

Urinary Bacterial Profile and Antibiotic Susceptibility Pattern among Patient of UTI

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ABSTRACT

Abstract: In this study, the bacterial etiologic agents for urinary tract infections were identified, and there *in vitro* resistance/susceptibility patterns to routinely used antimicrobial drugs in Shri Mahant Indiresch Hospital were assessed.

Methods: Over the course of six months, this observational prospective study was carried out at the medical ward of the Shri Mahant Indiresch Hospital in Dehradun. It identifies the bacterial pathogen that causes urinary tract infections and the pathogen's pattern of antibiotic sensitivity.

Results: Total 100 patients was enrolled in this study, this study found 85% females and 15% was male. Group of 21-30 year were found to be more susceptible for UTI. *Escherichia coli* are (87%) mostly cause urinary tract infection, then *Klebsiella pneumonia* (7%), *Pseudomonas* (3%), *Proteus vulgaris* (2%) and *Staphylococcus* (1%). *E.coli*. It is highly sensitive for Amikacin 66%, Piperacillin 83% and Nitrofurantoin 87% and resistance for ampicilline-90%, Gentamicine-78%, and Doxycyclin-70%.

Conclusion: We observed in this study suggest that *E.coli* was responsible for majority of UTI second is *Klebsiella pneumonia*. *E.coli* is most sensitive for Nitrofurantoin, Piperacillin and resistance for Ampicillin, Gentamicin and Doxycyclin. Antibiotic use should be monitored and administered in the right amounts and in right time to prevent or reduce antibiotic resistance.

Keywords: Urinary tract infection; Pathogen; Antimicrobial agent; Etiological agent

INTRODUCTION

The most prevalent bacterial infection in humans is still Urinary Tract Infection (UTI), which is also one of the most common nosocomial diseases. Cystitis (bladder infection), pyelonephritis (kidney infection), and arthritis are the most common urinary tract infections, which can affect any region of the urinary tract (urethra infection). Older males and young women are especially vulnerable to UTIs. Women frequently experience lower tract problems [1-5]. The most prevalent bacterial infection in females was determined to be bacterial cystitis. The agents that cause urinary tract infections differ geographically, as well as in terms of their susceptibility and patterns of resistance. Classification of urinary tract infection based on type of infection:

- Symptomatic UTI

- Asymptomatic UTI

The most prevalent bacterial infection in humans is still Urinary Tract Infection (UTI), which is also one of the most common nosocomial diseases. Cystitis (bladder infection), pyelonephritis (kidney infection) and arthritis are the most common urinary tract infections, which can affect any region of the urinary tract (urethra infection). Older males and young women are especially vulnerable to UTIs. Women frequently experience lower tract problems. The most prevalent bacterial infection in females was determined to be bacterial cystitis. The agents that cause urinary tract infections differ geographically, as well as in terms of their susceptibility and patterns of resistance [6,7].

Common invading pathogens which are responsible for UTI are *Escherichia coli*, *Klebsiella*, *Proteus*, *Pseudomonas*, *Streptococci*,

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Staphylococci like *Staphylococcus saprophyticus* or *S.epidermidis*, *Gram-negative enteric bacteria* and yeasts. The isolate organism that causes UTI most frequently is *E. coli*. Some others include the potentially very resistant *Proteus mirabilis* and *Klebsiella species*. UTI patients often appear with any or all of the following symptoms: Burning pain while urinating (dysuria), frequent or urgent urination, and urinary incontinence (leakage), urine that contains blood, urine that has a bad odour, Instances of a more severe infection may include fever [8-12]. In healthy patients, catheter-related UTI frequently presents with no symptoms and will most likely become apparent unexpectedly after catheter insertion [13].

A serious factor today is antimicrobial resistance. Antibiotic resistance is inversely associated with antibiotic use [14-17]. In this investigation, the bacterial etiologic agents for urinary tract infections were identified, and there *in vitro* resistance/susceptibility to routinely used antimicrobial drugs were assessed. This study is important for clinicians to effectively treat and manage patients showing symptoms of a urinary tract infection.

