



TO STUDY THE ANTIBIOGRAM OF MULTI-DRUG RESISTANCE (MDR) ECOLI AND ITS PREVALENCE IN UTI PATIENTS

General Surgery

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ABSTRACT

Background: Urinary tract infection (UTI) is one of the most prevalent diseases affecting people of all age groups. Wide spread use of antibiotics has led to the emergence of resistance microorganisms. As the antibiogram of the microorganisms are frequently changing hence the present study was done to analyse the recent antibiotic sensitivity pattern of uropathogens in Urinary tract infection. **Aims & Objectives:** To study the Prevalence of different uro pathogens in Urinary tract infections and to study the Antibiotic susceptibility pattern of MDR E. Coli to different microbial agents. **Methods:** This study was conducted in a Narayana Medical College and Hospital, Nellore from May 2022 to May 2023. A total of 2830 urine samples were processed for bacterial culture using standard methods. Data including age, gender, h/o predisposing factors were collected. Antibiotic susceptibility of the E.coli isolates were carried out by Kirby Bauer Disc diffusion method. **Results:** In our study, A total of 2830 urine samples were collected, of which 1152 were positive of which 693 were females and 459 were males. High prevalence was observed in females as compared to males. E.coli (63%) was the commonest isolate causing UTI followed by klebsiella pneumoniae (16%). The most effective antimicrobial agents in our study were colistin and amikacin whereas highest resistance was observed to antibiotics like ciprofloxacin, cefotaxime, cefepime, ceftazidime/Sulbactam, piperacillin/tazobactam, imipenem, meropenem, gentamicin. **Conclusion:** Our results give the data about the prevalence of different uropathogens in different age and gender groups and the antibiotic susceptibility pattern of the MDR E.coli strains to different microbial agents. Due to the emergence of MDR E.coli continuous surveillance & pattern of drug susceptibility and establishing infection control strategies are needed to prevent the treatment failure. Based on the local antibiogram, the empirical treatment should be administered.

KEYWORDS

Urinary Tract Infection, Prevalence, Antibiotics, Resistance.

INTRODUCTION:

- Urinary tract infection (UTI) is a microbiological infection that affects many people worldwide, primarily in hospitals and communities.
- Primary factor in morbidity and mortality.
- Although both sexes are impacted, females are more afflicted. In their lifetimes, 50 to 70 percent of women will get at least one UTI.
- Several variables, including age, gender, and weakened immunity, have an impact on the prevalence of UTI.
- The main risk factors for the development of UTI include H/O Indwelling Urinary Catheter, DM, Prior Surgical Procedure, Urolithiasis, Poor Sanitation, and Poor Nutrition.
- E. Coli, Staphylococcus saprophyticus, Enterococcus, Proteus sp., and Pseudomonas aeruginosa are among the bacteria that can cause UTIs.
- E. Coli is the primary UTI-inducing agent.
- E.coli is responsible for about 85% of UTIs obtained in the community and 50% of UTIs acquired in hospitals.
- Drug resistance in E. Coli is reported all over the world.
- Isolation and susceptibility pattern of E.coli exhibit large change & geographic variations.
- MDR defined as acquired non-susceptibility to at least one agent in three or more antimicrobial categories.
- Definition is as per European Centre for Disease Prevention and Control (ECDC) and the Centre for Disease Control and Prevention (CDC) proposal.
- Multiple drug-resistant (MDR) E. Coli in UTI is associated with treatment failure caused by :
 - Use of antibiotics without any cultural investigations.
 - Extensive use of drugs in clinical settings.
 - Resistance in the mutant strains of E.coli due to chromosomal alteration and the transportation of resistant genes which becomes insusceptible to the commonly used drugs.
- To tackle MDR uro-pathogen, choice of antibiotics should be based on the sensitivity pattern of Enterobacteriaceae & the empiric use of antibiotic for the treatment.

AIMS AND OBJECTIVES:

- To determine the prevalence of various uropathogens in relation to different age and gender groups.
- The Antibiotic susceptibility pattern of MDR E. Coli to different microbial agents.

MATERIALS AND METHODS:

A. Place and duration of the study:

Narayana medical college, Nellore during the period from May 2022 to May 2023.

B. Inclusion Criteria :

Demographic data from all patients of UTI admitted in, GYNACOELOGY, MEDICINE, SURGERY WARDS, ICU and from OPD

C. Exclusion Criteria :

Patients below the age of 20 years.

