Original Research Article

Recent Trends in Anti-microbial Resistance Pattern of *Escherichia coli* in UTI - An experience of tertiary care centre

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Abstract

Introduction: *Escherichia coli* is a Gram negative, motile, facultative anaerobe and non-spore forming bacteria. *Escherichia coli* is belonging to the genus *Escherichia* and family *Enterobacteriaceae*. *Escherichia coli* account for the large majority of naturally acquired urinary tract infections (UTI). The present study aimed to determine the prevalence of *Escherichia coli* in urine samples at Dhiraj General Hospital. We also studied antibiotic susceptibility pattern of *Escherichia coli* isolated from urine and to correlate it with clinical condition of the patients.

Materials and methods: The present study was conducted in Department of Microbiology, SBKS MI & RC, Dhiraj general Hospital, Waghodia for a period of April 2022 to July 2022. All the clinical specimens collected and transported to microbiology laboratory as per standard methods and was processed. . Motile bacteria confirmed by Hanging drop preparation and on examination motile bacteria were seen. Identification and AST was done by VITEK 2 system. Data was collected and analyzed statistically.

Results: During study period, a total 413 urine samples was collected and 264 (63.92%) samples were positive for bacterial growth out of them 72 (27.27%) urine sample were positive for *Escherichia coli* isolates. Out of 72 patients with *Escherichia coli* isolates, 47% isolate from male patients and 53% from female patients. In the present study, out of 72 *Escherichia coli* isolates, 67 were sensitive to

Fosfomycin, 59 to Cefaperazone/salbactum and 109 were resistant to Ampicillin and Nalidixic acid, 62 to Ciprofloxacin.

Conclusion: *Escherichia coli* is an important uropathogenic organism causing significant UTI. Resistance of antibiotics against bacteria increasing due to non systemic use in health care. We recommended a combined clinical and microbiological prevention strategies which include accurate investigation, invaluable input from the microbiological laboratory rational and early antibiotic therapy, timely surveillance, strict infection control measures, monitoring risk factors.

Key words

Escherichia coli, Urinary tract infections, Resistance of antibiotics.

Introduction

Escherichia coli is a Gram negative, motile, facultative anaerobe and non-spore forming bacteria. *Escherichia coli* is belonging to the genus *Escherichia* and family *Enterobacteriaceae* [1]. *Escherichia coli* account for the large majority of naturally acquired urinary tract infections (UTI) [2]. *Escherichia coli*–associated urinary tract infections are majorly caused by UPEC (Uropathogenic *Escherichia coli*) strains. These strains contain a variety of pathogenicity islands that code for specific toxins and adhesions that are capable of causing disease, including cystitis and acute pyelonephritis [3]. In young women, *Escherichia coli* account for approximately 90% of first urinary tract infections. Best consideration of UTIs is clinical syndrome (like pyelonephritis, uncomplicated cystitis and catheter associated UTIs) and within the context of specific host (like compromised host and premenopausal women). The signs and symptoms include dysuria, hematuria, urinary frequency and pyuria. For *Escherichia coli* infection, these signs or symptoms are not specific. Urinary tract infection can be result in bacteremia with clinical signs of sepsis [1, 4, 5, 6, 7]. Most of the urinary tract infections of the bladder or kidney in a healthy host are caused by a low number of O antigen types that have specifically described virulence factors that facilitate colonization and later clinical infections. These organisms are known as uropathogenic *Escherichia coli*. These organisms produce hemolysin, which is cytotoxic and make it easier for tissue invasion. K antigen is expressed by strains that cause pyelonephritis and elaborate a specific type of pilus, P fimbriae, which bind to the P blood group antigen [1, 4, 5, 6, 7]. The present study aimed to determine the prevalence of *Escherichia coli* in urine samples at Dhiraj General Hospital. We also studied antibiotic susceptibility pattern of *Escherichia coli* isolated from urine and to correlate it with clinical condition of the patients.

Materials and methods

The present study was conducted in Department of Microbiology, SBKS MI & RC, Dhiraj general Hospital, Waghodia for a period of April 2022 to July 2022. All the clinical specimens collected and transported to microbiology laboratory as per standard methods and were processed. Samples were subjected to microscopy (Gram stain of direct smear, wet mount and motility test) and culture (Four flame technique for culture and Semi-quantitative culture technique for Urine specimen) was done on Nutrient agar and MacConkey agar after that plates were incubated for 24 hours at 37^0 C and were examined carefully on the next day and colony characteristics was noted as per standard guidelines. On MacConkey Agar plate, the colonies were lactose fermenting, pink colored, flat, non-mucoid and dry colony with a surrounding darker pink area of precipitated bile salts. On Nutrient agar plate, the colonies after 18 hours of incubation at 37°C were large, circular, low convex, grayish white, moist, smooth with entire margin, opaque or partially translucent colonies. These smooth colonies are easily emulsifiable in saline. Gram staining was done by picking colonies on MacConkey agar

and Nutrient agar plates and observed for gram negative bacilli. Motile bacteria confirmed by Hanging drop preparation and on examination motile bacterias were seen. Identification and AST was done by VITEK 2 system. Data was collected and analyzed statistically.

