Doi: https://doi.org/10.3329/ewmcj.v13i1.77626

Original Article

BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY PATTERN OF URINARY TRACT INFECTION

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Article history:
Received: 7 November 2024
Accepted: 1 December 2024

Abstract:

Introduction: *Urinary tract infection (UTI) is a common infection that may occur in any part of the urinary system - kidneys, ureters, bladder and urethra. UTIs are caused by a wide range of pathogens, and recurrence rates of UTIs are high. Antibiotic resistance to microorganism is a burning issue all over the world due to inappropriate antibiotic use. Antibiotic resistance leads to morbidity, mortality and overall, the economic burden. Therefore, surveillance of antimicrobial resistance of UTI is essential to see its impact on population health and local treatment practices.* ***Objective:*** *This study was conducted to identify the bacterial agents of urinary tract infections and determine antibiogram patterns.*

Methods: *A cross-sectional study was conducted at the outpatient service. The study included all patients who presented with UTIs and the symptoms included urinary frequency, urgency, hematuria, dysuria, and suprapubic discomfort. Those patients with clinical manifestations but are on antibiotics or antibiotics completed within the past five days were excluded. Total sample size was 48 who meets the criteria along with positive urine culture.*

Results: *The prevalence of UTI is high among females (89.60%) than males (10.40%). Among 48 samples, the pathogens isolated were Escherichia coli (E. coli) 41 (85.4%), Klebsiella 4 (8.3%), followed by Proteus, Enterobacter, and Acinetobacter 2.1% each. Organisms showed higher sensitivity toward Meropenem, Imipenem, and Amikacin (100%) followed by Nitrofurantoin (95.8%). Isolated organisms showed high resistance levels to beta-lactamase ampicillin (60%) and cephalosporines groups. According to the sensitivity profiles, the most effective oral antibiotics were Nitrofurantoin (96%) followed by Cotrimoxazole (70.8%), Ciprofloxacin (66.7%).*

Conclusion: *This study findings emphasize the significance of local antibiotic resistance patterns in urinary tract infection. More studies can be done to create local and national guidelines and physicians should use rational and adequate dose of antibiotics to avoid the emergence of antibiotic resistance.*

Keywords:
Urinary tract infections, Uropathogens, Antibiotic resistance, Antibiogram

EWMCJ Vol. 13, No. 1, January 2025: 23-27

Introduction:

Urinary tract infections (UTIs) are one of the most common infections both in community and hospital settings[1,2]. Women are more susceptible to develop urinary tract infections than men, due to the female lower urinary tract anatomy. However, men with prostate problem, people with diabetes and immunosuppressed are also at greater risk. UTI typically occurs when bacteria enter the urinary tract through the urethra and begin to multiply in the bladder. It can occur in both the lower part (Cystitis or urethritis) and the upper part of the urinary tract (Pyelonephritis), and also varies according to age and sex[3].

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Among uropathogens, E. coli is the predominant etiological agent of UTIs[4]. Other organisms include Klebsiella, Enterobacter, Proteus, pseudomonas, and Enterococci, Staphylococcus saprophyticus.

Antimicrobial resistance is a worsening threat to both individual and population health worldwide. Inappropriate and excessive use of antibiotics has led to the resistant strains of uropathogens. Increasing levels of antimicrobial resistance threaten to limit available options for treating serious infections especially in critical care. At the population level, increased emergence and transmission of antimicrobial resistance can lead to strain on health care systems, and substantial social and economic impacts. Therefore, this study is aimed to see common etiological agents prevalent of UTI and to find suitable antimicrobial treatment in our local community.

Methods:

This study is a cross-sectional observational study. This study was conducted in Ibn Sina Diagnostic and Consultation Centre, Uttara, Dhaka from Jan 2024 to June 2024. Patients of 16 years of age and older have been included in study. Patients who have UTI or symptoms of UTIs such as burning urination, frequent or intense urge to urinate, cloudy, dark or strange smelling of urine, fever with chills and loin pain having urine culture positive were included in this study. However, patients were on antibiotic or antibiotic received within 5 days were excluded from the study despite of their symptoms. The patients came with the above symptoms having positive urine culture were included in the study and the total sample size was 48. Patients were encouraged to give clean voided mid-stream urine sample. The numbers of colonies were counted to quantify organisms. Diagnosis of UTI is defined on the basis of significant colony count of ≥105 cfu/ml for Gram-negative and Gram-positive bacteria [5]. Growths on the culture media were identified by using bacterial growth characteristics (morphology). The variables from which data were collected were: age, sex, microorganism and antibiotic sensitivity test.