MATERIALS AND METHODS

Study design

This was an observational prospective study conducted in Shri Mahant Indires, tertiary care hospital in Dehradun. To identify the microorganisms that cause urinary tract infections and assess their *in vitro* resistance/susceptibility pattern.

Study site

This study was carried out on inpatient of medicine ward of a tertiary care hospital Shri Mahant Indires, Patel Nagar, Dehradun.

Inclusion criteria

- Patient diagnosed with UTI.
- The study identified and included all the patients who had undergone antimicrobial treatment.
- Patient of either sex.

Exclusion criteria

- ICU patients excluded from this study.
- Pregnant women.
- Patient who are not eligible.

Source of data

Data obtained from patient laboratory report of urine sample, questionnaires and inpatient profile form.

Numbers of patients

In this research, 100 patients were involved.

Duration of study

Following the institution's ethical committee's approval, the study lasted for six months.

The study was conducted in Shri Mahant Indires Hospital which determines the etiology of bacterial pathogen involved in urinary tract infection and antibiotic sensitivity pattern of pathogen isolated. The patient's data was collected from the questionnaires; antibiotic prescribed pattern from patient profile forms and the micro-organism reported and sensitivity pattern reports of the patients was collected from the central laboratory reports.

RESULTS AND DISCUSSION

The study, which included 100 patients hospitalized in the medical ward of the Shri Mahant Indires Hospital in Patel Nagar, Dehradun, was prospective. The etiological bacteria for urinary tract infections were identified, and there *in vitro* resistance/susceptibility patterns were assessed. Figure 1 displays the study's gender distribution. According to this study, female patients (85%) are hospitalized slightly more frequently than male patients (15%). Figure 2 depicts the distribution of microorganisms in 100 patients with urinary tract infections caused by five different micro-organisms. The majority of these infections are caused by *E. coli* (87%) followed by *Klebsiella pneumonia* (7%), *Pseudomonas* (3%), *Proteus vulgaris* (2%) and *Staphylococcus aureus* (3%).

Figure 3 shows that *E.coli* causes 41% UTI in 20-30 age group whereas 35% in 30-40 age group and least UTI i.e. 8% is seen in the age group 50-60. *Klebsiella pneumonia* cause the same percent of UTI i.e. 29% in two age groups ; 20-30 and 60-70, *Proteus* shows its complete effect on the age group 60-70. *Staphylococcus* causes 50% UTI in two age groups i.e. 20-30 and 40-50. *Pseudomonas* causes the same percent of UTI i.e. 33% in two age groups 50-60 and 70-80. Figure 4 shows the various antibiotic susceptible patterns for *E.coli*. It is highly resistance for ampicilline-90%, Gentamicine-78%, Doxycyclin-70% and Medium resistance for Norfloxacin-68%, Ciprofloxacin-67%, Ceftriaxone-60%. Low resistance for Amikacin-34%, Piperacillin 17% and Nitrofurantoin 13%. Figure 5 shows various antibiotics, sensitivity and resistance pattern for *Klebsiella pneumonia*. It is highly sensitive for Norfloxacin (98%), Amikacin (92%) and Piperacillin (80%), medium level of sensitive for Nitrofurantoin (65%), Ceftriaxone (46%) and low level of sensitive for Ciprofloxacin (44%) and Gentamicin (40%).

Figure 6 shows various antibiotics, sensitivity and resistance pattern for *pseudomonas*. It is highly sensitive for Piperacillin and Tazobactam (88%), Amikacin (80%) and Piperacillin (73%), medium level of sensitive for Gentamicin (72%), and low level of resistance for Ciprofloxacin (12%). Figure 7 shows the antibiotic susceptible pattern for *Staphylococcus aureus*. It is highly sensitive for gentamicin(89%), Nitrofurantoin (85%), Ciprofloxacin (57%) and low level of sensitive for erythromycin(57%), whereas the antibiotics that show high level of resistance for ampicilline (90%) and low level of resistance for gentamicin (15%), Ciprofloxacin (18%), Nitrofurantoin (19%)

and erythromycin (20%). Figure 8 shows the antibiotic susceptible pattern for *proteus*. It is highly sensitive for Ciprofloxacin (86%), Gentamicin (58%) and Nitrofurantoin (29%). Whereas the antibiotics that show high resistance pattern for Gentamicin (42%), ciprofloxacin (14%) and low level of resistance for Nitrofurantoin (1%).

