

A Hospital-Based Study to Investigate the Common Bacteria Associated With UTI Cases and Their Antibiotic Susceptibility Pattern

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Abstract

Aim: The aim of the present study was to investigate the common bacteria associated with UTI cases and their antibiotic susceptibility pattern.

Methods: A retrospective descriptive study was done for one year in DMCH, Laheriasarai, Darbhanga, Bihar. The study included all in-patients of either gender above 18 years of age with a diagnosis of UTI. Data was collected from the patient's case record files, which were retrieved from the medical records department of our hospital.

Results: Out of 120 significant isolates, gram-negative organisms accounted for 81%. Fungal isolates were seen only in 2% of cases. E.coli was the most predominant uropathogen isolated followed by Klebsiella spp, Enterococcus fecalis and Acinetobacter spp. Other uropathogens included MRSA bacteria, Staphylococcus aureus, Candida spp, Citrobacter freundii, Pseudomonas spp and Streptococcus spp. E.coli, showed considerable resistance to ampicillin, ceftriaxone, Co-Trimoxazole and fluoroquinolones. Low level of resistance was observed with Nitrofurantoin, piperacillin+ tazobactam and Ticarcillin. Klebsiella spp, the second most common uropathogen showed high level of resistance with ampicillin, cephalosporins, cefuroxime, ceftriaxone and Nitrofurantoin.

Conclusion: Most of the identified bacteria were resistant to several of the popular antibiotics used in clinical settings. Consequently, it is vital to prescribe antibiotics rationally both before and after culture reports. Pattern needs to be studied further and the outcome should be communicated to the prescribing physicians in that area.

Keywords: antibiotic resistance, Culture, UTI, uropathogens

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Introduction

Urinary tract infections (UTIs) are a major public health problem in terms of morbidity and financial cost, and incur the highest total health care cost among urological diseases, exceeding that of chronic renal failure even when renal dialysis and renal transplantation are included. [1] UTI represents one of the most common diseases encountered in medical practice today with an estimated 150 million UTIs per annum worldwide. [2] Although UTIs occur in both men and women, clinical studies suggest that the overall prevalence of UTI is higher in women. Uncomplicated UTIs in healthy women have an incidence of 50/1000/year. [3] An estimated 50% of women experience at least one episode of UTI at some point in their lifetime and between 20% and 40% of women have recurrent episodes. [4,5] Approximately 20% of all UTIs occur in men. [6]

Most episodes of UTI are caused by Escherichia coli (up to 85%) and Staphylococcus saprophyticus (up to 10%), while Klebsiella pneumoniae and Proteus species account for most of the remaining infections. [7] The introduction of antimicrobial therapy has contributed significantly to the management of UTIs. However the main problem with current antibiotic therapies is the rapid emergence of antimicrobial resistance in hospitals and the community. [8] The resistance pattern of community acquired uropathogens has not been extensively studied in the Indian subcontinent. [9-11]

UTI is the most common in patients with diabetes and in those with structural and neurological abnormalities which interfere with urinary outflow. Nosocomial UTI is also common following catheterization and cystoscopy. The manifestations of UTI may vary from mild asymptomatic cystitis to

pyelonephritis and septicemia. [12] Gram-negative organisms are the most common pathogens involved in UTI, but almost all known pathogens have been incriminated as possible causative agents for UTI. [13,14] Treatment of UTI constitutes a great portion of prescription of antibiotics. Urinary pathogens have shown a changed pattern of susceptibility to antibiotics, resulting in an increase in resistance to commonly used antibiotics. [15] The distribution of uropathogens and their susceptibility pattern to antibiotics vary regionally. [16,17]

The aim of the present study was to investigate the common bacteria associated with UTI cases and their antibiotic susceptibility pattern.

