



ORIGINAL RESEARCH PAPER

Microbiology

EVALUATION ON SENSITIVITY PATTERN OF ESCHERICHIA COLI IN URINARY TRACT INFECTION: A TEACHING HOSPITAL BASED STUDY

KEY WORDS: Urinary tract infections, Escherichia coli and Antibiotic sensitivity.

Reyaz Ahmad

Lecturer, Department of Microbiology, Sarjug Dental College & Hospital, Darbhanga, Bihar-846003

Baidyanath Jha*

Lecturer, Department of Microbiology, Sarjug Dental College & Hospital, Darbhanga, Bihar-846003*Corresponding Author

ABSTRACT

Urinary tract infection is one of the most common bacterial infections in humans affecting all age groups and both genders in the community and hospital. Aim of the present study was to assess the sensitivity pattern of E. coli causing urinary tract infection in the human population. These findings suggest that, E. coli remains the leading uropathogen with the majority of the isolates from female patients. Antibiotics such as gentamycin, cotrimoxazole, ciprofloxacin, norfloxacin and cefotaxime have limited value for the treatment of UTI. Nitrofurantoin and amikacin should be used in empirical therapy of UTI.

Introduction:

Urinary tract infections (UTIs) are serious health affecting problems worldwide.^[1] Urinary tract infection is one of the most common bacterial infections in humans affecting all age groups and both genders in the community and hospital.^[2] Worldwide about 150 million people are being diagnosed with urinary tract infection every year.^[3] UTIs are associated with increased morbidity and mortality and it is one of the commonest nosocomial infections.^[4] The symptoms of UTI are fever, dysuria, urinary urgency and cloudy urine.^[5] Every woman has 60% lifetime risk of developing cystitis, by contrast, men have lifetime risk of only 13%.^[6] It is estimated that 3% of girls and 1% of the boys experience atleast one episode of UTI before 11 years of age.^[7]

E. coli, E. faecalis, K. pneumoniae, S. marcescens, P. aeruginosa, S. saprophyticus, S. aureus and Proteus mirabilis are most common bacteria causing UTIs in human beings.^[8-10] E. coli belongs to the family Enterobacteriaceae and accounts for 75% to 90% of all UTI in Inpatients and Outpatients.^[4] Reports from India reveal that E. coli is the most common cause of UTI and antibiotic resistance is reported to be high among the strains.^[6] The percentage of E. coli causing UTI in male and female are 31.4% and 58.2% respectively.^[11] UTI is initiated by E. coli, which is a commensal in the gastrointestinal tract.^[4] Commensal E. coli act as a reservoir of resistant genes and these resistant genes might be transferred to other commensal organism or pathogenic organism.^[12] According to the guidelines of Infectious Diseases Society of America (IDSA) the recommended drug for treatment of UTI is Trimethoprim/Sulphamethoxazole where the resistance prevalence is <10-20%. Ciprofloxacin is recommended where the resistance is >20%.^[13] Early treatment with an appropriate and effective antibiotic is essential for prevention of long term complications.^[13] Drug resistance of pathogens is a serious medical problem because of their characteristic of very fast rise and spread of mutant strains and hence these are insusceptible to medical treatment. The emergence of antibiotic resistance in the management of UTIs is a serious public health issue, particularly in the developing countries. Bacterial resistance to antibiotics complicates the treatment of UTI and the antibiotic sensitivity pattern shows geographical variations.^[14] Aim of the present study was to assess the sensitivity pattern of E. coli causing urinary tract infection in the human population.

Material and Methods:

This present study was conducted in the Department of Microbiology, Sarjug Dental College & Hospital, Darbhanga, Bihar. This Retrospective analysis was done on E. coli isolated from urine samples received during the study period from July 2016 to December 2017. Urine culture was done by standard loop method, a semi quantitative method. The organism isolated from urine culture was identified by conventional biochemical test. Antimicrobial susceptibility was done by Kirby-Bauer disc diffusion method on Mueller-Hinton agar and the interpretations were carried out according to the Clinical and Laboratory Standards

Institute guidelines. Quality control of media and discs were performed using ATCC E. coli control strain 25922. Antibiotics against which sensitivity was tested included Ciprofloxacin, Amikacin, Gentamycin, Ceftriaxone, Ceftazidime, Cefotaxime, Nitrofurantoin and Cotrimoxazole.