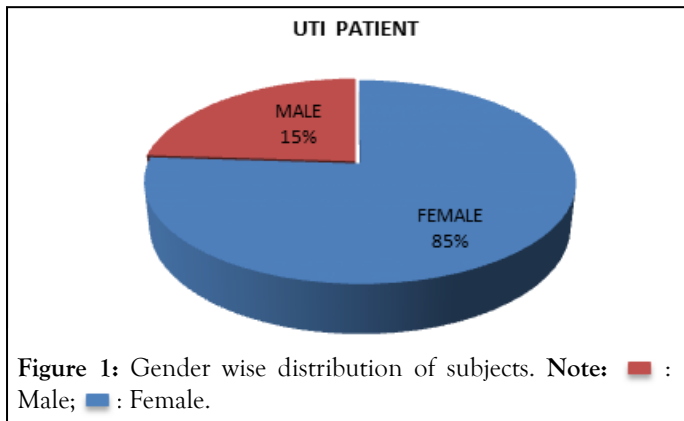


Figure 1: Gender wise distribution of subjects. Note: ■ : Male; ■ : Female.

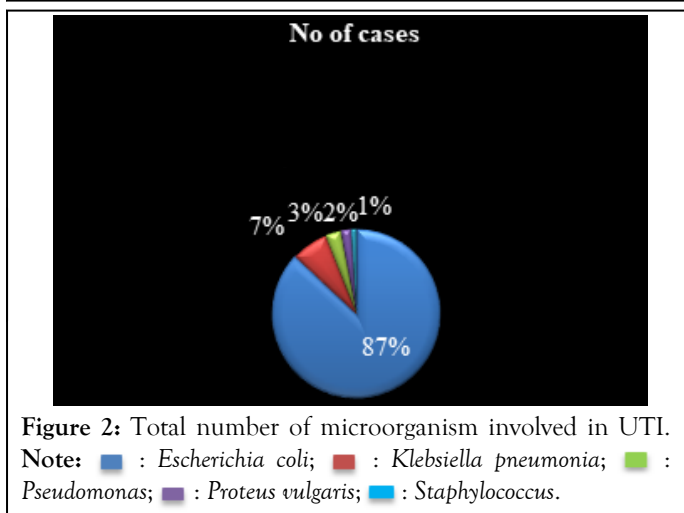


Figure 2: Total number of microorganism involved in UTI. Note: ■ : Escherichia coli; ■ : Klebsiella pneumoniae; ■ : Pseudomonas; ■ : Proteus vulgaris; ■ : Staphylococcus.