Materials and Methods

A retrospective descriptive study was done for one year in DMCH, Laheriasarai, Darbhanga, Bihar. The study included all in-patients of either gender above 18 years of age with a diagnosis of UTI. Data was collected from the patient's case record files, which were retrieved from the medical records department of our hospital. All relevant data regarding the type of clinical presentation, demographic distribution, associated risk factors, co-morbid conditions, microbiology reports, causative uropathogens and its antibiotic resistance pattern were documented into a proforma sheet prepared beforehand. The data was entered, stored and evaluated using Microsoft excel 2016. Data was calculated according to the percentages.

Results

Table 1: Antibiotic resistance pattern of gram-negative

| Antimicrobial Agents | <i>E.coli</i> | <i>Klebsiella spp</i> | <i>Acinetobacter spp</i> | <i>Citrobacter freundii</i> | <i>Pseudomonas spp</i> |
|------------------------------|---------------|-----------------------|--------------------------|-----------------------------|------------------------|
| | R (%) | R (%) | R (%) | R (%) | R (%) |
| Ampicillin | 87 | 96 | 93 | 95 | 100 |
| Amoxicillin- Clavulanic Acid | 67.8 | 46.4 | 76 | 93 | 95 |
| Ampicillin/Salbutam | | | | | |
| Cefalexin | 84.2 | 92 | 100 | 100 | 100 |
| Cefuroxime | 78.9 | 72 | 100 | 50 | 100 |
| Ceftriaxone | 77.6 | 76 | 100 | 50 | 100 |
| Ciprofloxacin | 84.0 | 50 | 100 | 50 | 100 |
| Levofloxacin | 78.2 | 34.6 | 100 | 50 | 100 |
| Cotrimoxazole | 46.4 | 46.4 | 100 | 100 | 100 |
| Gentamicin | 51.7 | 55.6 | 100 | 50 | 50 |
| Amikacin | 7.0 | 17.8 | 100 | 50 | 100 |
| Nitrofurantoin | 6.4 | 88.2 | 100 | 0.0 | 100 |
| Piperacillin + Tazobactam | 7.9 | 30 | 50 | 50 | 0.0 |
| Meropenam | 6.6 | 9.2 | 76 | 0.0 | 0.0 |

Out of 120 significant isolates, gram-negative organisms accounted for 81%. Fungal isolates were seen only in 2% of cases. *E.coli* was the most predominant uropathogen isolated followed by *Klebsiella spp*, *Enterococcus fecalis* and *Acinetobacter spp*. Other uropathogens included MRSA bacteria, *Staphylococcus aureus*, *Candida spp*, *Citrobacter freundii*, *Pseudomonas spp* and *Streptococcus spp*.

Table 2: Antibiotic resistance pattern of gram-Positive

| ANTIMICROBIAL AGENTS | <i>Enterococcus fecalis</i> | <i>Staphylococcus aureus</i> | MRSA | <i>Streptococcus spp</i> |
|-----------------------------|-----------------------------|------------------------------|-------|--------------------------|
| | R (%) | R (%) | R (%) | R (%) |
| Ampicillin | 25 | 34.4 | 100 | 0.0 |
| Amoxicillin-clavulanic acid | 18.2 | 0.0 | 100 | 0.0 |
| Cephalexin | 100 | - | 100 | 0.0 |
| Cefuroxime | 100 | 0.0 | 100 | 0.0 |
| Ceftriaxone | 100 | 0.0 | 100 | 0.0 |
| Ciprofloxacin | 29.7 | 100 | 100 | 0.0 |
| Levofloxacin | 29.7 | 0.0 | 66.7 | 0.0 |
| Cotrimoxazole | 57.1 | 0.0 | 66.7 | 0.0 |

| | | | | |
|-------------------------|------|-----|------|-----|
| Gentamicin | 72.5 | 0.0 | 0.0 | 100 |
| Amikacin | 64.6 | 0.0 | 66.7 | 100 |
| Nitrofurantoin | 12.5 | - | 0.0 | 0.0 |
| Piperacillin+Tazobactam | 0.0 | - | - | - |
| Imipenem | 14.6 | - | - | - |
| Meropenem | 34.4 | - | - | - |
| Vancomycin | 0.0 | 0.0 | 0.0 | - |
| Linezolid | 0.0 | 0.0 | 0.0 | - |
| Teicoplanin | 0.0 | 0.0 | 0.0 | - |
| Azithromycin | - | - | 100 | 0.0 |

