A CROSS - SECTIONAL STUDY ON EFFICACY AND SAFETY OF NITROFURANTOIN AND FLUOROQUINOLONES FOR THE TREATMENT OF URINARY TRACT INFECTION

Mohammed Rishwan S M[1,2], Dinesh Kumar S N1[1,2], Dhiyaneswaran R[1,2], Ajay R[1,2], Hari Haran S[1,2], Sivasakthi R[1,2 *], Mohan.S[1,3,] Shindya B[1,4], Varun Rajan[5]

[1] The Tamil Nadu Dr. M.G.R. Medical University, Chennai – 600032, Tamil Nadu, India.
[2]Department of Pharmacy Practice, Karpagam College of Pharmacy, Coimbatore-641032, Tamil Nadu, India.
[3]Department of Pharmaceutics, Karpagam College of Pharmacy, Coimbatore-641032, Tamil Nadu, India.
[4]Department of Clinical Pharmacy, Naruvi Hospital, Vellore - 632004, Tamil Nadu, India.
[5]Department of Urology, Karpagam Hospital, Coimbatore -641032, Tamil Nadu, India.

ABSTRACT

Background: A urinary tract infection is a common condition caused by microbial invasion of the urinary system. The treatment of UTIs typically involves the use of antibiotics, with the choice of medication depending on the severity of the infection and the specific pathogen involved. First-line antibiotics often include trimethoprim-sulfamethoxazole, nitrofurantoin, fluoroquinolones, fosfomycin.

Aim: The study aimed to assess the efficacy and safety of Nitrofurantoin and Fluoroquinolones for the treatment of UTI and our secondary objectives is to evaluate cost – effectiveness among drugs.

Methodology: A Cross Sectional Study was conducted in department of urology at the Karpagam Faculty of Medical Sciences and Research for a period of 6 months with 150 patients. They were included as per study criteria. The data were analysed by using SPSS software.

Results: The study found that, male patients (58.6%) were more prone to UTI than the female patients (41.3%). An age group of 50 – 60 years patients were mostly affected with UTI. Diabetes is the major co-morbidity found (24%) in Nitrofuranntoin group and 29.3% in Fluoroquinolones group. 37.33% of patients were resistant to Nitrofurantoin drug and 50.66% of patients were resistant to Fluoroquinolones drug. CEA found that Nitrofurantoin is available in lowest cost also with significant therapeutic action in patients with UTI.

Conclusion: The Study concludes that, when compared to Fluoroquinolone, Nitrourantoin is the lowest cost effective drug and have significant therapeutic effect for patients with UTI.

Keywords: Nitrofurantoin, Fluoroquinolones, Urinary tract infection, Efficacy , Safety.

Introduction

Urinary tract infections can result from various bacteria, including both Gram-negative and Gram-positive types, as well as certain fungi. Escherichia coli is the primary causative agent, followed by Klebsiella pneumoniae, Staphylococcus saprophyticus, Enterococcus faecalis, Group B Streptococcus, Proteus mirabilis, Pseudomonas aeruginosa, Staphylococcus aureus, and Candida species.

The causes of urinary tract infections (UTIs) are influenced by various underlying factors in the host, including age, diabetes, spinal cord injury, or catheterization. As a result, complicated UTIs have a broader range of causes compared to uncomplicated UTIs. Organisms that typically don't cause illness in healthy individuals can lead to significant disease in those with underlying anatomical, metabolic, or immunological conditions. The microbial origin of urinary tract infections has long been considered well understood, relatively stable, and of minor importance. Escherichia coli continues to be the most commonly isolated uropathogen. Any infection in the kidneys, ureters, bladder, or urethra is referred to as a urinary tract infection. The bladder, urethra, and lower urinary tract are the sites of most infections. A bladder infection can cause discomfort and annoyance. On the other hand, if a UTI spreads to your kidneys, it might have dangerous repercussions.

Though most infections are not as serious, UTIs can result in potentially fatal sepsis. Most UTIs are caused by bacteria, however they can also be caused by fungi, viruses, or parasites. The most common urinary tract infection (UTI) causes cystitis, however other urinary tract infections can result in pyelonephritis, urethritis, and prostatitis. Urinary tract bacterial colonization is not necessarily accompanied by symptoms, and women and older people are more likely to have bacteriuria, or silent bacterial colonization.

AIM AND OBJECTIVES

Aim: This study was aimed to assess the efficacy and safety of Nitrofurantoin and Fluoroquinolones for the treatment of urinary tract infection.

