

Original Article

Antibiogram of Urinary Escherichia coli isolated in Sir Salimullah Medical College Mitford Hospital, Dhaka.

Sanya Tahmina Jhora,¹ Shikha Paul,¹ Bilkis Ara Begum,² A bul Quashem Chowdhury³

¹ Department of Microbiology, Sir Salimullah Medical College, ² Department of Microbiology, National Institute of Cancer Research and Hospital, Dhaka ; ³ Department of Microbiology, Dhaka Community Medical College, Dhaka.

Abstract

Urinary tract infections (UTIs) are one of the most common infectious diseases & an important cause of morbidity in general population. More than 90% of all uncomplicated UTIs are caused by Esch. coli infection. The study was carried out in Department of Microbiology of Sir Salimullah Medical College & Mitford Hospital (SSMC & MH) Dhaka from October 2002 to September 2003. A total of 749 urine samples were studied of which 414 (55.27) showed significant growth. Among the 414 isolates, Esch. coli was the most predominant (82.61%) organism. Esch. coli was highly sensitive to Imipenem (95.02%) followed by Ceftriaxone (86.84%), Cefuroxime (67.54%), Gentamicin (66.08%), and Ceftazidime (55.84%) respectively. Low sensitivity patterns were shown against Nitrofurantoin (44.73%) & Ciprofloxacin (40.64%). The sensitivity to other antibiotics varied from 23.39% to as low as 2.63%. The aim of the present study was to observe the antibiotic sensitivity pattern of isolated Esch. coli from urine samples of patients admitted in inpatient department or visited the out patient department of Sir Salimullah Medical College & Mitford Hospital (SSMC & MH) Dhaka.

Key Words: UTI, Esch. coli.

Introduction:

Urinary tract infections (UTIs) are one of the most common infectious diseases encountered in the medical practices. UTI refers to the presence of micro-organism in the urinary tract including urinary bladder, prostate, collecting system or kidney. The syndrome ranges from asymptomatic bacteriuria to perinephric abscess with sepsis¹.

The prevalence of bacteriuria among the pregnant women in Bangladesh has been reported from 5 to 15.5%. In Bangladesh, 20%-35% females experience at least one episode of UTI in their lives^{2,3}. Among school children the prevalence is 1%-1.4% in Bangladesh⁴. The prevalence increases among patients from lower socio-economical group. UTIs including catheter related bacteriuria constitute the most common nosocomial bacterial infection with an average rate

of 13.1 cases per 1000 hospital discharges⁵.

Due to this high prevalence UTIs warrant careful consideration by the clinicians. More than 90% of all uncomplicated UTIs are caused by Esch. coli infection⁶. Urinary tract is the single most common site of Esch. coli infections; Esch. coli UTIs are caused by uropathogenic strains of Esch. coli. Esch. coli causes a wide range of UTIs, including uncomplicated urethritis or cystitis, symptomatic cystitis, pyelonephritis, acute prostatitis, prostatic abscess, and urosepsis. Even with effective antibiotic treatment, the average duration of severe symptoms in women with cystitis is somewhat longer than 3 days. Features that have been associated with a more prolonged course than average include a history of somatization, previous cystitis, urinary frequency, and more severe symptoms at baseline⁷. The recurrence rate after a first Esch. coli infection is 44% over 12 months⁸. So, proper & adequate antibiotic treatment is necessary to treat and prevent recurrence of UTI.

The present study has documented the distribution of urinary pathogens and the antimicrobial sensitivity pattern of Esch. coli isolated in Sir Salimullah Medical College Mitford Hospitals, Dhaka.

✉ Correspondence:

Professor Sanya Tahmina Jhora
Department of Microbiology
Sir Salimullah Medical College, Dhaka
E-mail: sanyatahmina@yahoo.com

Materials & Methods:

This study was done in the department of Microbiology, Sir Salimullah Medical college, Dhaka from October 2002 to September 2003. Total 749 urine samples were collected from patients who were either admitted in inpatient department or visited the out patient department of Sir Salimullah Medical College & Mitford Hospital (SSMC& MH), Dhaka during this period. The patients comprised both sexes and all age groups. Mid-stream clean catch urine was collected in two sterile containers by standard procedures. One sample was used for microscopy and another sample was used for culture. Semiquantitative culture was done on blood agar and MacConkey's agar media. The plates were incubated aerobically at 37°C overnight. Identification of the isolated organisms was done by colony morphology, Gram staining and relevant biochemical tests. Samples which showed significant colony count were taken into consideration and sensitivity pattern of the isolated organisms was determined by modified Kirby-Bauer technique using Mueller-Hinton agar⁹. The antibiotic discs used in antibiogram for *Esch. coli* were amoxicillin(10µg), cotrimoxazole(25µg), tetracycline(10µg), gentamicin(10µg), ciprofloxacin(5µg), cephalixin(30µg), cefuroxime (30µg), ceftazidime(30µg), ceftazidime(30µg), nalidixic acid(30µg), nitrofurantoin(300µg) and imipenem(10µg).

