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Recent Sensitivity Pattern of Escherichia Coli in Urinary Tract Infection.

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ABSTRACT

The objective of the study is to assess the recent sensitivity pattern of Escherichia coli in Urinary tract infection (UTI). Widespread use of antibiotics has led to the emergence of resistant microorganisms. As the antibiotic sensitivity patterns of the microorganisms are frequently changing, this retrospective analysis was designed to assess the recent antibiotic sensitivity pattern of Escherichia coli (E.coli) in urinary tract infection among the human population. Details of 412 urine culture positive reports for E.coli and their antibiotic sensitivity pattern pertaining to the study period of 12 months from June 2012 to May 2013 were collected from Central Microbiology Laboratory of Tirunelveli Medical College and the results were statistically analysed. The antibiotics tested for sensitivity were Amikacin, Gentamycin, Ciprofloxacin, Cotrimoxazole, Nitrofurantoin, Ceftazidime, Ceftriaxone and Cefotaxime. The sensitivity pattern of E.coli to antibiotics in UTI were Nitrofurantoin (85.19%), Amikacin (66.50%), Co-trimoxazole (31.31%), Gentamycin (26.90%), Ceftazidime (26.69%), Ciprofloxacin (22.57%), Cefotaxime (22.30%), Ceftriaxone (17.47%). The study highlighted the re-emergence of E. coli sensitive to Nitrofurantoin and marked resistance of E.coli to Aminoglycoside and third generation Cephalosporins.

INTRODUCTION

Urinary tract infection is one of the most common ailments in medical practice affecting people of all ages from neonate to geriatric age group. UTI is due to an inflammatory response of urothelium to the invading pathogenic organisms [1]. Worldwide about 150 million people are being diagnosed with urinary tract infection every year [2]. UTIs are associated with increased morbidity and mortality and it is one of the commonest nosocomial infections [3]. The symptoms of UTI are fever, dysuria, urinary urgency and cloudy urine [4]. Every woman has 60% lifetime risk of developing cystitis, by contrast, men have lifetime risk of only 13% [4]. It is estimated that 3% of girls and 1% of the boys experience at least one episode of UTI before 11 years of age [5].

Escherichia coli (E.coli) are the commonest organism causing UTI. E.coli belongs to the family Enterobacteriaceae and accounts for 75% to 90% of all UTI in Inpatients and Outpatients [3]. 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 [4]. The percentage of E.coli causing UTI in male and female are 31.4% and 58.2% respectively [6]. UTI is initiated by E.coli, which is a commensal in the gastrointestinal tract [3]. Commensal E.coli act as a reservoir of resistant genes and these resistant genes might be transferred to other commensal organism or pathogenic organism [7]. 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% [8]. Early treatment with an appropriate and effective antibiotic is essential for prevention of long term complications [8].

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 [9].

Management of UTI has become difficult due to increased bacterial resistance to antibiotics [8]. By and large, up to 95% of the cases with severe symptoms are treated without bacteriological investigations [10]. The present study was designed to assess the recent sensitivity pattern of E.coli in the management of UTI and this may help the Medical Practitioners to prescribe the right empirical treatment.

Aim

To study the recent sensitivity pattern of E.coli causing urinary tract infection in the human population.

MATERIALS AND METHODS

Institutional Ethical Committee approval was obtained for the study.

Study type – Retrospective analysis study

Study material – Reports of positive urine culture with growth of E.coli and its sensitivity to antibiotics.

Study place – Central Microbiology Laboratory, Tirunelveli Medical College Hospital.

Study period – June 2012 - May 2013 (12months)

Inclusion criteria

Urine culture positive reports showing purely the growth of E.coli and their sensitivity pattern with the following criteria were included in the study

- All Age Groups
- From All Departments
- Both Sex
- Both Inpatients And Out Patients

Exclusion criteria

Urine culture report showing mixed organisms were excluded from the study

Methodology

The suitable data collection form was prepared and was used to collect the data. The data of positive E.coli urine culture reports and their antibiotic sensitivity pattern, as mentioned in the inclusion criteria were collected from the registers of Central Microbiology Laboratory, Tirunelveli Medical College Hospital.

The culture method used was Kirby Bauer Disc Diffusion Method. The antibiotics tested for sensitivity were Amikacin, Gentamycin, Ciprofloxacin, Cotrimoxazole, Ceftriaxone, Cefazidime, Cefotaxime and Nitrofurantoin. The demographic data and the degree of sensitivity to antibiotics, whether sensitive or resistant, were recorded. The data collected for the period of 12 months were analysed. Descriptive statistics was used to analyse the sensitivity of E.coli.