Results:

Socio demographic status: The demographic profile of UTI of the study shows the patients were between 16 years and above with a mean age of 48.17. Most of patients with UTI were in older (60 to 69) age group and younger age (below 30 years) group. The prevalence of UTI is high among females (89.60%) than males (10.40%).

Isolated Bacteriologic Agents: Escherichia coli (E.coli) was the most common 41 (85.4%) of total isolates followed by Klebsiella 4 (8.3%) and Proteus, Acinetobacter and Enterobacter were found in 2.1% cases each.

Antibiogram Patterns: Various classes of antibacterial drugs were evaluated against the urinary pathogens. Organisms showed higher sensitivity towards Meropenem, Imipenem and Amikacin (100%) followed by and Nitrofurantoin (96.6%), Gentamycin (90%), Cefepime (80%).

Isolated organisms showed high resistance levels to beta-lactamase ampicillin (62.5%) and cephalosporines groups (52.1%), Cefixime (43.7%) and Ceftriaxone (35.4%). Piperacillin and Tazobactam showed also significant resistance (39.6%).

According to the sensitivity profiles, the most effective oral antibiotics were Nitrofurantoin (95.8%), Cotrimoxazole (70.8%), Amoxicillin Clavulanic Acid (70%) followed by Ciprofloxacin and Cefuroxime 66.7% each.

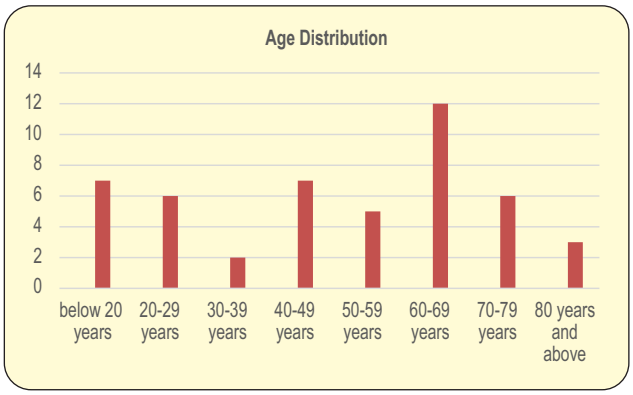

Figure 1: *Age distribution*

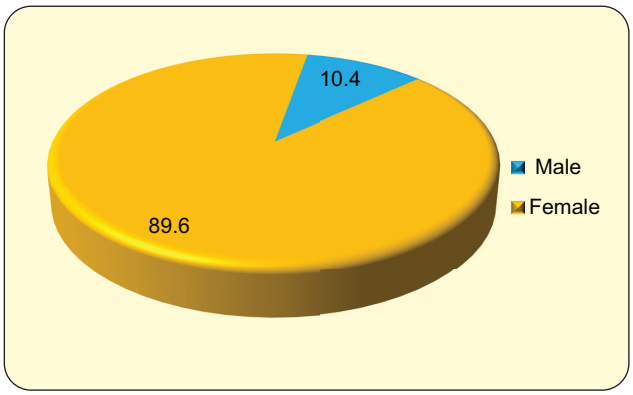

Figure 2: *Gender distribution of the study*

Table-I

Antibiogram sensitivity percentage of UTI

Name of the drug	Sensitive	Resistant	Percentage
Amikacin	48	0	100
Amoxycillin Clavulanic acid	34	14	70
Cefepime	37	11	77
Ceftriaxone	31	17	64.6
Imipenem	48	0	100
Nitrofurantoin	46		2
95.8			
Cefixime	27	21	56.3
Ceftazidime	35	13	72.9
Cephalexin	23	25	47.9
Cotrimoxazole	34	14	70.8
Cefuroxime	32	16	66.7
Ampicillin	18	30	37.5
Ciprofloxacin	32	16	66.7
Gentamicin	42	6	87.5
Meropenem	48	0	100
Aztreonam	32	16	78.0
Tazobactam Piperacillin	29	19	60.4