Results

During study period, a total 413 urine samples was collected and 264 (63.92%) samples were positive for bacterial growth out of them 72 (27.27%) urine sample were positive for *Escherichia coli* isolates. Out of 72 patients with *Escherichia coli* isolates, 47% isolate from male patients and 53% from female patients. In the present study patient's age varied between 6 days to 60 years. Most affected age group was 21-40 years (50 patients), followed by 41-50 years (12 patients), 51-60 years (5 patients). Three (4.16%) patients were between 0-10 years of age, out of which 2 were infants. Maximum isolates of *Escherichia coli* were isolated from Medicine ward (27.77%), followed by ICU (23.61%), Urology ward and Casualty (13.88%).Of total 72 patients from which *Escherichia coli* were isolated, 17 patients had fever. 26 patients had symptoms of suggestive of UTI like dysuria, frequency of micturition, burning micturition loin pain and others. Abdominal pain was present in 7 patients. 2 patients had symptoms related to hepatobilliary system infection, while 10 patients had symptoms of renal system affection (other than UTI). Among 72 patients with *Escherichia coli* infections, 70.83% patients suffered from community acquired infections (n=51) and 29.17% patients suffered from hospital acquired infections (n=21). In the present study, out of 72 *Escherichia coli* isolates, 67 were sensitive to Fosfomycin, 59 to Cefaperazone/ salbactum and 109 were resistant to Ampicillin and Nalidixic acid, 62 to Ciprofloxacin.

Discussion

Because of the high prevalence of infection in the community and hospital setting, urinary tract infections have imposed a significant financial burden on the health system [17]. Effective treatment of patients with bacterial urinary tract infections is often dependent on pathogen identification and antibiotic selection based on ongoing surveillance of the antimicrobial susceptibility pattern of urinary tract pathogens in specific regions. The current study's findings provide light on antimicrobial resistance patterns in tertiary care center.

In the present study the prevalence rate of *Escherichia coli* was 27.27%, while in study of Isaac Odongo, et al. the prevalence rate was 10% and Neetu Sharma, et al. the prevalence rate was (67.66%) [9, 10]. Female is predominantly affected by Escherichia coli, in our study 53% females were affected and in the study done by Chhaya Shah, et al. also found same result (53% female) [11]. In present study, most common age group was 21-40 years (50 patients). While Chhaya Shah, et al. found that Majority of the patients belonged to the age group 20–39 years (72, 68.56%) [11]. In the present study maximum isolates of *Escherichia coli* were isolated from ICU 17 cases, followed by Medicine ward were 20 and Urology & Casualty were 10 cases each. In the study of Behzad Dehghani, et al., 60% patients with *Escherichia coli* infection were from OPD, 20% from internal medicine ward, 10% from ICU and 5% from surgery and neurology [12]. Present study showed UTI was the most common symptoms among patients followed by fever, Kidney disease (Other than UTI), Abdominal pain and Symptoms suggestive of Hepatobilliary System Involvement. In the study of George Abongomera, et al., out of total 200 patients, 15 patients had fever, 158 patients had dysuria and 121 patients had increased urine frequency [13]. In our study, most sensitive antibiotic was Fosfomycin followed by Cefaperazone/ salbactum and most resistant antibiotic Ampicillin and Nalidixic acid followed by Ciprofloxacin. In the study of Isaac Odongo, et al. [9], most sensitive drug to *Escherichia coli* isolates were cefotaxime/clavulanic acid (100%), then nitrofurantoin (70%) and few showed sensitivity to nalidixic acid and ciprofloxacin (10%). Ceftazidime and cefuroxime showed

highest resistance (100%), followed by Ciprofloxacin and Nalidixic acid (90%) and least resistance to Nitrofurantoin (30%) [10].

Conclusion

Escherichia coli is an important uropathogenic organism causing significant UTI. Resistance of antibiotics against bacteria increasing due to unsystemic uses in health care. We recommended a combined clinical and microbiological prevention strategies which include accurate investigation, invaluable input from the microbiological laboratory rational and early antibiotic therapy, timely surveillance, strict infection control measures, monitoring risk factors. Finally, a comprehensive survey and research on antibiotic resistance are required to analyze this disastrous national situation and develop management solutions.

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