disk Diffusion method according to CLSI guidelines. Out of a total of 200 samples growth was seen in 130 samples. Different bacterial pathogens according to the prevalence were E.Coli (32) ,Staphylococcus aureus (16), Klebsiella(12), Pseudomonas aeruginosa(11), Proteus species(10), Enter. ococcus species (8), Acinetobacter species (5), Enterobacter (5), Citrobacter(6), Serratia (2), Candida albicans (18) and Candida non-albicans(5). Susceptibility of quinolones is as follows, Norfloxacin (68%), Naldixic Acid(58.4%), Ciprofloxacin(63%%), Levofloxacin(75.3%) , Gatifloxacin(83%), Ofloxacin (72%) and Moxifloxacin (89%) respectively. There is an alarming increase in prevalence of resistance to Fluroquinolones among the diabetic patients with UTI. From our study results we conclude that quinolones should be prescribed after doing the antibiotic susceptibility testing that will prevent the extensive and unnecessary use of antibiotics and so the emerging resistance.
Keywords: Quinolones, drug resistance, uropathogens, DM

INTRODUCTION

Urinary tract infection is one of the most frequent infections that occurs worldwide [1]. A total population of 371 million is suffering from diabetes mellitus globally [2]. Diabetic patients are more vulnerable to UTI as Diabetes mellitus has a deleterious effects on the genitourinary system. Mortality from UTI is 5 times higher in patients with diabetes aged 65 and older, as compared to the patients with diabetes mellitus without UTI [3]. It can be due to various factors like immunological impairment, delayed bladder emptying, increased adherence of bacteria on uroepithelial cells or due to higher glucose concentration in urine that acts as a favorable culture media for the growth of uropathogens. Since UTI can cause various complications in patients with DM, such as renal papillary necrosis, bacteremia and renal abscess that can be fatal to the patients so, it is important to diagnose and treat urinary tract infections that can prevent morbidity and mortality in such patients [4-6]. Fluroquinolones are the commonly used class of antimicrobial agents for the treatment of UTI. The study is aimed to validate the different uropathogens in patients with DM and their susceptibility or resistance to quinolones.

METHODS AND MATERIALS

The study was carried out from March 2016 to September 2016 in the Department of Microbiology, SBMCH. The study population comprised of a total of 200 diabetic patients with UTI. All the patients were proven to be diabetic with fasting blood sugar levels ≥126mg/dl and Post -Parandial blood sugar ≥200mg/dl. Urine is collected by voiding the clean-catch, midstream urine in the morning preferably [10]. In patients with altered sensorium or neurologic problems

that hamper the ability to void, a specimen may be obtained through a sterile urinary catheter inserted by strict aseptic technique, or by supra-pubic aspiration [9, 11]. Specimen were cultured on Mac-Conkey Agar plates and blood agar plates than incubated at 37°C for 24-48 h .followed by counting the colonies in the plates. The presence $\geq 10^5$ cfu/ml is considered diagnostic as significant bacteriuria. Then further identification by colony morphology, Gram-staining films, and biochemical reactions was done [11]. Identification was done by Gram staining, culture methods and biochemical tests [fig 1, 2, 3, 4]. Antibiotic susceptibility test to the selected quinolones was done by using Kirby Bauer's Disk Diffusion method according to CLSI guidelines.

RESULT

Out of a total of 200 samples 120 and 80 were from females and males respectively. Growth was seen in 130 samples of which 85 was from females and 45 from males [table1]. Different bacterial pathogens according to the prevalence were E.coli (32) , Staphylococcus aureus (16), Klebsiella species(12), Pseudomonas aeruginosa (11), *Proteus species*(10), *Enterococcus species* (8), *Acinetobacter species* (5),Enterobacter (5),Citrobacter(6), Serratia (2) and Candida albicans (18), candida non-albicans (5) [fig-5, table 2]. Susceptibility of quinolones is as follows, Norfloxacin (68%), Naldixic acid (58.4%), Ciprofloxacin (63%), Levofloxacin (75%), Gatifloxacin (83%), Ofloxacin (72%) and Moxifloxacin (89%) respectively [Fig-6, table 3].

