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Original Research Article

Trends in Antimicrobial Resistance Pattern among Extraintestinal Infections Due to *Escherichia Coli*

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ABSTRACT

Escherichia coli are an important member of Family Enterobacteriaceae. It is a commensal bacterium in human intestine and is a major human pathogen. We conducted a one year prospective study to find the antimicrobial resistance pattern among extra intestinal infections due to *E. coli.* 12.6% pus infections and 8.4% Urinary Tract Infections were due to *E.coli.* High levels of antibiotic drug resistance rates were observed from these isolates. Proper use of antibiotics is recommended to prevent development of resistance.

Keywords: Family Enterobacteriaceae, UTI, wound infections.

INTRODUCTION

Escherichia coli previously known as *Bacterium coli* are a major human pathogen and were first described by Escherich. It is a gram negative, non capsulate bacilli, motile with peritrichous flagella. *Escherichia coli* are an important member of Family Enterobacteriaceae. It is a commensal bacteria in human intestine. It is the commonest cause of uncomplicated infection of lower urinary tract. [1] It also causes peritonitis, cholecystitis, wound infections, bacteraemia, neonatal meningitis, pyelonephritis and gastrointestinal infections. [1] Clinical management of *Escherichia coli* infections is complicated by the emergence of antibiotic resistant strains.

MATERIALS AND METHODS

This is a one year prospective cross sectional study. All urine, pus and blood samples received in the Microbiology Laboratory for aerobic bacterial culture were included in the study. Pus samples were inoculated on Blood Agar and MacConkey agar and incubated for 24 hrs at 37^0C. Urine samples were processed semi-quantitatively and inoculated on MacConkey Agar and incubated for 24 hrs at 37^0C. Blood samples for culture were received in Brain Heart Infusion Broth. Serial subcultures were done on day 2 and day 4 on Blood and MacConkey Agar. All isolates obtained were identified by standard microbiological techniques. Those with culture positive for *Escherichia coli* were included in the study. Details pertaining to age, sex and antibiotic susceptibility pattern of *E.coli* isolate were recorded and analyzed to look for incidence of *E.coli* UTI (Urinary Tract Infection), SSI (Skin and soft tissue infection) and bacteremia. Antibiotic susceptibility test of these isolates was done using Kirby Bauer Disc Diffusion test on Muller Hinton Agar.

RESULTS

Total pus samples received during the year 2015 were 1490. Among these 188 (12.6%) isolates of *E.coli* were obtained. 117 isolates were obtained from males and 71 from females. 4086 urine samples were received in the same year. 342 (8.4%) isolates of *E.coli* were cultured from these. Similarly 1695 blood samples were received and 24 were culture positive of *E.coli*. Distribution of these isolates in various samples is given in Table -1.

Antibiotic susceptibility pattern of urine isolates (Table 2) and pus isolates (Table 3) is shown in tabulated form. In case of blood isolates resistance rate for Cephalothin was 89.47%, Ceftazidime 69.57%, Gentamicin 42.86%, Ciprofloxacin 82.61%, Co-trimoxazole 50%, Amoxicillin-Clavulanic Acid 66.67%, Cefoxitin 36.36% and Imipenem 0%.

Table 1: Distribution of *E.coli* isolates among various clinical samples

Sample type	No of samples	No of *E.coli* isolates	
Urine	4086	342 (8.4%)	Male 116
			Female 226
Pus	1490	188 (12.6%)	Male 117
			Female 71
Blood	1695	24 (1.4%)	Male 11
			Female 13
Total	7271	554	Male 244
			Female 310

Table 2: Antibiotic susceptibility pattern of *E.coli* isolates from urine samples

Antibiotic	No. of resistant isolates	Total isolates tested	% of drug resistance
Cephalothin	198	287	68.99%
Ceftazidime	162	329	49.24%
Gentamicin	76	309	24.60%
Ciprofloxacin	36	55	65.45%
Norfloxacin	187	284	65.85%
Nitrofurantion	22	278	7.91%
Co-trimoxazole	64	95	67.37%
Amoxycillin-clavulanic acid	225	337	66.77%
Imipenem	0	224	0%