D. Sample Size and Sample Collection :

A total of 2830 samples collected from patients of UTI. The freshly voided clean catch midstream urine samples were collected and sent to laboratory as early as possible to avoid contamination.

E. Antimicrobial Susceptibility :

Antimicrobial sensitivity testing was performed through Kirby-Bauer disc diffusion method on Mueller-Hinton agar in the department of microbiology.

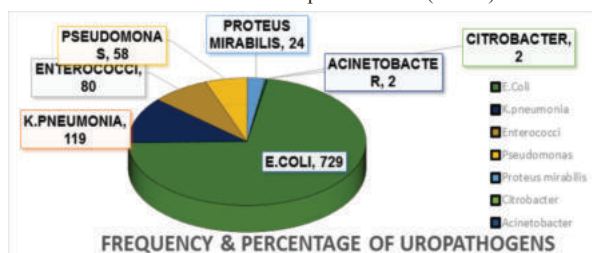
- The antimicrobial susceptibility test performed against 50 isolates of E. Coli strains using the following antibiotics :
 - 1.Cefotaxime
 2. Ciprofloxacin
 - 3.Cefixime
 - 4.Piperacillin/Tazobactam
 - 5.Imipenem
 - 6.Ceftazidime/Sulbactam
 - 7.Meropenem
 - 8.Gentamicin
 - 9.Amikacin
 - 10.Colistin
- The results recorded as per standard protocol of CLSI (Clinical and Laboratory Standards Institute) criteria.
- The MDR E. Coli strains classified as per the criteria described by the European Centre for Disease Prevention and Control (ECDC) and the Centre for Disease Control and Prevention (CDC).

OBSERVATIONS :

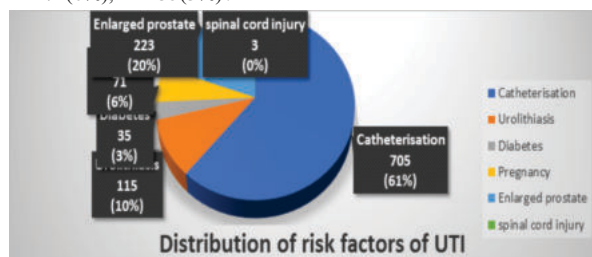
- A total of 2830 urine samples were collected between May 2022 and May 2023, of which 1152 were positive samples, with females making up 693 (or 60%) and males making up 459 (or 40%).



- E. coli-729 (63%) is the most frequent bacterium in both sexes among the isolated uropathogens, with a frequency of 50 (33.33%). K. pneumonia: 119 (16%), Enterobacter species: 80 (10%), Pseudomonas: 58 (5.03%), P. mirabilis: 24 (2.03%), Citrobacter and Acinetobacter species: 2 each (0.17%).



- For age- and sex-wise distribution, data was categorized into age and sex:
- Patients were divided into age groups of 20–30, 30–40, 40–50, 50–60, 60–70, and >70 years.
- In females, the prevalence of UTI was highest in the age group of 20–30 years.
- In Males, the highest prevalence of UTI was observed in the age group of 30–40 followed by 40–50, 20–30, >70 years, 50–60, and 60–70 years.
- Distribution of Risk factors associated with the development of UTI.
- H/O Catheterisation-702 (61%) [Male-274(39%), Female-428(60%)], BPH (20%), Urolithiasis 115(10%), Pregnancy-71(6%), DM-35(3%).



- The antibiotic susceptibility pattern of 50 isolates of E. Coli analysed.
- Isolates showing an intermediate level of susceptibility were not classified as resistant
- The overall highest resistance shown to ciprofloxacin(64%), cefotaxime (60%), cefepime(50%),cefoperazone/ sulbactam (44%), piperacillin/tazobactam (32%) , imipenem,meropenem, gentamicin (16% each) in our institute.
- Colistin, Amikacin shown 80-100% sensitivity to E.coli isolates.

Statistical Analysis:

- Categorical data are presented in percentages and frequencies.
- All statistical analyses were performed in the XL-stat software 2010.