E.coli, showed considerable resistance to ampicillin, ceftriaxone, Co-Trimoxazole and fluoroquinolones. Low level of resistance was observed with Nitrofurantoin, piperacillin+ tazobactam and Ticarcillin. *Klebsiella* spp, the second most common uropathogen showed high level of resistance with ampicillin, cephalixin, cefuroxime, ceftriaxone and Nitrofurantoin.

Discussion

Any infection of the urinary tract involving either the kidneys, ureters, urinary bladder, or the urethra is termed as urinary tract infection (UTI). In both community and hospital-acquired infections, urinary tract infection (UTI) is a prevalent health concern hospital-acquired infections. [18] It is one of the most frequent infections, especially among women. [19] There are many factors associated with the occurrence of urinary tract infection. Timely diagnosis and treatment of these predisposing factors is essential for preventing recurrences. [20] Treatment of UTI is usually initiated empirically with antibiotics without performing culture and sensitivity test, has led to improper usage of antibiotics. [21] Identification and practice rational prescription of antibiotics to reduce the emergence of resistant bacterial strains. [22] Culture sensitivity tests were also important in case of UTI to go for a specific antibiotic treatment rather than the empirical treatment for the patients. [23,24]

Out of 120 significant isolates, gram-negative organisms accounted for 81%. Fungal isolates were seen only in 2% of cases. *E.coli* was the most predominant uropathogen isolated followed by *Klebsiella* spp, *Enterococcus fecalis* and *Acinetobacter* spp. Other uropathogens included MRSA bacteria, *Staphylococcus aureus*, *Candida* spp, *Citrobacter freundii*, *Pseudomonas* spp and *Streptococcus* spp. *E.coli*, showed considerable resistance to ampicillin, ceftriaxone, Co-Trimoxazole and fluoroquinolones. Low level of resistance was observed with Nitrofurantoin, piperacillin+ tazobactam and Ticarcillin. *Klebsiella* spp, the second most common uropathogen showed high level of resistance with ampicillin, cephalixin, cefuroxime, ceftriaxone and Nitrofurantoin. *E.coli* is

the commonest uropathogen causing both complicated and uncomplicated UTI. [25] In this study, the most predominant uropathogen isolated was *E.coli* and this finding was similar to results of studies by Basnyat KB et al [26] and Khameneh ZR. [27]

E.coli, which was the predominant uropathogen isolated showed considerable resistance to ampicillin. A resistance rate comparable to our study was observed in a study conducted by Mandal et al. in South India. [28] In contrast to our observations, in a study conducted by Das RN [29] in West Nepal, *E.coli* isolates showed high susceptibility to ampicillin and cotrimoxazole. High level of resistance was observed with ampicillin in similar with In a retrospective study conducted by Bahadin et al [30], *klebsiella* was found to be the second most prevalent isolate and a hundred percent resistance was observed with ampicillin. However, in contrary to our observations, their study noted higher sensitivity to gentamicin. Another study by Bhargavi PS et al [31] conducted in Southeast part of India showed a higher resistance to gentamicin (83.3%) and cotrimoxazole (82.4%) compared to our study results, which were 54.5% and 45.5% respectively. Our study showed resistance to Nitrofurantoin (6.4 %), piperacillin+ tazobactam (7.8%), and Ticarcillin (4.5%). *Klebsiella* spp.

Conclusion

Most of the identified bacteria were resistant to several of the popular antibiotics used in clinical settings. Consequently, it is vital to prescribe antibiotics rationally both before and after culture reports. Pattern needs to be studied further and the outcome should be communicated to the prescribing physicians in that area.

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