A Study on the Bacteriological Profile of Urinary Tract Infection and Their Antibiotic Sensitivity Pattern in a Secondary Care Hospital in Kerala, India
Sanjo Saijan, Sandra Reji, Neethu Mariyam Johny, Shaji George*
Department of Pharmacy Practice, Nirmala College of Pharmacy, Muvattupuzha, Kerala, India.
*Corresponding Author
Email Id: shajige@gmail.com

ABSTRACT
A study was done over a period of 6 months to highlight the bacteriological profile and sensitivity pattern of bacteria inducing urinary tract infection (UTI). It was a prospective observational study conducted in a secondary care hospital, in Muvattupuzha of Ernakulam district of Kerala. All positive urine culture irrespective of sex and age group were included in the study and a total of 247 urine samples, 191 (77.3%) females, and 56 (22.7%) males were analyzed. The study revealed that E. coli (59.1%) was a predominant organism causing UTI, followed by Klebsiella (34.4%), pseudomonas (4.9%), and staphylococcus aureus. The incidence of UTI was common among the geriatric population in the age group 60 – 100. The sensitivity pattern indicated higher susceptibility of E. Coli strains towards Meropenem (95.92%), followed by Nitrofurantoin (85.62%), Colistin (83.33%), Netilmicin (79.75) and Chloramphenicol (79.41%). Klebsiella in urine showed more sensitivity to Meropenem (96.2%), followed by Colistin (72.7%), Chloramphenicol (70.3%), Gentamicin (67%), Netilmicin (59%) and Amikacin (56.6%). E. Coli showed peak resistance to Teicoplanin while Klebsiella showed resistance to Moxifloxacin, Amoxicillin, and Ampicillin. Thus leading to the conclusion that a proper antibiotic policy can positively help clinicians to provide effective treatment, as well as prevent the emergence of antibiotic resistance.

Keywords: Antibiotic sensitivity, resistance pattern, uropathogenic, E.coli, Klebsiella.

INTRODUCTION
Urinary tract infections (UTIs) are the most commonly occurring diseases in developing countries with an estimated global incidence of 250 million annually [1].

UTI can affect both lower and upper urinary tracts and are the most common bacterial infection experienced in secondary care settings with causative agents like E. Coli, Klebsiella Pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Enterobacter agglomerans, etc. The causative agents of UTI are variable and it depends upon the time, geographical region, and the age of the patients [2, 3].

Antibiotics have revolutionized the field of medicine with some of the powerful drugs like Penicillin’s, third-generation cephalosporins like cefotaxime, ceftazidime, and cefaclor, fluoroquinolones like ciprofloxacin and levofloxacin, aminoglycosides like amikacin and gentamicin, which are commonly used antimicrobial agents to treat UTI.

Resistance patterns shown by the microorganisms vary from country to country, state to state, large hospital to small hospital, and hospital to a community spread infection. Antibiotics if used inappropriately and extensively can result in the development of multidrug
resistance. In some of the cases with suspected UTI, empirical therapy is started well before the culture and sensitivity reports are made available and that too with the latest antibiotics in the market, so that it does not have resistance and the patient is cured quickly. This approach can lead to antibiotic resistance due to unwanted use or overuse/misuse of antibiotics. The country like India where there is no control over the sale of prescription drugs as over the counter drugs and with no surveillance program to minimize the emergence of resistance can lead to an era where microbes overtake and all antibiotics become resistant. Thus, the knowledge about the organisms and their antibiotic susceptibility pattern is necessary to ensure appropriate treatment [4].

METHODOLOGY
The study was conducted in a secondary care hospital in Muvattupuzha, of Ernakulam district of Kerala, India for a period of 6 months (October 2019 – March 2020). During the period the data was collected which contained all positive, urine cultures and sensitivity reports of males and females of all the age groups. Permission for the study was taken from the institutional human ethical committee and the head of the microbiology department to obtain the data on the study. Patients already on antibiotics therapy for other infections before admission and isolates containing more than one organism were excluded from this study.

Antibiotic sensitivity pattern of isolated pathogens was determined on Muller Hinton agar plates by Kirby-Bauer disc diffusion method. Isolates were declared as sensitive or resistant based on the zone of inhibition following the criteria of the Clinical Laboratory Standards Institute (CLSI) [5]. The surface of Muller Hinton agar plates was streaked using a sterile cotton swab impregnated in a urine sample. The Muller Hinton agar plates were allowed to dry before applying antibiotic disc. Then, filter paper disks imbued with a fixed amount of antimicrobial drugs were gently and firmly placed on the agar plates, which is then left at room temperature for 1 hour to allow diffusion of the antibiotics into the agar medium. The plates were then incubated at 37 degrees Celsius for 24 hours. An inhibition zone formed around the disc showed an antimicrobial activity present on the plates. The diameter of the inhibition zones was measured in millimeters at 24 hours using a scale. The antibiotics tested were Penicillins, cephalosporins, quinolones, aminoglycosides, carbapenems, and nitrofurantoin, etc. The most common type of organisms in the urine sample and the drugs effective against them were noted.

