Original Research

Assessment Of Fosfomycin Sensitivity Pattern Along with Minimum Inhibitory Concentration (MIC) Against Uropathogens at A Tertiary Centre

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ABSTRACT
Background: Among the most prevalent illnesses in humans are UTIs. The present study was conducted to evaluate Fosfomycin sensitivity pattern against uropathogens.
Materials & Methods:58 patients with UTI of both genders were selected. Midstream clean catch urine samples were collected in a sterile urine container. The significant growths of pathogenic bacteria were subjected to antibiotic susceptibility testing. Fosfomycin (200 µg) disc was used in Kirby-Bauer disc diffusion testing. Fosfomycin trometamol MIC was determined by agar dilution method
Results: Out of 58 patients, 20 were males and 38 were females. Organism isolated were E. coli in 42, Enterococcus spp. in 8, Klebsiella spp. in 2, Proteus spp. in 1, Enterobacter spp. in 2, Pseudomonas spp. in 2, and Acinetobacter spp. in 1 case. The difference was significant (P< 0.05). E. coli showed maximum susceptibility against FOS (40) followed by NIT (38). Enterococcus spp. showed maximum susceptibility against FOS (7) followed by CZ (6). Klebsiella spp. showed maximum susceptibility against FOS (2), and FQ (2). Proteus spp. showed maximum susceptibility against FOS (1), FQ (1), COT (1) and CZ (1). Pseudomonas spp. showed maximum susceptibility against FOS (1), and Acinetobacter spp. showed maximum susceptibility against showed maximum susceptibility against NIT (1), COT (1) and CZ (1).
Conclusion: Fosfomycin trometamol's high susceptibility and low MIC distribution imply that it should be used in conjunction with nitrofurantoin as part of a patient's empirical therapy arsenal for UTIs.
Keywords: Fosfomycin, Sensitivity, Uropathogens

INTRODUCTION

Among the most prevalent illnesses in humans are UTIs. About 25% of women will have recurring infections, and 50% of women will have UTIs at least once in their lives. As one of the most prevalent illnesses in humans, UTIs account for a significant share of antibiotic use, which in turn contributes to antibiotic resistance. Treatment options for multidrug resistant (MDR) microorganisms are limited, and their cause of UTIs is on the rise.[1,2]One strategy for addressing this complex disease burden is to reevaluate "neglected" antibacterial medications, since several earlier medications, such as temocillin, mecillinam, fusidic acid, polymyxins, etc., have been shown to have potential efficacy against MDR microorganisms.[3,4]

In the United Kingdom (UK), fosfomycin is one such medication that is once again being used to treat UTI.[5]

In addition to being a well-tolerated medication, fosfomycin trometamol exhibits a broad

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spectrum of efficacy against a variety of Gram-positive and Gram-negative bacteria.[6]

It has low toxicity and functions as a time-dependent inhibitor of the MurA enzyme, which catalyzes phosphoenolpyruvate synthetase's first committed step in the manufacture of peptidoglycans. Since there are no data on the MIC and susceptibility pattern of fosfomycin from this region of the country.[7]

AIM ANDOBJECTIVES: The present study was conducted to evaluate fosfomycin sensitivity pattern against uropathogens.

MATERIALS & METHODS

The present cross-sectional study was conducted on 58 patients with UTI of both genders in the Department of Microbiology, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India. All participants gave written consent after being made aware of the study. The study was approved by the Institutional Ethics Committee. The duration of the study was from January 2019 to December 2019. All were informed regarding the study and their written consent was obtained. All were informed regarding the study and their written consent was obtained.Data such as name, age, gender etc. was recorded.

Using an agar dilution method on Muller Hinton Agar (MHA) supplemented with 25 µg/mL of glucose-6-phosphate to reduce the rate of false resistance in accordance with CLSI guidelines (2017), the isolates were tested for minimum inhibitory concentration (MIC) against fosfomycin trometamol.[8]

Following the adjustment of turbidity using 0.5 McFarland standards, 10 µL of the test organism's bacterial culture was spot-inoculated on MHA plate with different concentrations offosfomycin. Midstream clean catch urine samples were collected in a sterile urine container from all patients. All urine samples were plated semi-quantitatively on CLED agar and incubated at 37°C for overnight. The significant growths of pathogenic bacteria were subjected to antibiotic susceptibility testing. Fosfomycin (200 µg) disc was used in Kirby-Bauer disc diffusion testing. The following criteria were used to interpret the obtained MIC values: - The following criteria were used to interpret the MIC values:

- Susceptible (S) ≤64 µ µg/mL,
- Intermediate (I) ≥128 µg/mL,
- Resistant (R) ≥256 µg/mL.
- As a control strain, E. coli ATCC 25922 and E. faecalis ATCC 51299 were used (MIC 0.5-2 µg/mL).

Statistical analysis

Statistical analysis of the data collected for the study was done using the Fisher's exact test using IBM SPSS version 16.0. P-values less than 0.05 were regarded as statistically significant.

RESULTS

Table I:Gender wise distribution of patients

Total- 58		
Gender	**Male**	**Female**
Number	20 (34.5%)	38 (65.5%)

Table I, figure1 shows that out of 58 patients, 20 were males and 38 were females.

Figure 1: Gender wise distribution of the patients

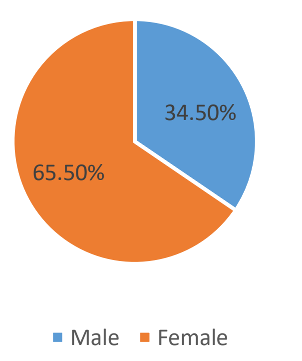

Table II:Organism isolated from Urinary Tract Infection (UTI) patients.