RESULTS:

- In females, the prevalence of UTI was highest in the age group of 20–30 years
- Where as in the elderly it is equal in both sexes
- In our study patient with h/o catheterization was a major predisposing factor for development of UTI(61%).
- Among Different types uro-pathogenic Escherichia coli (UPEC) strains are considered to be the main causative agents of UTIs(63%)
- In our study Colistin , Amikacin shown 80-100% sensitivity to E.coli isolates
- Antibiotic resistance in E. Coli isolated from UTI patients is increasing day by day, making it a major public health concern
- The overall highest resistance shown to ciprofloxacin(64%), cefotaxime(60%),cefepime(50%), cefoperazone/sulbactam (44%),Piperacillin/tazobactam (32%), imipenam, meropenam, gentamicin (16% each) in our institute
- Higher resistance of these antibiotics indicates the misuse and overuse of these drugs in hospitals and clinics without any cultural investigations
- Such rising resistance among E. Coli from UTI patients should be needed to minimize by taking some necessary measurements :-

- Such as antimicrobials should be used only when necessary
- Taking antibiotics after cultural investigation
- And establishing infection control strategies in hospitals

DISCUSSION:

- UTI is a common problem despite age and sex worldwide. In our Study, a total of 2830 urine samples of male and female patients showed positive UTI incidence in 1152 samples 40.7%. A Study from Karnataka state reported that 26.01% prevalence Of UTI. In this study population, women predominated compared to male predominance. Although, many studies have similar prevalence in women, studies by Karishetti MS, Shaik HB, and Christy VR et al., showed male preponderance. In females the prevalence was highest in the age group of 20-30 years similar to studies such as Tada DG et al., Kulkarni SR et al., and Ranjini CY et al., reported higher prevalence of 67%, 81.26% and 56.9% respectively among women in the reproductive age. H/o catheterization was a major predisposing factor for the development of UTI. Contrary to this study, Sasikala G et al., reported diabetes mellitus (46.66%) Followed by catheterisation (20%) as the most common risk factors Associated with MDR E. coli .
- In this study, E.coli (63%) was the most common organism causing UTI in all age groups. Even though our most common isolate was E. coli, the rate of incidence is less than the report from the Western studies, where the corresponding rate were ranges from 80 – 85%. Klebsiella (16%) was the second most Common organism in this study. A study done by Somshekhar et al and Hassan et al. were also found a similar conclusion.
- E.coli isolates in our study were resistant to ciprofloxacin and cefotaxime. In contrast, studies by Akinjogunla et al and Akingbade O et al, reported low percentage of resistance to ciprofloxacin and cefotaxime[20,21]. Resistance to other beta-lactam antibiotics such as cefotaxime was also very high rendering many of these cephalosporins inefficient for empirical prescription to treat urinary tract infections. Previous studies have also shown very high antibiotic resistance in E. coli against cephalosporins and penicillins[16,22]. Lesser degree of resistance was observed to gentamicin which is in consistent with the study by Sabir et al (12.7%)[15].
- Quinolones, especially ciprofloxacin have been used for E. coli infections in recent past. In the present study, E.coli isolates showed a high degree of resistance to fluoroquinolones. Similar results have been reported in another study by Mavroidi et al. [23].
- We found that the E.coli isolates were highly susceptible to colistin and amikacin (80-100%). Similar results have been reported by Sumera et al [15]. In many previous studies, Nitrofurantoin is found to be reasonably effective against E.coli (24,25,26). Also, nitrofurantoin is more advantageous because of its oral usage. Meropenem, imipenem, amikacin are found to have good sensitivity. Hence, these drugs can be reserved for critical conditions and when first line drugs are found to be resistant.
- The high degree of resistance of E.coli isolates in this study can be attributed to the widespread and indiscriminate use of antibiotics in current clinical practice. In order to avoid treatment failure and spread of mutant strains, knowledge about the resistant pattern of the E.coli isolates in the locality will be helpful to select appropriate antibiotics. Further, Organisms emerge as resistant strains when the patient does not maintain antibiotic dose regimen eventually leading to nosocomial and community acquired infections.

Limitation Of The Study:

- Our findings may not be inferred to specialized groups like HIV positive individuals or pregnant women and it was not possible to include anaerobic bacteria isolates due to lack of culture media. Because of lack of molecular methods and genes, antibiotic resistance of encoding genes (ARGs) of isolates were not detected as a confirmatory test.

CONCLUSION:

- Female sex has a higher prevalence of UTI and H/O catheterization.
- In our facility, E. coli bacteria shown a sizable resistance to ciprofloxacin, cefotaxime, and cefepime.
- Significant susceptibility to the antibiotics colistin and amikacin.
- Due to the rise of MDR E. coli, ongoing monitoring of medication susceptibility patterns and the implementation of infection control measures are required to avoid treatment failure.

- Based on the local antibiogram, the empirical treatment should be administered.

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