Result:

Out of 749 urine samples 414 (55.27) showed significant growth of bacteria of which 259(63.48%) isolates were from in patient department & 155(45.45%) were from out patient department (Table I).

Table I: Distribution of specimens with or without significant growth

Urine culture	Inpatient dept.	Outpatient dept.	Total
Significant growth	259 (63.48%)	155 (45.45%)	414 (55.27%)
No growth	149 (36.52%)	186 (54.54%)	335 (44.73%)
Total	408 (100.00%)	341(100.00%)	749 (100.00%)

Table II showed the frequency of isolated bacteria from urine samples. *Esch. coli* was the most predominant (82.61%) Gram negative urinary pathogens followed by *Klebsiella* spp. (3.86%), *Pseudomonas* spp. (3.14%) and *Proteus* spp. (1.45%). Of the Gram positive bacteria, *Staphylococcus saprophyticus* (7.01%) was the predominant. Other Gram positive isolates were *Enterococci* (1.21%), *α* hemolytic *Streptococci* (0.48%) & *Staphylococcus aureus* (0.24%) (Table II).

Table II: Frequency of isolated Gram negative pathogens

Isolated organisms	Number	Percentage (%)
<i>Escherichia coli</i>	342	82.61
<i>Klebsiella</i>	16	3.86
<i>Pseudomonas</i>	13	3.14
<i>Proteus</i>	5	1.45
<i>Staphylococcus saprophyticus</i>	29	7.01
<i>Enterococci</i>	6	1.21
<i>α</i> hemolytic <i>Streptococcus</i>	2	0.48
<i>Staphylococcus aureus</i>	1	0.24
Total	414	100.00

The antibiogram of isolated *Esch. coli* had been shown in table III.

Table III: Anti-microbial sensitivity pattern of *Esch. coli* (n=342)

Antibiotic	Sensitive	Resistant
Imipenem	325(95.02%)	17(4.97%)
Ceftriaxone	297(86.84%)	45(13.16%)
Cefuroxime	231(67.54%)	111(32.46%)
Gentamicin	226(66.08%)	116(33.90%)
Ceftazidime	191(55.84%)	151(44.15%)
Nitrofurantoin	153(44.73%)	189(55.26%)
Ciprofloxacin	139(40.64%)	203(59.35%)
Cephalixin	80(23.39%)	262(76.61%)
Nalidixic acid	69(20.17%)	273(79.82%)
Tetracycline	63(18.42%)	279(81.57%)
Cotrimoxazole	62(18.12%)	280 (81.88%)
Amoxicillin	09 (2.63%)	333(97.36%)

Esch. coli had been shown highly sensitive (95.02%) to Imipenem. High sensitivity (86.84%) was also observed to ceftriaxone. Cefuroxime, gentamicin and ceftazidime were found to be sensitive against 67.54%, 66.08% and 55.84% isolates respectively. Low sensitivity patterns were shown against nitrofurantoin (44.73%) and ciprofloxacin (40.64%). The sensitivity to other antibiotics varied from 23.39% to as low as 2.63%.

Discussion

Urinary tract infections are one of the most common infectious diseases encountered in the medical practices and only second to respiratory tract infections as a cause of hospital visit¹⁰. *Esch. coli* is the leading cause of both community-acquired and nosocomial UTIs. Up to 50% of female eventually experience at least one episode of UTI in their life time. *Esch. coli* UTI is more common in females

than in males because of differences in anatomic structure and changes during sexual maturation, pregnancy, and childbirth. Men older than 45 years with prostatic hypertrophy are at an increased risk of UTI due to related bladder stasis. Among neonates, *Esch. coli* UTI is more common in boys than in girls, but circumcision reduces the risk¹⁰. *Esch. coli* is a leading cause of nosocomial bacteremia from a gastrointestinal or genitourinary source. The mortality and morbidity associated with *Esch. coli* bacteremia is the same as that for other aerobic gram-negative bacilli¹¹.

In this study urine samples from 749 subjects were cultured of which 414 (55.27%) showed significant growth of which 259 (63.48%) isolates were from in patient department and 155 (45.45%) were from out patient department. This correlates with the findings of Kalsi et al¹². Patients with indwelling urinary catheters, patients undergoing urological manipulations, long-stay elderly male patients and patients with debilitating diseases are at high risk of developing nosocomial UTIs. The organisms responsible usually originate from patients' endogenous intestinal flora, but occasionally from a moist site in the hospital environment. Among the total 414 isolates, *Esch. coli* was the most predominant (82.61%) followed by *Klebsiella* spp (3.86%), *Pseudomonas* spp.(3.14%) and *Proteus* spp (1.45%). Gram positive isolates were *Staphylococcus saprophyticus*(7.01%), *Enterococci* (1.21%), *α* hemolytic *Streptococci* (0.48%) and *Staphylococcus aureus* (0.24%). The predominance of *Esch. coli* as the causative agent of UTI correlates with the findings of other workers^{13,14, 15}. The reason of the highest rate of isolation of *Esch. coli* is that they are the normal fecal flora and uropathogenic strains of *Esch. coli* have an adherence factor called P fimbriae, or pili, which mediate the attachment of *Esch. coli* to uroepithelial cells. Thus, patients with intestinal carriage of *Esch. coli* that contains P fimbriae are at greater risk of developing UTI than the general population¹⁶.