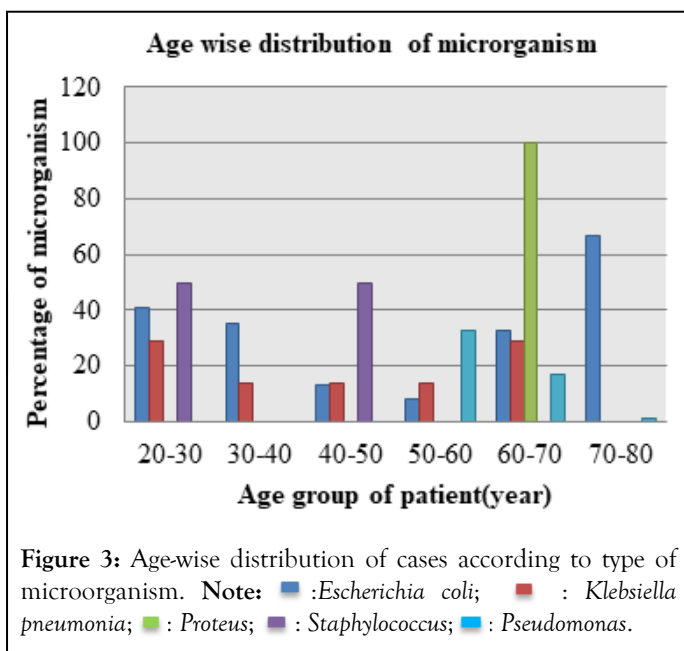


Figure 3: Age-wise distribution of cases according to type of microorganism. Note: ■ : Escherichia coli; ■ : Klebsiella pneumoniae; ■ : Proteus; ■ : Staphylococcus; ■ : Pseudomonas.

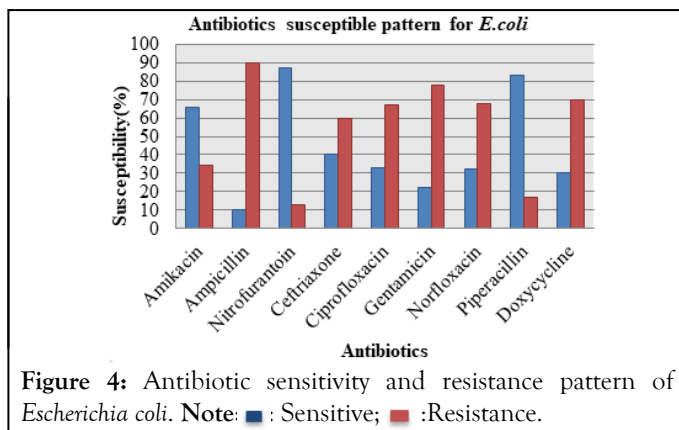


Figure 4: Antibiotic sensitivity and resistance pattern of Escherichia coli. Note: ■ : Sensitive; ■ : Resistance.

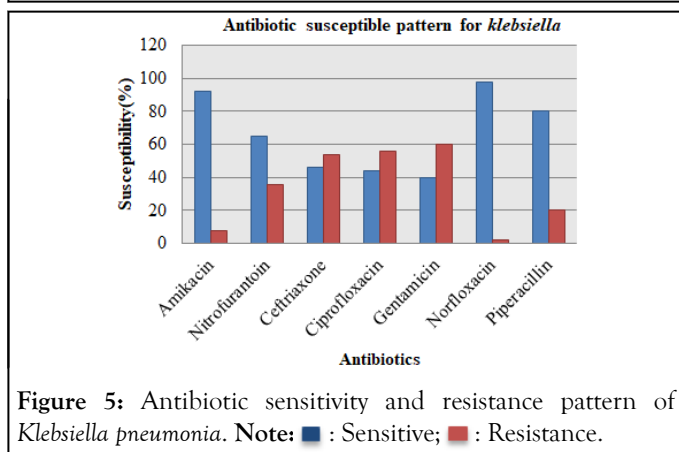


Figure 5: Antibiotic sensitivity and resistance pattern of Klebsiella pneumoniae. Note: ■ : Sensitive; ■ : Resistance.

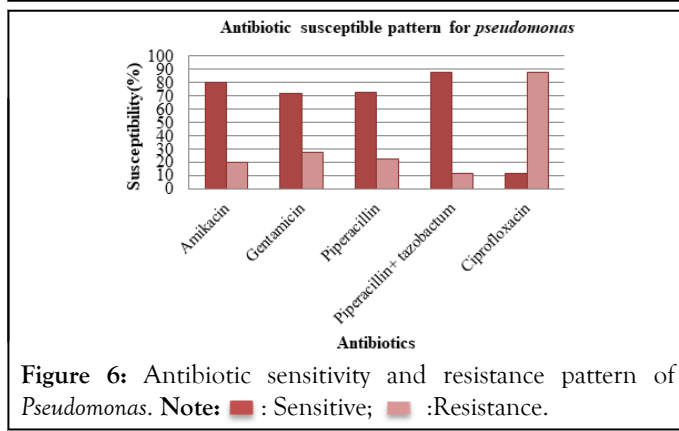


Figure 6: Antibiotic sensitivity and resistance pattern of Pseudomonas. Note: ■ : Sensitive; ■ : Resistance.

