

## Antibiotic Sensitivity in Complicated and Uncomplicated UTI in Patuakhali Medical College Hospital

F. M Atiqur Rahaman<sup>\*1</sup>, Sheikh Anika Rahman<sup>2</sup>, Tohfatun Nesa Nitu<sup>3</sup>, Faria Sharif<sup>4</sup>, Jamil Khan<sup>5</sup>

### Abstract

**Introduction:** Urinary tract infection (UTI) is a common reason for attending hospital emergency departments (ED). A complicated urinary tract infection (UTI) is associated with structural or functional abnormalities of the genitourinary tract or presence of any underlying disease. **Objective:** To assess the antibiotic sensitivity in complicated and uncomplicated UTI. **Materials and Methods:** The study was carried out in the Department of Medicine and Department of Microbiology. The urine samples were collected from the OPDs (outpatients departments). These sample collection sites were chosen as they mostly covered the urban area of the city. The duration of the study was one and a half year from July 2018 to January 2020. The urine samples of 200 patients, comprised of 60 males and 140 females, who attended the outpatient departments (OPDs) of three hospitals and had clinical evidence of urinary tract infection, determined by treating physicians, were included in this study. **Results:** Most common isolated pathogen was *Escherichia coli* 170(85.0%) followed by *staphylococcus aureus* 40(20.0%) and *Klebsiella* (10%). Multiple organisms were found few cases. Regarding drug sensitivity it was observed that maximum sensitivity was to Amikacin 94.0% followed by Nitrofurantoin 92.0%, Levofloxacin 90.0%, Meropenam 88.0%, Amoxicillin+Clavulanate 70.0% and Cefixim 70.0%. **Conclusion:** Female patients were predominant most common isolated pathogen were *Escherichia coli*, *staphylococcus aureus* and *Klebsiella*. Amikacin, Nitrofurantoin, Levofloxacin, Meropenam and Amoxicillin+Clavulanate were more sensitive antibiotic.

**Keywords:** UTI, Sensitivity pattern, Organism.

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### \*1. Corresponding Author: Dr. F. M Atiqur Rahaman

Assistant Professor  
Department of General Medicine  
Patuakhali Medical College Hospital, Patuakhali.  
Email: fmatiqur@gmail.com  
Mobile: 01718533734

### 2. Dr. Sheikh Anika Rahman

Intern Doctor  
Patuakhali Medical College Hospital, Patuakhali.

### 3. Dr. Tohfatun Nesa Nitu

Intern Doctor  
Patuakhali Medical College Hospital, Patuakhali.

### 4. Dr. Faria Sharif

Intern Doctor  
Patuakhali Medical College, Patuakhali.

### 5. Dr. Jamil Khan

Intern Doctor  
Patuakhali Medical college Hospital, Patuakhali.

### Introduction:

Urinary tract infection (UTI) is a common reason for attending hospital emergency departments (ED)<sup>1</sup>. In the United States, UTIs represented more than 3 million visits to ED<sup>+</sup>, making it one of the most common reasons for prescribing empirical antibiotics<sup>2-3</sup>. A complicated urinary tract infection (UTI) is associated with structural or functional abnormalities of the genitourinary tract or presence of any underlying

disease. Complicated UTI may be associated with severe morbidity, such as septic shock, renal failure or even death<sup>4</sup>. Urinary tract infection is one of the commonest infections seen in clinical practice. Lack of compliance and unjustified antibiotic prescriptions has resulted in bacterial resistance and is proving as a major challenge in the management of these infections<sup>5</sup>. The treatment of UTI can be classified into uncomplicated and complicated on the basis of their choice of treatment. UTI is more common in females than in males as female urethra structurally found less effective for preventing the bacterial entry<sup>6</sup>. It may be due to the proximity of the genital tract and urethra<sup>7</sup> and adherence of urothelial mucosa to the mucopolysaccharide lining<sup>8</sup>. The other main factors which make females more prone to UTI are pregnancy and sexual activity<sup>9</sup>. The spectrum of bacteria causing complicated UTI is much broader than of those causing uncomplicated UTI. Increasing multidrug resistance in bacterial uropathogens is an important and emerging public health problem. This study was conducted to determine the distribution and antimicrobial susceptibility of uropathogens in the Bangladeshi community as well as to determine the effect of antibiotic sensitivity in complicated and uncomplicated UTI.