The antibiogram of isolated *Esch. coli* of the present study reveals that maximum resistance was found against amoxicillin (97.36%) followed by cotrimoxazole (81.88%), tetracycline(81.57%), nalidixic acid (79.82%) and cephalexin (76.61%) while moderate resistance was shown towards ciprofloxacin (59.35%) and nitrofurantoin (55.26%). cefuroxime, gentamicin and ceftazidime were found to be sensitive against 67.54%, 66.08% and 55.84% *Esch. coli* isolates respectively. High sensitivity was observed to Ceftriaxone (86.84%). Imipenem was found to be 95.02% sensitive towards *Esch. coli*. Similar findings were also observed by Shahnaz et al¹⁵. It was observed that the sensitivity of ciprofloxacin and gentamicin was reduced from 91% to 40.64% and 90% to 66.08% respectively. The marked reduction in ciprofloxacin sensitivity from 91% to 40.64%

may be due to the fact that the antibiotic is being overprescribed, handed out to patients who have no bacterial infections¹⁷. In this study resistance was found to be increasing towards 3rd generation cephalosporin also which should alert us that at time no antibiotics in our hands to treat the infections. The newer drug, imipenem was found to be the most effective drug which was found 95.02% sensitive against *Esch. coli*. On the contrary 4.97% *Esch. coli* was resistant against imipenem in this study. The rapid emergence of antibiotic resistant strains such as ESBL, MBL producing strains alert us that we should be cautious with indiscriminate use of antibiotics. Antibiotics should be prescribed with proper dose and duration after culture and sensitivity reports are available.

Reference:

1. Johnson CC: Definition, classification, & clinical presentation of Urinary tract infections. *Med Clin North Am.* March 1991; 75(2):241-243.
2. Akhter N, Mowla G, Shufi GB, Mowla A, Haque R. Resistance of urinary tract bacterial pathogens. *Bangladesh J Microbiology* 1995; 12(1& 2): 97-100.
3. Ahmed S, Rashid HU. Urinary tract infections in adults. A review; *Bangladesh Renal Journal* 1996;15(1):23-31.
4. Kunin CM, Zache E, Paquin JR. Urinary tract infections in school children, prevalence of bacteriuria & associated urological findings. *The New England J of Medicine* 1982; 288:1287-96.
5. Guideline Hooton TM, Bradley SF, Cardenas DD, et al. Diagnosis, prevention, and treatment of catheter-associated urinary tract infection in adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. *Clin Infect Dis.* 2010; 50(5):625-63.
6. Foxman B, Manning SD, Tallman P, et al; Uropathogenic *Escherichia coli* are more likely than commensal *E. coli* to be shared between heterosexual sex partners. *Am J Epidemiol.* 2002; 156(12):1133-40.
7. Little P, Merriman R, Turner S, Rumsby K, Warner G, Lowes JA, et al. Presentation, pattern, and natural course of severe symptoms, and role of antibiotics and antibiotic resistance among patients presenting with suspected uncomplicated urinary tract infection in primary care: observational study. *BMJ.* 2010;340:b5633.
8. Barnett BJ, Stephens DS. Urinary tract infection: an overview. *Am J Med Sci.* 1997;314(4):245-9.
9. Bauer AW, Kirby WM, Sherris JC, Tenover JC. Antibiotic

susceptibility method. *Am J Clin Path* 1996; 451:493-496.

10. Liperky BA. Urinary tract infection in men: epidemiology, pathophysiology, diagnosis & treatment. *Ann Intern Med* 1989; 111: 138-50.
11. Melzer M, Petersen I. Mortality following bacteraemic infection caused by extended spectrum beta-lactamase (ESBL) producing *E. coli* compared to non-ESBL producing *E. coli*. *J Infect.* 2007; 55(3):254-9.
12. Kalsi J, Arya M, Wilson P, Mundy A. Hospital-acquired urinary tract infection. *Int J Clin Pract.* 2003; 57(5):388-91.
13. Ahmed AA, Khatun M, Alam MJ. Antibacterial susceptibility of common aerobic bacteria of hospitalized patients. *Mymensingh Medical J*

1995;4(2):256-60.

14. Das RN, Chandrashekhar TS, Joshi HS, Gurung M, Shrestha N, Siivananda PG. Frequency & susceptibility profile of pathogens causing urinary tract infection in a tertiary care hospital in Western Nepal. *Singapore Med J* 2006; 47(4):281-284.
15. Shahnaz S. Murshed M. Rahman T. Urinary pathogens & its culture sensitivity pattern in Holy Family Red Crescent Medical College Hospital, Dhaka, Bangladesh. *Bangladesh Private Practitioners' Journal* 2005; 11(1): 19-22
16. Johnson JR. Virulence factors in *Escherichia coli* urinary tract infection. *Clin Microbiol Rev.* 1991;4(1):80-128.
17. Barnett BJ, Stephens DS. Urinary tract infection: an overview. *Am J Med Sci.* 1997;314(4):245-9.