Organism isolated	Number	Percentage	P value
E. coli	42	72.42%	0.01
Enterococcus spp.	8	13.79%	
Klebsiella spp.	2	3.45%	
Proteus spp.	1	1.72%	
Enterobacter spp.	2	3.45%	
Pseudomonas spp.	2	3.45%	
Acinetobacter spp.	1	1.72%	

Table II shows that organism isolated were E. coli in 42 (72.42%), Enterococcus spp. in 8 (13.79%), Klebsiella spp. in 2(3.45%), Proteus spp.in 1, Enterobacter spp. in 2(3.45%), Pseudomonas spp. in 2(3.45%), and Acinetobacter spp. in 1 (1.72%) case. The difference was significant (P< 0.05).

Figure 2: Organism isolated from UTI patients (Percentage wise)

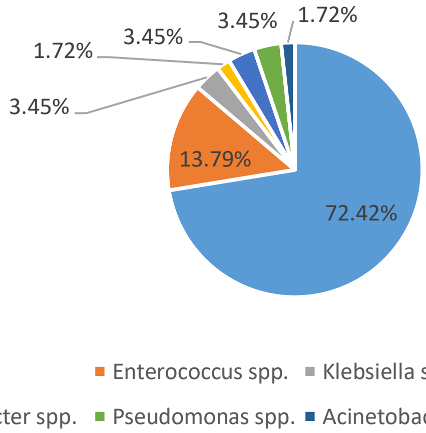

Table III:Antibiotic sensitivity pattern by Kirby-Bauer disc-diffusion method among gram-negative uropathogens (n=58)

Organism	FOS		FQ		NIT		COT		CZ	
	S	R	S	R	S	R	S	R	S	R
E. coli	40	2	34	6	38	4	28	14	24	18
Enterococcus spp.	7	1	5	3	4	4	3	5	6	2
Klebsiella spp.	2	0	2	0	1	1	0	2	0	2
Proteus spp.	1	0	1	0	0	1	1	0	1	0
Enterobacter spp.	1	0	1	0	1	1	0	1	1	0
Pseudomonas spp.	1	1	0	2	0	2	1	1	0	2
Acinetobacter spp.	0	1	0	1	1	0	1	0	1	0

FOS: Fosfomycin; NIT: Nitrofurantoin; COT: Trimethoprim/Sulphamethoxazole; CZ: Cefazolin; FQ: Fluoroquinolones. S: Sensitive, R: Resistant. The Fisher-Exact test was performed for comparing proportions.

Table III shows that E. coli showed maximum susceptibility against FOS (40) followed by NIT (38). Enterococcus spp. showed maximum susceptibility against FOS (7) followed by CZ (6). Klebsiella spp. showed maximum susceptibility against FOS (2), and FQ (2). Proteus spp. showed maximum susceptibility against FOS (1), FQ (1), COT (1) and CZ (1). Pseudomonas spp. showed maximum susceptibility against FOS (1), and Acinetobacter spp. showed maximum susceptibility against NIT (1), COT (1) and CZ (1).

DISCUSSION

One of the most typical bacterial infections and the second most prevalent infectious disease in clinics and hospitals is urinary tract infections, or UTIs.[9,10] The most common illness, impacting nearly every age group and gender, is urinary tract infections (UTIs).[11,12] The present study was conducted to evaluate fosfomycin sensitivity pattern against uropathogens.

We found that out of 58 patients, 20 were males and 38 were females.

We found that the organisms isolated were E. coli in 42 (72.42%), Enterococcus spp. in 8 (13.79%), Klebsiella spp. in 2 (3.45%), Proteus spp. in 1, Enterobacter spp. in 2 (3.45%), Pseudomonas spp. in 2 (3.45%), and Acinetobacter spp. in 1 (1.72%). Enterococcus spp. was reported as the second most common urinary pathogen in the present study, similarly finding by other previous studies.[13-15]

We found that E. coli showed maximum susceptibility against FOS (40) followed by NIT (38). Enterococcus spp. showed maximum susceptibility against FOS (7) followed by CZ (6). Klebsiella spp. showed maximum susceptibility against FOS (2), and FQ (2). Proteus spp. showed maximum susceptibility against FOS (1), FQ (1), COT (1) and CZ (1). Pseudomonas spp. showed maximum susceptibility against FOS (1), and Acinetobacter spp. showed maximum susceptibility against showed maximum susceptibility against NIT (1), COT (1) and CZ (1).

Banerjee S et al.[16] studied show that Fosfomycin MIC determination by agar dilution method, and they found more than 95% susceptibility among Enterobacteriaceae and Enterococcus spp., 73.33% against Pseudomonas spp., and only 50% against Acinetobacter spp. Another similar study was performed by Gopichand P et al.[17] and they found that 100% fosfomycin susceptibility in E. coli, 94.23% in Klebsiella spp., 64% in Enterobacter spp., and 71.88% in Pseudomonas spp. S. Shraddha et al.[18] found that 96.96% of Enterobacteriaceae were reported sensitive by the agar dilution method. High rates of resistance were seen in Enterococcus spp. against minocycline and fluoroquinolones. Fosfomycin and Nitrofurantoin were 100% susceptible to Enterococcus spp.The MIC value of fosfomycin against most of the susceptible uropathogens was noted between 4 and 64 µg/mL.

LIMITATION OF THE STUDY: The shortcoming of the study is small sample size.

CONCLUSION

Authors found that Fosfomycin trometamol's high susceptibility and low MIC distribution imply that it should be used in conjunction with nitrofurantoin as part of a patient's empirical therapy arsenal for UTIs.

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