### Materials and Methods:

The study was carried out in the Department of Medicine and Department of Microbiology. The urine samples were collected from the OPDs (outpatients departments). These sample collection sites were chosen as they mostly covered the urban area of the city. The duration of the study was one

and a half year from July 2018 to January 2020. The urine samples of 200 patients, comprised of 60 males and 140 females, who attended the outpatient departments (OPDs) of three hospitals and had clinical evidence of urinary tract infection, determined by treating physicians, were included in this study. The age of patients included in the study ranged from 15 to  $\geq 60$  years. Patients with history of hospital admission a week before their presentation in OPDs were excluded from the study to rule out hospital-acquired infections. The patients on antibiotic therapy were also excluded from the study. Clean catch midstream urine was collected from each patient into a 20mL calibrated sterile screw-capped universal container which was distributed to the patients. The specimens were labeled, transported to the laboratory, and analyzed within 6 hours. In each container boric acid (0.2mg) was added to prevent the growth of bacteria in urine samples. All patients were well instructed on how to collect sample aseptically prior to sample collection to avoid contaminations from urethra. Verbal informed consent was obtained from all patients prior to specimen collection. The study was conducted after due ethical approval which was subjected to the hospital administrations. A calibrated loop method was used for the isolation of bacterial pathogens from urinary samples. A sterile 4.0mm platinum wired calibrated loop was used which delivered 0.001mL of urine. A loopful urine sample was plated on Cystine-Lactose-Electrolyte Deficient (CLED) agar, MacConkey agar, and blood agar medium (Hi Media Laboratories, Mumbai, India). The inoculated plates were incubated at 37°C for 24 h and for 48 h in negative cases. The number of isolated bacterial colonies was multiplied by 1000 for the estimation of bacterial load/mL of the urine sample. A specimen was considered positive for UTI if an organism was cultured at a concentration of  $\geq 10^5$  cfu/mL or when an organism was cultured at a concentration of 104 cfu/mL and  $>5$  pus cells per high-power field were observed on microscopic examination of the urine. Identification of bacterial isolates was done on the basis of their cultural and biochemical characteristics. Gramnegative bacteria were identified by the standard biochemical tests and Gram positive microorganisms were identified with the corresponding laboratory tests: catalase, coagulase, and mannitol test for Staphylococcus aureus. Identified and pure isolates were maintained in nutrient agar slants and incubated at 37°C for 24 hrs. The isolates were subcultured periodically. Antibiotic Susceptibility Testing. Isolates were tested for antimicrobial susceptibility testing by the standard Kirby Multiple Antibiotic Resistance (MAR) Indexing. MAR index for an antibiotic = [number of antibiotics resistant to the isolates/(number of antibiotics  $\times$  Number of isolates)]. The number of MAR index for an antibiotic indicates its sensitivity and resistance. Antibiotic resistance increases with the increasing MAR values.

#### Results:

Out of 200 patients, majority 120 (60.0%) patients belonged to age group 15-60 years with mean age was 52.7 $\pm$ 13.5 years. Female patients were predominant

140(70.0%) whereas male 60(30.0%). Male-female ratio was 1:2.3 (Table-I). Complicated UTI was found 40(20.0%) and uncomplicated was 160(80.0%) (Table-II). Most common isolated pathogen was Escherichia coli 170(85.0%) followed by staphylococcus aureus 40(20.0%) and Klebsiella (10%), Proteus (9%), Streptococcus (8%), Pseudomonas (7.5.0%). Multiple organisms was found few cases (Table-III). Regarding drug sensitivity it was observed that maximum sensitivity was to Amikacin 94.0% followed by Nitrofurantoin 92.0%, Levofloxacin 90.0%, Meropenam 88.0%, Amoxicillin+Clavulanate 70.0%, Cefixim 70.0%, Azithromycin 55.0%, Cefroxiam 50.0%, Cefuroxime 50.0%. Other results are depicted in the Table-IV.