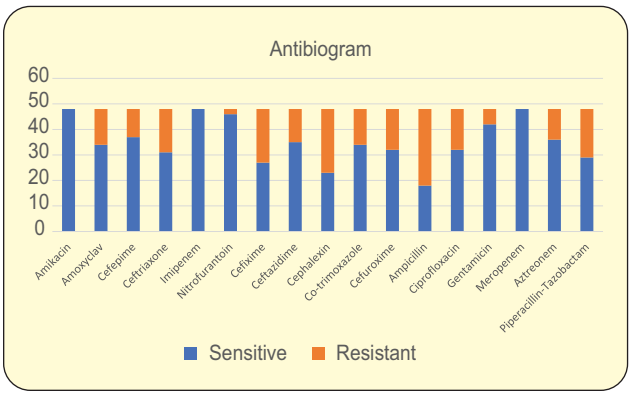

Figure 3: *Frequency of organisms isolated in culture.*

Discussion:

Urinary tract infection (UTI) is an infection caused by the presence and growth of microorganisms anywhere in the urinary tract[6]. It is usually due to bacteria from the gastrointestinal tract which climb the opening of the urethra and begin to multiply to cause infection. UTI is a common health problem but rapidly increasing antimicrobial resistance of uropathogens results limited treatment options. Hence, knowledge of the uropathogens and their antibiotic susceptibility pattern is important for better treatment of UTI[7]. Unary tract infections (UTIs) are common among adult men and women; although the incidence is higher among women due to their anatomy[8].

Our study also showed that the incidence of UTI is highest among older and younger group of age. This is understandable because the younger age group covers the very sexually active and prime reproductive years of a woman[9] and old age due to their comorbidities[10].

The predominance of Escherichia coli in cases of UTI is supported by our finding and that of other researchers[11]. The prevalence of E. coli as the most common uropat[hogen has also been found to be remarkably consistent with previous studies[12]. E. coli was considered as the most prominent uro-pathogenic bacteria due to a number of virulence factors specific for colonization and invasion of the urinary epithelium[13].

In El Batnan Medical Center, during 2003 and 2004 in the UTI patients *E Coli* was the most common pathogen 40.46%, followed by Klebsiella 22.5%. was most sensitive to Ciprofloxacin (85.8%) with noticeable resistance to Ampicillin (90.6%resistance)[14].

The antibiogram of the uropathogens is constantly changing due to clinical failure resulting from misuse or overuse of the commonly available antibiotics. In our study Organisms higher sensitivity toward Meropenem and Imipenem and Amikacin (100) followed by and Nitrofurantoin (95.8%), Gentamycin (87.5%), Cotrimoxazole (70.8 %) Cefepime (70%). In a study conducted in Bangladesh in 2014 also showed almost similar sensitivity towards Meropenem, Imipenem and Amikacin[15]. Amikacin showed good sensitivity profile in other studies[16].

According to the sensitivity profiles, the most effective oral antibiotics were Nitrofurantoin (95.8%) followed by Cotrimoxazole (70.8%) Ciprofloxacin (66.7%) and Cefuroxime (66.7). 3rd generation oral cephalosporin Cefixime shows only 56.3% sensitivity. The susceptibility profiles of isolated pathogens demonstrate the high efficacy of nitrofurantoin in other studies[17]. However, quinolones had high percentages of resistance, which is important, since some authors in Latin America report a high resistance to quinolones[16].

Isolated organisms showed high resistance levels to beta-lactamase ampicillin (62.5%) and cephalosporines groups (52.1%), Cefixime (43.7%) and Ceftriaxone (35.4%). These findings are consistent with a study conducted in Pakistan[18]. Piperacillin and Tazobactam showed also significant resistance (39.6%). One interesting recent study showed E.Coli with strains with phenotypic resistance to piperacillin/tazobactam shows susceptibility to third-generation cephalosporins[19].

Conclusion:

The pattern of microbial resistance pattern shows still Nitrofurantoin and quinolones are good choice as oral antibiotics as an empirical therapy. However, in complicated cases or in critical situations Meropenem and imipenem are good choices. This study has limitations as it was done in a single center with less sample but it gives emphasis on routine surveillance and monitoring studies need to be constantly conducted to update clinicians on the prevalent pathogens and the rational and empirical treatment of UTIs. Aggressive and consistent health education using all possible social media is also recommended to combat the risk of drug resistance caused by inappropriate antibiotic use.

Conflict of Interest: None to disclose.

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Peer-Review History:
The peer review history for this paper can be accessed here: https://ewmch.com/review/