Objectives:

1. To compare the effectiveness and safety of Nitrofurantoin and Fluoroquinolones for the treatment of urinary tract infection.
2. To assess cost – effectiveness of the drugs among the study population.

Methodology

Study Design: A cross sectional study

Study site: The study was conducted in the department of urology, Karpagam Faculty of Medical and Research, Coimbatore.

Study Period: This study was conducted for the period of 6 months.

Study Population: The study conducted with 150 patients with Urinary Tract infection

STUDY CRITERIA:

Inclusion Criteria:

1. Patients of both Gender with age group between (18-60 years).
2. Both In-patients and Out patients with significant bacterial infections
3. Patients who were prescribed with Nitrofurantoin and Fluoroquinolones.

Exclusion Criteria:

1. Pregnancy and Lactating Women.
2. Patients who are not interested to participate in the study.

Methodology

Patients diagnosed with urinary tract infection were enrolled in the study.Patient's demographics, chief complaints, diagnosis, urine routine analysis, culture sensitivity test, treatment chart, pre treatment and post treatment were collected. The study was approved by the Institutional Ethics Committee Ref No: IHEC/333/KCOP /03/2024 at Karpagam Faculty of Medical Science and Research. Data was collected using well designed patient data collection form on a daily basis from patient's medical record.the data was analysed by using SPSS software.

Result

A total of 150 patients were enrolled and found that,86 (58.66%) patients were male and 64 (41.33%) patients were female. Majority of the patients under the age group of 56 – 60 years of age followed by 34 patients were under 46 -55 years of age group which was given in figure-1.

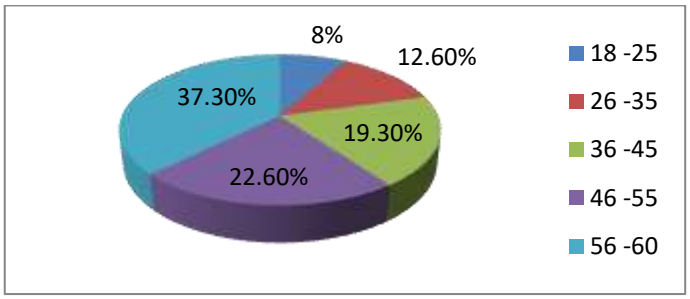

Figure-1; Age wise distribution of study patients

Out of 150 Patients, 43 patients (22.66%) were smoker, and 107 patients (77.33%) were non-smoker. 36 patients (24%) were alcoholic, and 114 patients (76%) were nonalcoholic. It was indicated in figure-2.

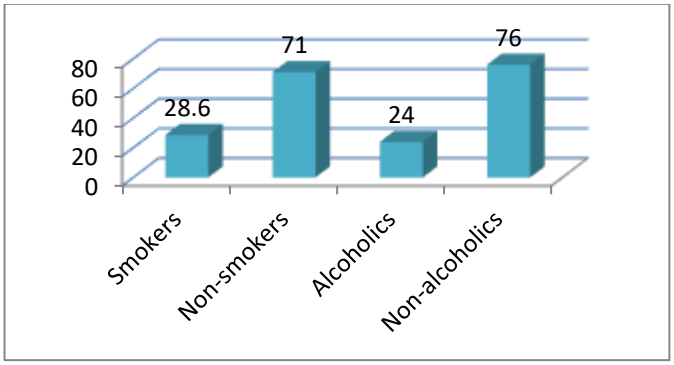

Figure-2; Social habits of study patients

The comorbidities among the study patients were found that, Out of 150 patients, 34 patients (32%) were with Hypertension and followed by Diabetes Mellitus in 40 (29.33%), and 48 patients (40%) were having no such co-morbidities.which was given in figure-3.