Table 3: Antibiotic susceptibility pattern of *E.coli* isolates from pus samples

Antibiotic	No. of resistant isolates	Total isolates tested	% of drug resistance
Cephalothin	150	165	90.91%
Ceftazidime	137	190	72.11%
Gentamicin	54	185	29.19%
Ciprofloxacin	115	177	64.97%
Co-trimoxazole	107	182	58.79%
Amoxicillin-clavulanic acid	154	184	83.70%
Imipenem	6	157	3.82%
Cefoxitin	45	54	83.33%

DISCUSSION

E. coli is the bacterial species most commonly recovered in clinical laboratories and has been incriminated in infectious diseases involving virtually every human tissue and organ system. [2] It is one of the common organisms involved in gram negative sepsis and endotoxin induced shock. [2] *E. coli* commonly causes UTI, wound infections, neonatal meningitis, gastrointestinal infections etc.

In our study 342 (8.4%) of urine samples received were culture positive for *E.coli*. Among these 226 (66.08%) isolates were obtained from female patients and 116 (33.92%) from males. Very high level of drug resistance was seen for Cephalothin, Ciprofloxacin, Norfloxacin, Cotrimoxazole and Amoxicillin-Clavulanic Acid. High level of drug resistance was also observed for Ceftazidime. Gentamicin fared somewhat better with 24.60% resistance, but being an injectable drug is not a popular treatment of choice for UTI. With only 7.91% resistance rate Nitrofurantoin was unarguably the best drug among the lot and should be tested and used for treatment of UTI in patients. No resistance was observed for imipenem; however it should be kept as a reserve drug and not used routinely.

In a study by Gupta K et al most *E. coli* isolates from urine samples of female

patients were susceptible to nitrofurantoin and to the fluoroquinolones and 33%-40% of *E. coli* isolates were resistant to ampicillin and 16%-18% were resistant to Co-trimoxazole. [3]

Akram M found maximum isolates of E.coli, 61 from 100 culture positive urine samples among total 920 samples processed. [4] Females were affected more than men in all age groups. [4] Resistance to ampicillin was 76%, Co-trimoxazole 75%, and extended spectrum cephalosporins 55to 85%. Interestingly resistance to nitrofurantoin was a high 80% in contrast to our and most studies worldwide. Imipenem showed 100% sensitivity to E.coli in this study, Amikacin 49% and extended spectrum cephalosporins 15-45%. [4]

AST of pus isolates present a grim picture as a very high level of resistance is shown to Cephalothin, Ceftazidime, Amoxicillin-Clavulanic acid and Cefoxitin, Ciprofloxacin and Co-trimoxazole. Gentamicin fared better with 29.19% resistance and Imipenem with 3.82% resistance. These drugs can be considered as treatment options for *E.coli* infections however only after performing culture and AST.

Most common isolate from wound infections in a study from Nigeria was *Pseudomonas* spp (29.9%), followed by *Staphylococcus aureus* (27.5%), *Klebsiella* spp (18.5%), *Proteus* spp, (15.1%) *E.coli* (7%), *Streptococci* (2%) and *Enterococci* (0.3%). [5]

In a study from Uganda 7% bacterial isolates from post-operative wounds were of *E.coli*. 80% of these were sensitive to Gentamicin, 60% to Ciprofloxacin, 60% to Ceftazidime and 20% to Ampicillin. [6]

UTI are common infections diagnosed in the hospital. Knowledge of AST pattern is important for appropriate treatment and prevention of drug resistance. Wound infections are important cause of morbidity among surgical patients and lead to prolonged hospitalization. [5] Organism's AST in every institute is different and its knowledge is important to formulate hospital antibiotic policy.

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