

Antimicrobial Susceptibility Pattern of E.coli in cases of UTI in a Tertiary Care Teaching Hospital, Bareilly

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Abstract

Background: Urinary tract infections (UTIs) is the most common infections in OPD and even hospitalized patients. Current knowledge on antimicrobial susceptibility pattern for uropathogens is essential to effectively manage UTIs. The development of antimicrobials has changed the scenario of medical science by being able to treat a number of infections but with their development microorganisms have adapted and become resistant to previous antimicrobial agents. **Objectives:** The present study is aimed at determining antimicrobial susceptibility pattern in E.coli in urine samples. **Methods:** the samples were collected from Microbiology Department where E.coli was isolated from urine samples and antibiotic susceptibility testing was done on Mueller-Hinton agar using the disk diffusion (Kirby Bauer's) technique following the CLSI guidelines. **Results:** Out of 180 urine samples studied, *E. coli* was the most dominant with a prevalence of 41.6%. *Escherichia coli* isolates were highly susceptible to Carbapenem (100%) and nitrofurantoin (100%) but showed high resistance to Amoxicillin-Clavulanic acid (88%) and Fluroquinolones (76%). **Conclusion:** *Escherichia coli*, the predominant uropathogen, showed significant multidrug resistance to antibiotics commonly prescribed for the management of UTIs. These findings should form a basis for empirical treatment for UTIs.

Keywords: Antimicrobial resistance, Carbapenem, *E.coli*.

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Introduction

The emergence and increasing prevalence of antibiotic resistant pathogens is a major public health concern. This has become one of the important and main causes of therapeutic failure of infectious disease thereby resulting in increased morbidity, mortality and cost of health care services[1].The treatment of Enterobacteriaceae family has been increasingly complicated by the emergence of resistant strains to most first-line antimicrobial agents[2,3].Amongst these is *Escherichia coli* (*E.coli*), a gram negative, facultative anaerobic bacteria that is found commonly in lower intestine of humans and is one of the most frequent causes of Urinary Tract Infection[4,5]and other infections as well. A distressing increase in multi-drug resistant enterobacteriaceae, particularly to third-generation cephalosporins and colistin (last resort antibiotic used to treat carbapenem-resistant enterobacteriaceae), has been reported in different regions[6-9].The rate of drug discovery and its development in the 21st century cannot match with the continuous and detrimental change in antibiotic resistance trends [10].Self-medication, overuse, and misuse of drugs are the key causes of newer and more resistant strains of various microorganisms[11].The antimicrobial susceptibility pattern of *E.coli* show substantial variation in geographical location, population and environments [12] and thus monitoring of antibiotic resistance pattern of *E.coli* from urine samples could help in developing empirical treatment guidelines.

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Objective

To determine resistance and sensitivity pattern of *E.coli* isolated from urine samples in a tertiary care teaching hospital, Bareilly.

Material and Methods

A cross sectional study was conducted from September 2020 to November 2020 to determine the antibiotic susceptibility pattern of *E.coli*. A total of 360 samples were collected between September 2020 to November 2020 from the microbiology department of Rohilkhand Medical College and Hospital, Bareilly. All the samples were processed according to standard operating procedures. *Escherichia coli* isolates were initially identified by their morphological characteristics on MacConkey agar based on standard microbiological culture as per the Clinical and Laboratory Standards Institute (CLSI) guidelines[13].Antimicrobial susceptibility testing was performed on Mueller-Hinton agar using the disk diffusion (Kirby Bauer's) technique following the CLSI guidelines. The study was approved by the Institutional Ethics Committee. Confidentiality of the records was maintained. Results were tabulated and analysed.

Results

Present cross sectional study was carried out in the department of Pharmacology in collaboration with department of Microbiology. Data was collected from Bacteriology laboratory of Microbiology department. On the basis of inclusion criteria, a total of 360 samples from various clinical departments were included in this study. The isolated organisms were characterized for their antibiotic sensitivity pattern. Figure 1 shows distribution of various samples collected, out of which 180 samples were that of urine on which sensitivity pattern of various antibiotics were recorded.