Results and Discussion:

This present study was carried out in the Department of Microbiology, Sarjug Dental College & Hospital, Darbhanga, Bihar In all the 420 urine culture positive reports of Escherichia coli and their sensitivity pattern were analysed. The patients' age group were between 0 and 80 years of age. We noted that UTI caused by E. coli was more common in females of age group 51 -60 years in the subjected cases. In males it was commonly seen in age group 21-30 years (Figure-1). Based on the present study it was noted that UTI caused by E. coli was sensitive to Nitrofurantoin in about 85.67% cases. Among the Aminoglycosides the sensitivity of E. coli to Amikacin was 69.48% and to Gentamycin was 37.74%. E. coli in UTI was resistant to Ciprofloxacin in 76.33% cases and to Cotrimoxazole in 67.57% of cases. The resistance of E. coli in UTI to Cephalosporins like Ceftazidime, Cefotaxime, Ceftriaxone were 74.21%, 71.21%, 81.73% respectively (Table -1). This present study E. coli has been found to be more sensitive to Nitrofurantoin than other antibiotics used in the sensitivity test. E. coli is highly resistant to third generation Cephalosporins, Quinolones and Aminoglycosides. Among the Aminoglycosides resistance is more to Gentamycin than to Amikacin.

Figure: 1 Age and sex distribution of patients with urinary tract infections:

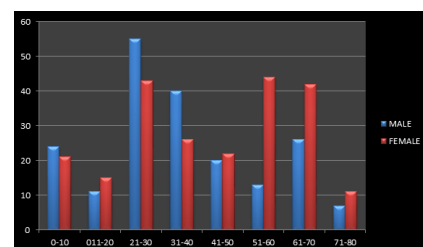


Table: 1 Pattern of E. Coli resistance to antibiotics in urinary tract infections:

Drug	Sensitivity (%)	Resistant (%)
Ciprofloxacin	23.67	76.33
Amikacin	69.48	30.52
Gentamycin	37.74	62.26
Ceftriaxone	18.27	81.73
Ceftazidime	25.79	74.21
Cefotaxime	28.79	71.21
Nitrofurantoin	85.67	14.33
Cotrimoxazole	32.43	67.57

The study observes that the prevalence of UTI is high among females (53.33%) than males (46.66%). Females are more prone to develop UTI, probably due to the characteristic anatomy of the urethra and the effect of normal physiological changes that affect the urinary tract – short urethra, its proximity to the anus, urethral trauma during intercourse dilation of the urethra and stasis of urine during pregnancy.^[15,16] UTI was recorded high in elderly males of age group (50-90) probably due to prostate enlargement and neurogenic bladder.^[17] The results are supported by a previous study from Nigeria in which *E.coli* showed highest sensitivity to Nitrofurantoin 76%^[18] and another study by Shalini from India showed that 93.48% of *E.coli* in UTI are sensitive to Nitrofurantoin.^[19] Re-emergence of *E.coli* sensitivity to Nitrofurantoin is probably due to non-usage of the drug, Nitrofurantoin, for a long period of time. Nitrofurantoin has been less commonly used in the treatment of uncomplicated UTI in recent years. Earlier usage of monohydrate formulations of Nitrofurantoin required dosing administration four times a day and data from literatures suggested that three day course of Nitrofurantoin was not as effective as Quinolones and Cotrimoxazole. So until recently Nitrofurantoin was considered as an inferior agent for uncomplicated UTI. But, currently available macrocrystal formulation of Nitrofurantoin can be given as twice daily regimen.^[20] The increased sensitivity of *E.coli* to Nitrofurantoin has made three day treatment of Nitrofurantoin the current treatment of choice. The high level of susceptibility of *E.coli* to Nitrofurantoin may be due to Nitrofurantoin's narrow spectrum of activity, limited indication like treatment of acute cystitis, narrow tissue distribution.^[18]

This present study shows that the organism *E.coli* in UTI is resistant to commonly prescribed drugs like Quinolones. The drug Quinolone is commonly prescribed because it achieves high concentration in urine. Over use of Quinolone has led to increased prevalence of *E.coli* resistance to Quinolones.^[18] *E.coli* has developed resistance to third generation Cephalosporins, Quinolones, and Aminoglycosides and so they cannot be considered for treatment in UTI caused by *E.coli*. The above mentioned resistance pattern is similar to a study by Durgesh et al which showed UTI caused by *E.coli* was resistant to Gentamycin 90% ,Ciprofloxacin 80% ,Ceftriaxone 80% ^[6] cotrimoxazole 61%.^[3]

Inadequately treated UTI, besides, extensive and inappropriate use of antibiotics and usage of spurious drugs has led to the development of organisms resistant to antibiotics. Choice of treatment of *E.coli* in UTI gets narrowed due to emerging resistance to drugs used previously.

Conclusion:

These findings suggest that, *E. coli* remains the leading uropathogen with the majority of the isolates from female patients. Antibiotics such as gentamycin, cotrimoxazole, ciprofloxacin, norfloxacin and cefotaxime have limited value for the treatment of UTI. Nitrofurantoin and amikacin should be used in empirical therapy of UTI. Therefore, routine monitoring of antibiotic susceptibility patterns is mandatory. Constant surveillance of antibiotic sensitivity pattern will help the Medical Practitioners to use safe and effective therapy in the management of UTI caused by *E.coli*. Proper guidelines, supervision of antibiotic usage and constant information to the Medical Practitioners regarding the sensitivity pattern can help to prevent drug resistance.

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