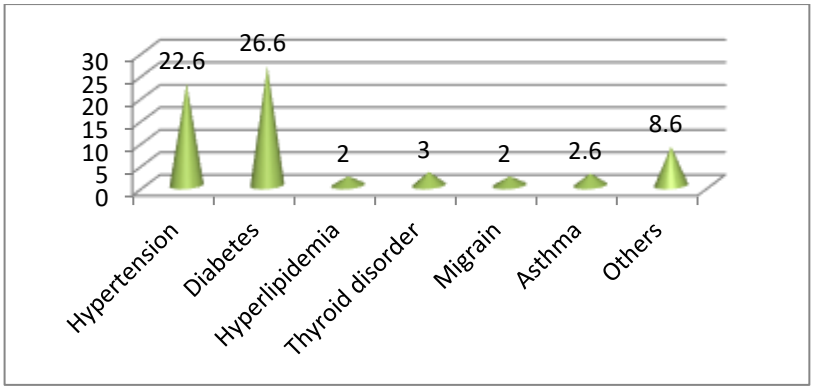

Figure-3; co-morbidities among the study patients

The drug resistance among the study patients was found that, Out of 150 patients, 38 patients (50.66%) shows resistance to Fluoroquinolones, 28 patients (50.66%) shows resistance to Nitrofurantoin followed by 41 patients (26.66%) shows resistance to other antibiotics [Cefixime, Gentamicin, Amikacin, Penicillin G, Doxycycline, Tetracycline, Linezolid, etc…,]and 43 patients (22.66%) were not taken the Culture Sensitivity test. which was shown in figure-4.

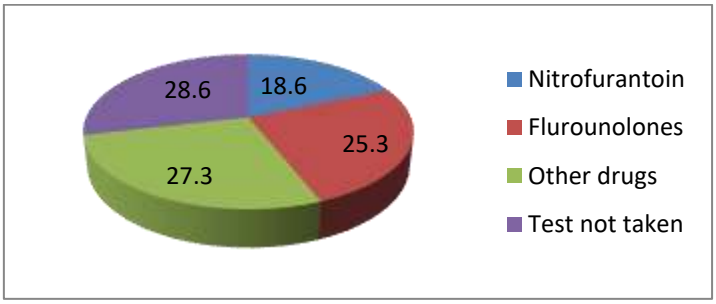

Figure 4: The drug resistance among the study patients

The prevalence of microorganism in study patients was analyzed and found that, E. coli is present in 64% of Nitrofurantoin group and 42.66% in Fluoroquinolones group. E.coli is the major type of microbe found in the study population. Pseudomonas spp was present in 5.33% of Nitrofurantoin group and 2.66% in Fluoroquinolones group. Which was shown in table-1.

Table 1: Prevalance of organisms responsible for causing UTI among study population in Nitrofurantoin group and Fluoroquinolones group (n=150)

PARAMETERS	NITROFURANTOIN group-A		FLUROUINOLONE group-B	
	n	%	n	%
E. coli	48	64	32	42.66
Klebsiella spp.	1	1.33	14	18.66
Pseudomonas spp	4	5.33	2	2.66
Enterobacter spp	1	1.33	0	0
Staphylococcus spp	4	5.33	1	1.33
Test not taken	17	22.66	26	34.66

The QOL of study patients assessed and found that, 64% of patients had lack of physical functioning during pre - treatment but only 10.66% of patients reported lack of physical functioning during post - treatment. 77.33% of patient had mental stress during pre - treatment but only 6.66% of patients reported mental stress during post - treatment. 72% of patients had body pain during pre - treatment but only 1.33% of patients reported body pain during post - treatment. 93.33% of patient had decline in their general health during pre - treatment but only 8% of patients reported decline in general health during post treatment. The result given in table-2.

Table 2: Physical Components Score Parameters among study population

Group	**Parameters**	**Pre -treatment**				**Post- treatment**			
		yes	**%**	**No**	**%**	**yes**	**%**	**No**	**%**
Nitrofurantoin group	Physical functioning	48	64	27	36	8	10.66	67	89.33
	Mental stress	58	77.33	17	22.66	5	6.66	70	93.33
	Body pain	54	72	21	28	1	1.33	74	98.66
	General health	70	93.33	5	6.66	6	8.0	69	92
Fluoroquinolone group	Physical functioning	47	62.66	28	37.33	24	32.0	51	68.0
	Mental stress	55	73.3	20	26.66	20	26.66	55	73.33
	Body pain	66	88.0	9	12	19	25.33	56	74.66
	General health	62	82.66	13	17.33	32	42.66	43	57.33

The study assess the cost of the drugs and found that, when Comparing Nitrofurantoin and Fluoroquinolones, the cost of the Fluoroquinolones is low than Nitrofurantoin. While in case of efficacy the Nitrofurantoin is more effective.

Conclusion

The Study concludes that, when compared to Fluoroquinolone, Nitrofurantoin has significant therapeutic effect by means of effective pharmacological action and improvement of physical components score. The drug Nitrofurantoin improves the QOL of the study patients and also it is the lowest cost effective drug for the treatment of Urinary Tract Infection.

Conflicts of interest: None

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