RESULTS

In all, 412 urine culture positive reports of E. coli and their sensitivity pattern pertaining to a period of 12months (June 2012 - May 2013) were analysed. We noted that UTI caused by E.coli was more

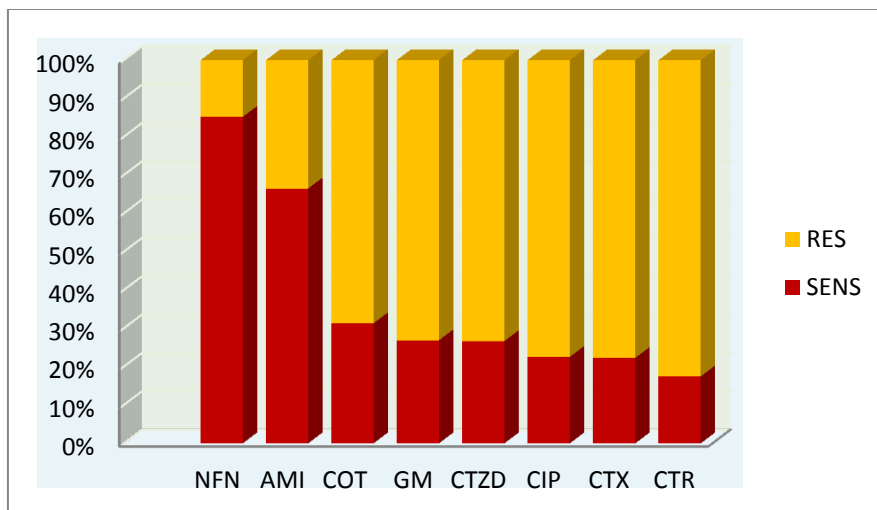
common in females of age group 20 -29 years in the subjected cases. In males it was commonly seen in age group 0-9 years and 60-69 years (Table-1).

Table 1: Demographic Pattern of UTI Positive E.Coli

Age Range	Female	Male	Total
0-9yrs	24	36	60
10-19yrs	11	10	21
20-29yrs	54	32	86
30-39yrs	36	21	57
40-49yrs	21	26	47
50-59yrs	23	25	48
60-69yrs	34	36	70
70-79yrs	11	12	23
Total	214	198	412

Based on the present study it was noted that UTI caused by E.coli was sensitive to Nitrofurantoin in about 85.19% cases. Among the Aminoglycosides the sensitivity of E.coli to Amikacin was 66.50% and to Gentamycin was 26.90% . E.coli in UTI was resistant to Ciprofloxacin in 77.43% cases and to Cotrimoxazole in 68.69% of cases. The resistance of E.coli in UTI to Cephalosporins like Ceftazidime , Cefotaxime , Ceftriaxone were 73.31%,77.70% ,82.53% respectively Table -2, figure -1.

Figure 1: Sensitivity Pattern of E. Coli In UTI



NFN -Nitrofurantoin ,AMI - Amikacin ,COT- Cotrimoxazole, GM-Gentamycin
CTZD - Ceftazidime , CIP-Ciprofloxacin , CTX - Cefotaxime , CTR -Ceftriaxone

Table 2: Distribution of E.Coli Sensitive to Antibiotics In UTI

Drug	Sensitivity	Resistant
Nitrofurantoin	85.19%	14.81%
Amikacin	66.50%	33.50%
Gentamycin	26.90%	73.10%
Cotrimoxazole	31.31%	68.69%
Ciprofloxacin	22.57%	77.43%
Ceftazidime	26.69%	73.31%
Cefotaxime	22.30%	77.70%
Ceftriaxone	17.47%	82.53%

DISCUSSION

The study shows that UTI caused by E.coli is high among females in reproductive age groups, 20-29 years and 30-39 years. Short urethra, close proximity of female urethral meatus to anus, and sexual activity influence higher prevalenc of UTI in women of reproductive age group. Among males, UTI caused by E.coli was high in younger age group of 0-9years, as uncircumcised boys have higher risk and also in

elderly aged between 60-69 years probably due to comorbid conditions like prostatic disease and diabetes.

In the 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.

The results are supported by a previous study from Nigeria in which E.coli showed highest sensitivity to Nitrofurantoin 76% [11] and another study by Shalini from India showed that 93.48% of E.coli in UTI are sensitive to Nitrofurantoin [12].

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 [13]. 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 [11].

The 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 [11]. 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% [4] cotrimoxazole 61% [2].

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

The study highlighted the re-emergence of E.coli sensitive to Nitrofurantoin and increasing resistance to Aminoglycoside and third generation Cephalosporins. 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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