**Table-I: Demographic characteristics of the study patients (n=200).**

Variables	Frequency	Percentage
<b>Age (years)</b>		
<15	10	5.0
15-60	120	60.0
>60	70	35.0
<b>Mean<math>\pm</math>SD</b>	52.7 $\pm$ 13.5	
<b>Sex</b>		
Male	60	30.0
Female	140	70.0

**Table-II: Pattern of UTI (n=200).**

UTI	Frequency	Percentage
Complicated UTI	40	20.0
Uncomplicated UTI	160	80.0

**Table-III: Distribution of the study patients by organism (n=200).**

Organism	Frequency	Percentage
E. coli	170	85.00
Staphylococcus aureus	40	20.00
Klebsiella pneumonia	20	10.00
Proteus	18	9.00
Streptococcus pneumonia	16	8.00
Pseudomonas	15	7.50

**Table-IV: Distribution of the study patients by drug sensitivity (n=200).**

Drug sensitivity	Frequency	Percentage
Amikacin	188	94.0
Nitrofurantoin	184	92.0
Levofloxacin	180	90.0
Meropenam	176	88.0
Cefroxiam	100	50.0
Amoxicillin	90	45.0
Amoxicillin+Clavulanate	140	70.0
Cefuroxime	100	50.0
Cefixim	140	70.0
Azithromycin	110	55.0
Flucloxacilline	50	25.0

#### Discussion:

In this study observed that the majority 120(60.0%) patients belonged to age group 15-60 years with mean age was 52.7 $\pm$ 13.5 years. Kidwai et al.<sup>5</sup> reported that the mean

age was 48.5±12 years. 83(45.6%) patients were between 45-60 years. In study of Prakash et al.<sup>10</sup> reported the highest susceptible age group of patients to UTI was ≥48 years (63.51%) followed by 26-36 years (58.11%), 15-25 years (54.55%), and 37-47 years (39.19%). In another study differs from the other studies done in Kuwait<sup>11</sup> and Nigeria<sup>12</sup> in which the highest incidence of UTI was recorded among the age group 20 to 50 years (63.4 and 74.7%, resp.) and lowest among the age group >50 years (13.3 and 10.3%, resp.). However, their results agree with the study done in Japan with a 20-year period in which a trend of increasing complicated UTI was reported in elderly patients<sup>13</sup>.

In current study observed female patients were predominant 140(70.0%) whereas male 60(30.0%). Male-female ratio was 1:2.3. Similar study was found Kidwai et al.<sup>5</sup> reported Male to Female ratio is 1: 2 (n=58/126). In another study showed a high prevalence of UTI in females (73.57%) than in males (35.14%) which correlates with other findings which revealed that the frequency of UTI is greater in females as compared to males<sup>14-15</sup>. The reason behind this high prevalence of UTI in females is due to close proximity of the urethral meatus to the anus, shorter urethra, sexual intercourse, incontinence, and bad toilet<sup>16-17</sup>. In present study revealed most common isolated pathogen was *Escherichia coli* 170(85.0%) followed by *Staphylococcus aureus* 40(20.0%) and *Klebsiella*, *Proteus*, *Streptococcus*, *Pseudomonas* 20(10.0%). Kidwai et al.<sup>5</sup> study also agreement with our observation they showed most common isolated pathogen was *Escherichia coli* 108(59%) followed by *Staphylococcus aureus* 30(16.4%) and *Klebsiella* 20(11%). Etiology of UTI shows a diverse group of uropathogens of which the commonest pathogen involved is *E. coli*, a gram -ve facultative anaerobe responsible for 80% of UTI cases in women aged 18-39 years, followed by *Staphylococcus saprophyticus* and the less common *Klebsiella*, *Enterobacter*, *Serratia*, *Proteus*, *Pseudomonas* and *Enterococcus*<sup>18</sup>. Prakash and Saxena<sup>10</sup> study observed total of 155 bacterial uropathogens comprised of 140 (90.32%) Gram negative and 15 (9.68%) Gram positive were isolated from positive urine samples. *Escherichia coli* was found the dominant bacteria among all isolated uropathogens with the prevalence rate of 42.58%. The second most prevalent isolate was *Klebsiella pneumoniae* (18.71%) followed by *Pseudomonas aeruginosa* (12.90%), *Staphylococcus aureus* (9.68%), *Proteus* spp. (9.03%), and *Enterobacter* spp. (7.10%). There was no statistically significant variation ( $P > 0.05$ ) was found among the isolates. These findings were not correlate with other reports in which *P. aeruginosa* was reported as the second most common bacterial isolate in UTI studies in India<sup>19</sup> and Lafia, Nigeria<sup>20</sup>; however, these results correlates with others in which *Klebsiella* spp. was reported as the second most frequently isolated organism in UTI<sup>21-22</sup>. Regarding drug sensitivity it was observed that maximum sensitivity was to Amikacin 94.0% followed by Nitrofurantoin 92.0%, Levofloxacin 90.0%, Meropenam 88.0%, Amoxicillin+