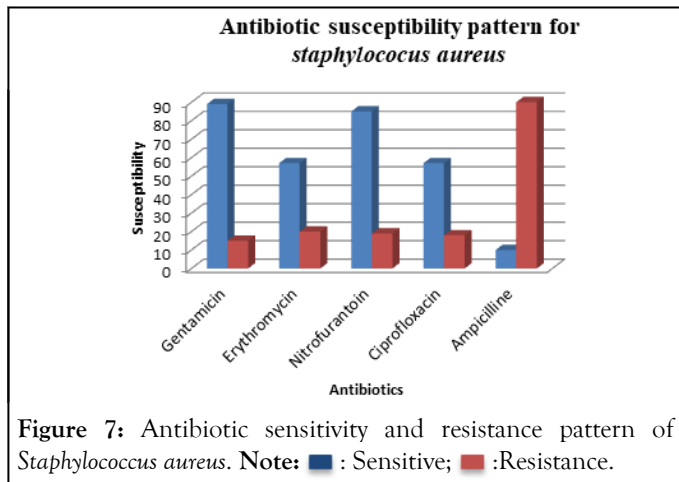
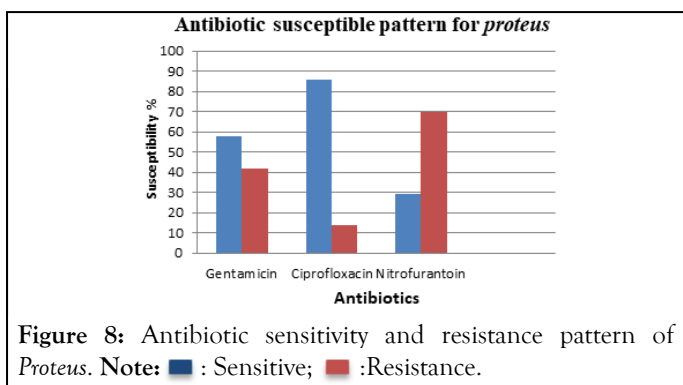


Figure 7: Antibiotic sensitivity and resistance pattern of Staphylococcus aureus. Note: ■ : Sensitive; ■ : Resistance.



UTI is a prevalent issue that affects a lot of people globally irrespective of their age and sex. In this investigation, 100 patients with urinary tract infections were included. According to gender wise distribution of the subjects diagnosed with UTI in medicine ward of tertiary care hospital. According to the study, females had a higher rate of Urinary Tract Infections (UTIs) than males do (15%), which is comparable to the findings of Subedi N is (15.2%). Both Akhtar and Ahmed noted that, respectively, females made up 60% and 63% of the population and men made up 40% and 37%. The shorter urethra and closer proximity of the parietal region in females make them more prone to urinary tract infections than males. Due to their small urethras, females have a higher prevalence of colonization with enteric bacteria.

According to distribution of microorganism in 100 patients, this study evaluated, which microorganism mostly cause urinary tract infection. In this study five microorganisms were isolated from urine sample which were responsible for UTI. *Escherichia coli* and *K. pneumonia* in patients are the most common and primary etiological bacteria for UTI in the current study. This was discovered to be comparable to research done by Lee and others. These research revealed that compared to *klebsiella*, *E. coli* was the most responsible for UTI. In Other study *proteus* was mainly found to cause UTI in many patients but here in this study *proteus* was responsible for causing UTI in single patient.

Age wise distribution of UTI according to type of uropathogens this present study shows that *E.coli* causes 41% UTI in 20-30 age groups whereas 35% in 30-40 age groups and least UTI i.e. 8% is seen in the age group 50-60. *E.coli* is the main etiological agent for UTI. *Klebsiella pneumonia* causes the same percent of UTI i.e. 29% in two age groups 20-30 and 60-70. It is the second most common etiological agent to cause UTI. This was found to be similar with other studies conducted by Magoha G, these study showed similar result. *E. coli* cause 38% UTI in 20-30 age group, 32% in 30-40 age group and least UTI i.e. 6% then second most common microorganism is *Klebsiella*. So we come to a conclusion that the microorganism *E.coli* shows its maximum effect on the patient.