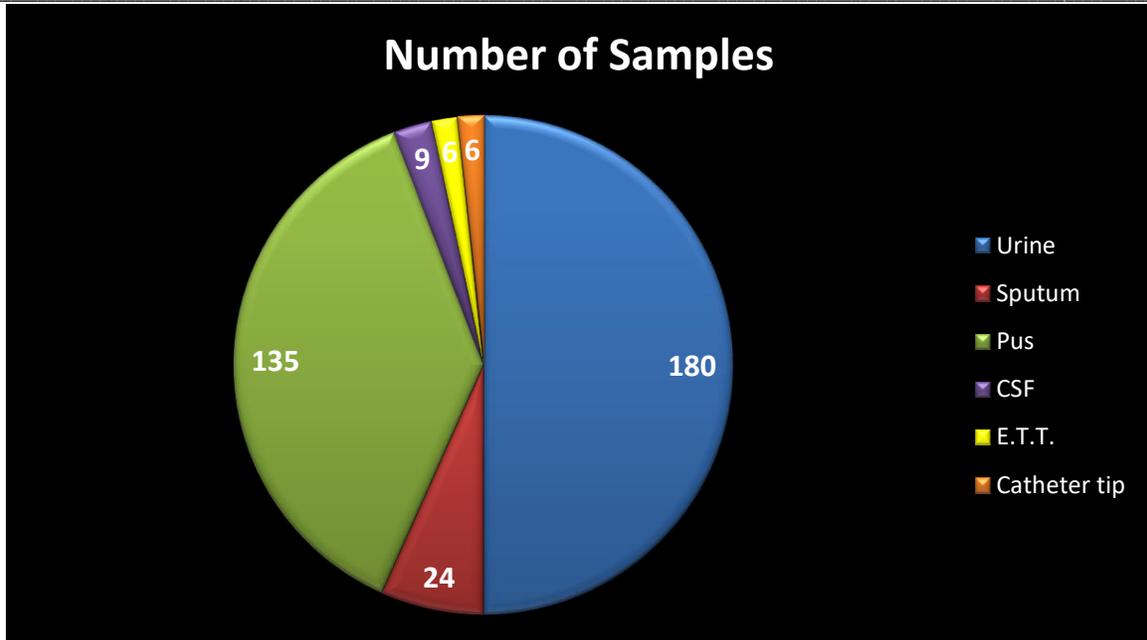


Fig 1 : Number of samples collected.

Figure 2 shows total number of pathogens isolated in urine. Amongst various isolated pathogens E.coli (41.6%) topped the list followed by Staphylococcus aureus (25%), Acinetobacter (11.6%), Pseudomonas aeruginosa (8.3%), Proteus (5%), Klebsiella pneumoniae (5%) and Citrobacter (3.3%).

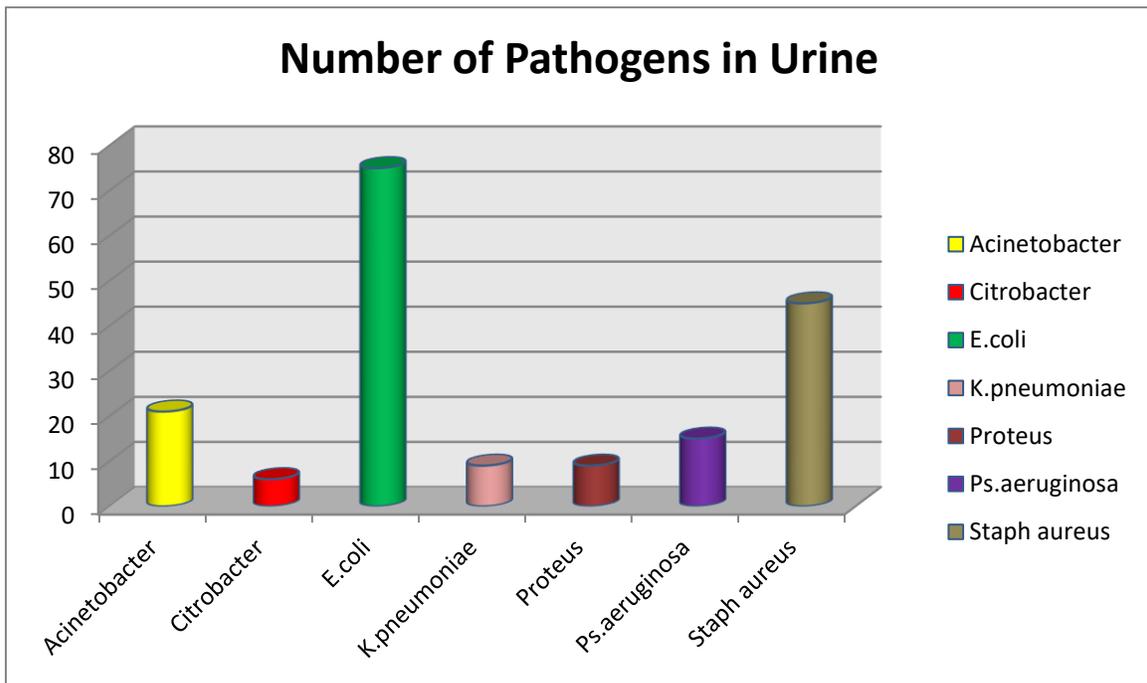


Fig 2 : Number of Pathogens in Urine

Table 1 shows antibiotic sensitivity pattern of E.coli where total E.coli samples were 75. In the current study, the frequency of resistance to antimicrobial agents in E.coli was 76% for fluoroquinolones, 20% to 48% in Aminoglycosides, 76% in Macrolides, 4% for Carbapenem and polypeptide antibiotics, 84% for Broad spectrum antibiotic, 24% to 88% for beta lactamase inhibitors, 60% to 100% for cephalosporins.