Clavulanate 70.0%, Cefixim 70.0%, Azithromycin 55.0%, Cefroxiam 50.0%, Cefuroxime 50.0%. In Kidwai et al.<sup>5</sup> study, *E. coli* showed the highest sensitivity to imipenem 93% followed by amikacin 78%, tazobactam 69%, fosfomycin 60% and nitrofurantoin 59%, interestingly the floxacin group showed only 26-28% sensitivity, also including was cefixime 25% and augmentine 22%, which explains the failure of response to treatment on empirical basis. Fosfomycin 59% was the other oral antibiotic which has shown some sensitivity. *Klebsiella* had also shown similar pattern of sensitivity only the percentages are lower when considering imipenem 85%, amikacin 70% and tazobactam 70%. Response to floxacin group was better than *E. coli* although not satisfactory, being the most sensitive to Levofloxacin 54% then ciprofloxacin 40%, ofloxacin 40% and only 20% to moxifloxacin. In the cephalosporin group *Klebsiella* had shown maximum sensitivity to cefuroxime 50%. About 53% were sensitive to fosfomycin and only 25% to nitrofurantoin unlike *E. coli*. *Staphylococcus Aureus* sensitivity to antibiotics was better than *E. coli* and *Klebsiella*. Maximum sensitivity was to imipenem 97%, Tazobactam 87%, Nitrofurantoin 86% and Augmentine 77% followed by cefotaxime 74%, Amikacin 71% and cefuroxime 71%. 65% were sensitive to fosfomycin. Most of the subjects were not literate with unsatisfactory hygiene and although the method of collection was explained specifically the possibility of contamination cannot be ruled out. Another study conducted in India proved that the hospital acquired *E. coli* in UTI was more aggressive and difficult to control needing at least one IV antibiotic preferably cephalosporin along with an oral antibiotic when compared with community acquired *E. coli*, again endorsing the prevalence of resistance in UTI needing inpatient treatment<sup>12</sup>. Shifali and Gupta in their study done on females proved maximal susceptibility pattern of pathogens predominantly to Amikacin and Nitrofurantoin favouring our results<sup>23</sup>. These antibiotic susceptibility results correlate with other studies<sup>24-25</sup>. Another study conducted in India showed that meropenem was highly sensitive against Gram negative bacilli whereas cephalosporin showed highest resistance against gram negative rods<sup>26</sup>. In other study, meropenem and imipenem were found to be 98% and 100% sensitive, respectively, against highly resistant gram negative bacilli<sup>27</sup>. A study done in King Fahd Hospital, Saudi Arabia showed that meropenem was 95.8% sensitive followed by amikacin (93.7%) and imipenem (91.71%) against extended spectrum  $\beta$  lactamase producing *E. coli*<sup>28</sup>.

#### Conclusion:

Female patients were predominant most common isolated pathogen were *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella*. Amikacin, Nitrofurantoin, Levofloxacin, Meropenam and Amoxicillin+ Clavulanate were more sensitive antibiotic. Several antibiotics and combination therapies have proven to be effective in treating complicated UTI.

**Conflict of Interest:** None.

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