



Original Article

Recent Antibiotic 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 358 urine culture positive reports for E. coli and their antibiotic sensitivity pattern pertaining to the study period of 6 months from Jan 2017 to June 2017 were collected from Microbiology Laboratory of Diagnostic Centers at Rajshahi and the results were statistically analyzed. The antibiotics tested for sensitivity were amikacin, gentamycin, ciprofloxacin, levofloxacin, cotrimoxazole, nitrofurantoin, ceftazidime, ceftriaxone and cefixime. The sensitivity pattern of E.coli to antibiotics in UTI was amikacin (82.68%), gentamycin (75.97%), nitrofurantoin (70.67%), levofloxacin (44.13%), ceftazidime (42.17%), co-trimoxazole (40.78%), ceftriaxone (38.54%), ciprofloxacin (35.75%), and cefixime (24.02%). The study highlighted the marked resistance of E. coli to quinolones and third generation cephalosporins.

Key words: E. coli, antibiotic sensitivity

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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.¹ 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

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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 antibiotic sensitivity pattern of *E. coli* causing urinary tract infection in the human population.

Materials and Methods

Study type – Retrospective study

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

Study place – Department of urology, Rajshahi Medical College Hospital.

Study period – Jan 2017 - June 2017 (6months)

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

1. All Age Groups
2. From All Departments
3. Both Sex
4. 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 microbiology laboratory of different diagnostic centers at Rajshahi, Bangladesh.

The culture method used was disc diffusion method. The antibiotics tested for sensitivity were amikacin, gentamycin, ciprofloxacin, levofloxacin, cotrimoxazole, ceftriaxone, ceftazidime, cefixime 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 6 months were analyzed. Descriptive statistics was used to analyze the sensitivity of *E. coli*.

Results

In all, 358 urine culture positive reports of *E. coli* and their sensitivity pattern pertaining to a period of 6 months (Jan 2017 - June 2017) were analyzed. We noted that UTI caused by *E. coli* was more common in females of age group 20 -39 years in the subjected cases. In males it was commonly seen in age group 60 years and above (Table-1).

Table 1: Demographic pattern of E.coli positive UTI

Age range (yrs)	Female	Male	Total
0 – 9	20	7	27
10 – 19	17	11	28
20 – 29	33	10	43
30 – 39	41	15	56
40 – 49	26	20	46
50 – 59	32	27	59
60 – 69	16	34	50
70 - above	16	33	49
Total	201	157	358

Based on the present study it was noted that UTI caused by E. coli was mostly sensitive to aminoglycosides. In case of amikacin about 82.68% and gentamycin about 75.97% were sensitive. Next more sensitivity was observed to nitrofurantoin about 70.76% cases. Among the cephalosporins the sensitivity of E. coli to ceftazidime was 42.17%, to ceftriaxone was 38.54% and to cefixime 24.02%.

E. coli in UTI was resistant to cefixime in 75.98%, to ciprofloxacin in 64.25% cases and to cotrimoxazole in 59.22% of cases (Table - 2, figure -1).

Discussion

The study shows that UTI caused by E.coli is high among females in reproductive age groups, 20- 39 years. Short urethra, close proximity of female urethral meatus to anus, and sexual activity influence higher prevalence of UTI in women of reproductive age group. Among males, UTI caused by E. coli was high in elderly age group of 60 years and above, probably due to co morbid conditions like prostatic disease and diabetes.

In the present study E. coli has been found to be more sensitive to amikacin, gentamycin and nitrofurantoin than other antibiotics used in the sensitivity test. E.coli is highly resistant to third generation cephalosporins, quinolones and cotrimoxazole. Among the aminoglycosides resistance is more to gentamycin than to amikacin.

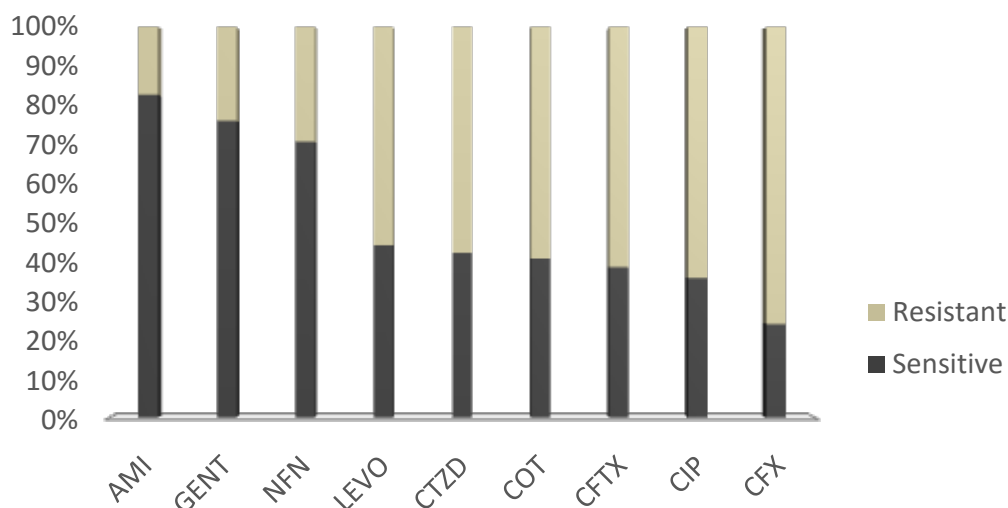
Table 2: Distribution of E.Coli sensitive to antibiotics in UTI (total 358)

Drug	Sensitive		Resistant	
	No.	%	No.	%
Amikacin	296	82.68	62	17.32
Gentamycin	272	75.97	86	24.03
Nitrofurantoin	253	70.67	105	29.33
Levofloxacin	158	44.13	200	55.87
Ceftazidime	151	42.17	207	57.83
Cotrimoxazole	146	40.78	212	59.22
Ceftriaxone	138	38.54	220	61.46
Ciprofloxacin	128	35.75	230	64.25
Cefixime	86	24.02	272	75.98

The results are supported by a previous study from Nigeria in which E. coli showed sensitivity to nitrofurantoin 76% (present study 70.67%) and differed by another study by Shalini from India showed that 93.48% of E. coli in UTI are sensitive to nitrofurantoin.^{11,12}

Re-emergence of E.coli sensitivity to aminoglycosides and nitrofurantoin is probably due to non-usage of the drugs for a long period of time. Aminoglycosides are nephrotoxic and should be given parenteral, so not preferable in outpatients and renal failure cases. Nitrofurantoin has been less commonly used in the treatment of uncomplicated UTI in recent years. Earlier usage of monohydrate formulations of

Figure 1: Sensitivity pattern of E. coli in UTI



AMI- Amikacin, GENT- Gentamicin, NFN- Nitrofurantoin, LEVO- Levofloxacin, CTZD- Ceftazidime, COT- Cotrimoxazole, CFTX- Ceftriaxone, CIP- Ciprofloxacin, CFX- Cefixime.

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 it.¹¹ E. coli has developed resistance to third generation cephalosporins, quinolones, and cotrimoxazole 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 ciprofloxacin 80%, ceftriaxone 80% and cotrimoxazole 61%.^{2,4} 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 aminoglycosides and nitrofurantoin and increasing resistance to quinolones 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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