STATISTICAL ANALYSIS
Data entry was done using Microsoft excel with descriptive statistics for the analysis. Proportions were used to study the sensitivity pattern of various organisms and variables were expressed as percentages. Licensed SPSS version 16.0 was also used for the statistical analysis.

RESULT AND DISCUSSION
A total of 247 positive urine culture cases were taken from the culture and sensitivity reports of all the age groups and out of 247 urine samples, females were 191 (77.3%), outnumbering males who were 56 (22.7%). This could be due to the fairly short and straight urethra making it easier for germs to enter into the bladder in females as was proved under various studies.

A similar study done by Jubina Bency A.T et al. and Akram M et al, in their study on gender-wise data of the prevalence of
uro pathogens in community-acquired urinary infections, states that they found all the organisms more common among the females than males [5]. A contradictory study was done by K V Ramana et al., found that 62.3% of the subjects were males and 37.7% were females, which was a significant difference [6].

This study also reveals that the Incidence of UTI was most common among geriatrics in the age range of 61-100. Elderly people are more prone to infections due to several comorbid conditions and decreased immune function. The sample collected indicated various strains of microbes with significant growth involved in UTI like the E. Coli, Klebsiella, and Pseudomonas.

The E. Coli were the predominant causative organism causing UTI with 146 (59.1%) cases, followed by Klebsiella (34.4%) and Pseudomonas (4.90%). A similar study was done by Sindhu Ravi Kumar S and Senthil Kumar R on antibiotic susceptibility pattern in UTI from a tertiary care hospital in Coimbatore Tamil Nadu, state the E.coli predominance like this study [7] (Figure 1).

![Growth of the Organism in a Urine Sample](image)

**Fig. 1. Growth of the Organism in a Urine Sample**

![Incidence of UTI with Comorbidities](image)

**Fig. 2. Incidence of UTI with Comorbidities**
Fig 3. Sensitivity Pattern of E. Coli in Urine.

Fig 4: Sensitivity Pattern of Proteus in Urine.

Fig 5: Sensitivity Pattern of Klebsiella in Urine.
While analyzing the month-wise distribution of UTI, it was observed that a peak of UTI (57 cases) was observed in December and the most common comorbidities that we analyzed in UTI patients were Hypertension, Diabetes mellitus, COPD, and CAD. Prevalence of UTI maxed out in patients with Diabetes mellitus (Figure 2).

The study states that *E. Coli* was the predominant organism followed by *K. Pneumoniae* being the second commonest organism isolated from urine samples. On analyzing and plotting the sensitivity pattern of various organisms isolated during the study, it developed an antibiogram to speculate the most effective pattern to be used for empirical therapy for treating the UTI (Figure 3, 4, 5, 6).

The sensitivity pattern indicated that the drugs like Meropenem, Nitrofurantoin and Colistin, all showing above 80% sensitivity were highly effective in treating *E. Coli* induced UTI and in case of Proteus, Gentamycin and Meropenem were highly effective (100%) followed by Ofloxacin, Levofloxacin, And Netilmicin with 66.6% effectiveness (Figure 3 & 4).

The *Klebsiella* showcased high sensitivity towards Meropenem (96.23%), followed by Colistin and Chloramphenicol with above 70% effectiveness, whereas the *Pseudomonas* was exhibiting 100% sensitivity towards Colistin, Piperacillin, and Azithromycin followed by Amikacin and Netilmicin with above 80% sensitivity.

Devananth Prakash and Ramachandra Sahai Saxena, in their study, stated that *E.coli* was the predominant organism followed by *Klebsiella*, and both of them showed susceptibility to Imipenem and Meropenem [8]. Whereas, Mohammed Azmi Hassali et al in their study done at Oman indicates *E.coli* as a predominant organism followed by *Klebsiella*. But *E.Colli* showed a higher susceptibility to ciprofloxacin and *Klebsiella* showed higher susceptibility to co-Amoxiclav which was contradictory to this study [9].

This pinpoints that a single antibiogram or antibiotic usage guidelines cannot be followed, and requires the development of policies locally.

**CONCLUSION**

The study reveals the need for the antibiogram preparation so that local antibiogram policies can be developed to treat the patients empirically and also to lower down the risk of resistance induced by unethical usage of antibiotics.
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Ethical Approval: The study was approved by the Institutional Ethics Committee.

REFERENCES