Table 1: Antibiotic sensitivity Pattern of Escherichia Coli

Number of E.coli isolates present in urine (n) = 75

Drug	Sensitive	Resistant
CPM	12	63
CAZ	30	45
CPD	6	69
CEP	0	75
Cip	18	57
Le	18	57
Of	18	57
Nx	18	57
Gen	39	36
Tob	60	15
Azm	18	57
Mrp	72	3
Ipm	75	0
Te	12	63
Cot	21	54
CFS	72	3
AMC	9	66
PiT	57	18
Nit	75	0
Cl	72	3
PB	72	3
CXM	18	57
CDR	12	63
CFM	27	48

Discussion

Knowledge on local antimicrobial resistance trends among various isolates is important not only in guiding clinicians to prescribe appropriate antibiotics but also for evidence based recommendations in empirical antibiotic treatment. The current study described the antimicrobial resistance pattern of E.coli. Our study analysed total 360 isolates amongst which 180 (50%) samples were that of urine. Majority of isolates were principally of Escherichia coli (41.67%). Beta-lactams are the most widely used antibiotics all over the world, and resistance to this antibiotic has resulted in a major clinical crisis [14]. The findings of the present study are indicative of high resistance rates in most microorganisms. In the current study, the frequency of resistance to antimicrobial agents in E.coli was 76% for fluoroquinolones, 20% to 48% in Aminoglycosides, 76% in Macrolides, 4% for Carbapenem and polypeptide antibiotics, 84% for Broad spectrum antibiotic, 24% to 88% for beta lactamase inhibitors, 60% to 100% for cephalosporins. This shows that quinolones and even 3rd generation cephalosporins are now resistant to a large population of gram negative organisms which is similar to a study done in Jalandhar 2014 [15]. A similar pattern of resistance for cephalosporins was observed by Bashir and kakur 2014 [16] which showed resistance against cephalosporins in a range of 89.7% to 91.2%. and the extensive use of these antibiotics could be a reason for increased resistance of various gram negative organisms. Moreover, many of these antibiotics are easily available to the patients over the counter further increasing the risk of resistance [17]. Resistance to one of the most widely used antimicrobials for the treatment of urinary tract infection caused by E. coli – fluoroquinolones – is very widespread. According to the present study the empirical treatment of suspected Escherichia coli should be started with AK, G, Tb, C or Pit before culture sensitivity reports and treatment, if needed, should be modified thereafter on the basis of the reports. It was also observed that most of the isolates were sensitive to I, Cl and PB suggesting restricted use of these drugs to prevent resistance by these drugs. The development of bacterial resistance is linked with antibiotic use and hence selective pressure which is specific for the type of antibiotic and the bacterial species. An

appropriate use of antimicrobials in hospitals, including evaluation of individual drug utilization with regular monitoring of bacterial resistance, is the basis for antibiotic policy. This procedure enables the development of resistance to antimicrobial agents to be analysed and helps to prevent the spread of multiresistant strains [18]. Unfortunately, the recent emergence of multidrug-resistant (MDR) pathogens seriously threatens this class of lifesaving drugs [19]. Even though the studies mentioned were conducted in different geographical areas but comparison with the current study suggests that antimicrobial resistance has increased to a great extent alarming the treating physicians for a very cautious use of the reserved antibiotics. Carbapenem resistance pose a great threat for public health as they are frequently used as the last choice in treating serious infections caused by gram negative bacilli, and there is diminishing number of new antimicrobial drugs in the pharmaceutical pipeline. The current condition suggests judicious and rational use of the antibiotics so that the resistance rate is minimised. Empiric treatment in a setting that lacks information about the patterns of bacterial disease and their antibiotic susceptibilities is viewed as a major driver of resistance. The possibility of reducing resistance by controlling the use of antibiotics is a logical approach and a combined approach of antibiotic restriction, effective surveillance and good infection control practices is essential if antibiotic resistance is to overcome [20]. Thus surveillance studies should be done periodically and in different geographical areas and the results should be made available to all the treating physicians in order to guide proper use of antibiotics.

Conclusion

Escherichia coli was the predominant organism observed in the UTI patients. There was a significantly high resistance to Cephalothin, Cefpodoxime, Cefepime, Cefdinir and Tetracycline to E. coli isolated. Continuous use of these drugs might most likely be associated with treatment failure and serious antimicrobial resistance. There was acceptably high sensitivity to Nitrofurantoin, Imipenem, Meropenem, Colistin and Polymyxin B. Periodic monitoring of antimicrobial susceptibility in hospital as well as community settings is recommended.

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