Table1: Prevalence of UTI among male and female diabetic patients

	Female (N=120)	Male (N=80)	Total
Growth	85 (70.8%)	45(43.7%)	130
No Growth	35	35	70

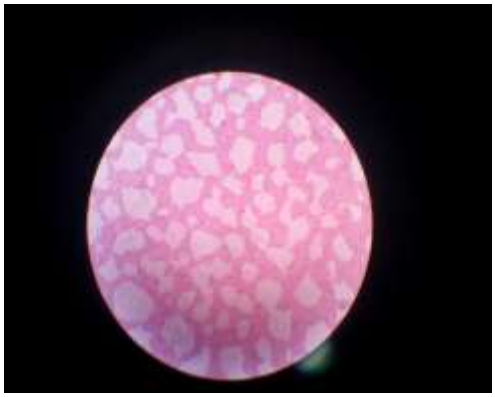

Fig-1: Gram Staining

Fig-2: Mac-Conkey Agar Plate

Fig-3: Blood Agar Plate

Fig-4: Biochemical tests

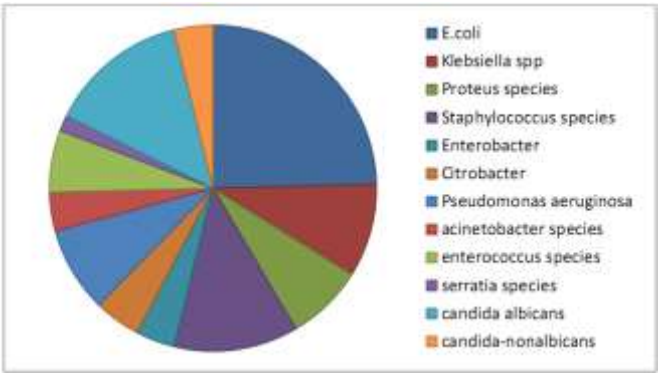

Fig- 5: Prevalence of uropathogens in Diabetes Mellitus

Table 2: Uropathogens in patients with Diabetes Mellitus

S.No	Organisms	Total (N=130)	Percentage%
1	Escherichia coli	32	25%
2	Staphylococcus aureus	16	12%
3	Klebsiella species	12	9%
4	Pseudomonas species	11	8%
5	Proteus species	10	8%
6	Enterococcus species	8	6%
7	Serratia species	2	1%
8	Enterobacter aerogenes	5	4%
9	Citrobacter species	6	5%
10	Acinetobacter species	5	4%
11	Candida albicans	18	14%
12	Candida non-albicans	5	4%

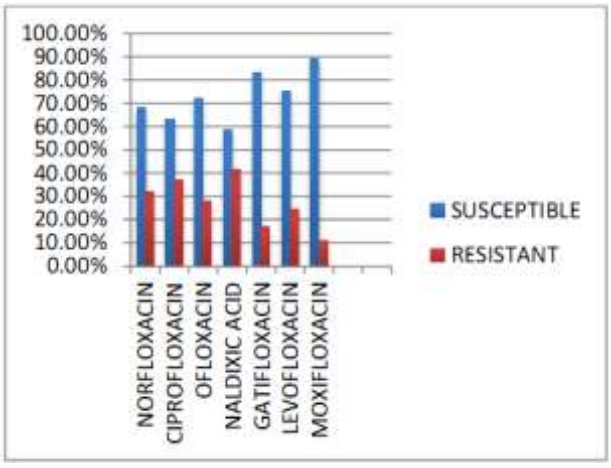

Fig-6: Susceptibility and Resistance of uropathogens to different quinolones

Table3: Antibiotic susceptibility pattern to quinolones

ANTIBIOTIC S	SENSITIVITY	RESISTANCE
Naldixic acid (30ug)	76 (58.4%)	54 (41.5%)
Ciprofloxacin (5ug)	82 (63%)	48(36.9%)
Norfloxacin (10ug)	88(68%)	42 (32%)
Ofloxacin (5ug)	94 (72%)	36 (28%)
Levofloxacin (5ug)	98 (75.3%)	32 (24.6%)
Gatifloxacin (5ug)	108 (83%)	22 (17%)
Moxifloxacin (5ug)	116 (89%)	14 (10.7%)

DISCUSSION

According to the study results UTI is more prevalent among diabetic women than in men. This can be due to the larger size of urethra, distance between the anus and the urogenital meatus in males is more as compared to the females and the bactericidal properties of the prostatic fluids [7]. Escherichia coli (25%) is the most predominant organism causing UTI followed by the other organisms. In patients with diabetes mellitus there is a high occurrence of fungi mostly Candida albicans and Candida non-albicans that can be attributed due to the glycosuria [9]. Fluroquinolones are broad-spectrum antibiotics used for the treatment of UTI. According to my study results nalidixic acid was the most resistant in preventing the growth of uropathogens and moxifloxacin was the most potent among quinolones. Fluoroquinolones resistance mechanism may be due to chromosomal mutations, plasmid-mediated or due to the alterations in efflux mechanisms [13].

CONCLUSION

The study concluded that the prevalence of UTI is higher in females as compared to male in diabetics. E.coli was the foremost etiological agent of UTI. There is an emerging resistance to fluoroquinolones among diabetic patients with UTI. So, fluoroquinolones should be prescribed after regular monitoring of susceptibility pattern of urinary pathogens that will prevent the extensive and unnecessary use of antibiotics and so the emerging resistance among diabetic patients with UTI.

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