According to the antibiotic sensitivity and resistance pattern of *E. coli* in our study we observed that it is highly sensitive for Nitrofurantoin (85%) and Piperacillin (72%). In this finding Nitrofurantoin is more susceptible for *E.coli* microorganism this was comparable with study done by Sood S, in this study Nitrofurantoin (82%) sensitive, and Piperacillin (74%), study conducted by Razak SK, also shows Nitrofurantoin (70%) and

Piperacillin (69%) is sensitive for *E.coli*. In this present study we observed highly resistance for Ampicillin-90%, Gentamicine-78%, and Doxycycline-70%. So we come to a conclusion that Nitrofurantoin and Piperacillin are susceptible for treatment of UTI because they show low level of resistance. Which was relevant with the study conducted by Bency J shows highly resistance for Ampicillin (95%), Gentamicin (75%), and Nitrofurantoin (10%).

According to antibiotic sensitivity and resistance pattern of *Klebsiella* it is highly sensitive for Norfloxacin (98%), Amikacin (92%), and Piperacillin (80%), medium level of sensitive for Nitrofurantoin (65%), Ceftriaxone (46%) and low level of sensitive for ciprofloxacin (44%) and Gentamicin (40%). *K. pneumonia* was becoming resistant to Norfloxacin is very less. This was relevant with the study conducted by Rajesh showed that *Klebsiella* was highly sensitive for Norfloxacin (95%), Amikacin (89%), and low level of sensitive for Ciprofloxacin (40%). Norfloxacin was found to be highly sensitive against *Klebsiella* i.e.98% whereas Gentamicin was found to be least sensitive against *Klebsiella* i.e. 40%.

According the antibiotics sensitivity and resistance pattern of *Pseudomonas* in our study that *Pseudomonas* was highly sensitive for Piperacillin and Tazobactam (88%), Amikacin (80%) and Piperacillin (73%), medium level of sensitive is Gentamicin (72%), and low level of resistance for Ciprofloxacin (12%). Which was relevant with the study conducted by Bency J, showed it was highly sensitive for Piperacillin and Tazobactam(85%), Amikacin(77%) and low level of resistance for ciprofloxacin(10%). Piperacillin and Tazobactam, Ampicillin is more susceptible for *Pseudomonas* and Ciprofloxacin is more resistance.

According to antibiotic sensitive and resistance pattern of *Staphylococcus* in our study it is sensitive for Nitrofurantoin, Amikacin and resistance for Piperacillin, Norfloxacin and Ciprofloxacin. Which was relevant with the study conducted by Hooton T, show similar result *Staphylococcus* was sensitive for Nitrofurantoin, Amikacin and resistance for Norfloxacin and ciprofloxacin.

CONCLUSION

Data from the study demonstrate that *E.coli* microorganism was responsible for majority of urinary tract infection and the second one is *Klebsiella pneumonia*. Occurring in a tertiary care hospital Dehradun they were females of the age group 20-30 are seen most affected by UTI and males of the age group 40-50 and 50-60 are seen most affected by UTI. Incidence of UTI in reproductive age and other reason such as shorter urethra, closer proximity causes UTI. In males incidence of UTI may increase due to prostatic obstruction or subsequent instrumentation. *E.coli* is most sensitive for Nitrofurantoin, piperacillin and resistance for Ampicillin, Gentamicin and Doxycyclin. The current scenario is the outcome of improper antibiotic policies and ineffective measure for infection control. Regular surveillance and monitoring are important to give physicians knowledge about the most recent and efficient empirical treatment for UTIs because antibiotic resistance among bacterial

infections is an evolving process. Antibiotic use should be closely monitored and administered in accordance with dosage guidelines for the right length of time in order to avoid or reduce antibiotic resistance.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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