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Original research article

Clinical Presentation & Antibiogram of Uropathogens Isolated at a Tertiary Care Hospital

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Abstract

Background: UTI(Urinary tract infection) remains one of the most common infectious diseases diagnosed by clinicians in everyday practice in developing countries with an estimating global incidence of at least 250 million, of which 50% of the people will suffer once in their lifetime. UTI is common among both genders, but its prevalence is more common in women than in men at a ratio of 8:1 due to anatomical and physiological factors. Mostly around 80 to 90% of the UTI is caused by a single microbe. Widespread use of antibiotics against uropathogens has led to the emergence of antibiotic resistant strains which makes the treatment of UTIs more complex. The UTI can affect any part of the urinary system producing high fever with chills, pelvic pain, frequent painful micturition and in the elderly confusion in addition to the above symptoms. Hence the purpose of this study is to know the antibiogram of uropathogens isolated in our tertiary care hospital and guide the clinicians to select the appropriate antibiotics for treating the urinary tract infections. This study also evaluates the patterns of various symptoms and the uropathogens in various age groups.

Material and Methods: This is a Cross-sectional study was conducted to find out the prevalence of common micro-organisms causing UTI and to determine the antimicrobial sensitivity pattern among the patients attending in the department of microbiology, ACS Medical college & Hospital from May 2022 to July 2022**.** Inclusion criteria: All patients clinically suspected of having UTI from various wards and OPDs. The anti-microbial profile in the urinary pathogens were conducted in 348 consecutive urine samples received in laboratory. Samples were collected from patients presented to the out patients and those who were admitted.

Results: A total of E. Coli (N=42) (12.06%) , enterococcus(N=25) (7.18%), CONs (N=9) (2.58),Klebsiella (N=8) (2.29), Pseudomonas.A (N=6)(1.72%)Candida (N=5) (1.43%) were commonly isolated from the urine samples analyzed in this study. The isolates were resistant to amoxicillin, sulphamethoxazole-trimethoprim, ceftazidime, amoxicillin-clavulanic acid,

ceftriaxone, ofloxacin, aztreonam and nalidixic acid; and they were found to be multi-drug resistant to the antibiotics. Most of the isolates were sensitive to Amikacin and Nitrofurantoin.
Conclusion: Overenthusiastic use of antibiotic has resulted in emergence of drug resistant bacterial strains in UTI patients. Hence, antibiotic susceptibility testing is essential and aids to diagnose and treat the drug resistant UTI cases.
Keywords: Antibiogram, Uropathogens, Escherichia Coli, Urinary Tract Infection

Introduction

Urinary tract infections (UTI) are the most common bacterial infections affecting humans throughout their lifetime. The UTI can affect any part of the urinary system producing high fever with chills, pelvic pain, frequent painful micturition and in the elderly confusion in addition to the above symptoms. One of the most prevalent problems faced by healthcare services is the increasing prevalence of antimicrobial resistance. They are the frequent cause of morbidity in outpatients as well as most frequently involved in the cause of nosocomial infection in many hospitals (Sussman M 1998) [1]. The commonest urinary pathogen accounting for over 80% of community-acquired infection is due to Escherichia coli. However, other organisms gain a greater foothold in patients with complicated UTI [2].

Compounded by a diminishing number of new agents entering clinical practice, resistance is widely recognized as a major threat to public health sectors. UTI is a serious ailment in human due to increasing frequency, recurrence and difficulty in eradication; it poses stiff challenge to the medical professionals. It is much more common in women than in men, due to anatomical and physiological reasons; by virtue of its position urogenital tract is more vulnerable to bacterial infections caused by both internal and external flora [3].

UTIs are often treated with different broad-spectrum antibiotics, one with a narrow spectrum of activity may be appropriate because of emerging concerns about infection with resistant organisms, and antimicrobial susceptibility testing of the urinary pathogens constitutes the basis for antibiotic therapy. However, in view of the increasing bacterial resistance, regular monitoring of resistance patterns is necessary to improve guidelines for empirical antibiotic therapy [4]. Escherichia coli in particular are the notorious pathogens [5] causing infections by adhering to, invading, and replicating the umbrella cells of the bladder epithelium [6].

E. coli replication is facilitated by inflammation, leading to increased bacterial survival and invasion to the deeper layers of the urothelium. Consequently, these urothelial cells become reservoirs in which pathogens persist in a quiescent state becomes reservoirs and may be the source of recurrent UTIs. In general practice, there are concerns that some common infections are becoming increasingly difficult to treat and that complications due to antibiotic resistant bacteria may take longer to resolve. The distribution of urinary pathogens in hospitalized patients is differs with Escherichia coli accounting for about 50% of infections. Enterococcus, Klebsiella, Enterobacter, Citrobacter, Serratia, Pseudomonas aeruginosa, Providencia, and Staphylococcus epidermidis account for most of the rest [7].

Aerobic nonfermenting gram-negative bacilli (nonfermenters) are a heterogeneous group of organisms that are either incapable of utilizing carbohydrates as a source of energy or degrade them via oxidative rather than fermentative pathway [8]. Risk factors include immunosuppression, trauma, foreign body, broad-spectrum antibiotic use, infused body fluids like saline irrigations and also urinary catheterization when infections are caused by these

pathogens [9-11]. We present data on antimicrobial susceptibility and resistance in UTIs patients attending to a tertiary care hospital.

Aim: 1. To study the prevalence of uropathogens in patients with symptoms of UTI at a tertiary care hospital
2. To evaluate the antibiogram of the isolated pathogens
3. To evaluate the patterns of various symptoms and the uropathogens in various age groups.

Material and Methods
This is a Cross-sectional study was conducted to find out the prevalence of common micro-organisms causing UTI and to determine the antimicrobial sensitivity pattern among the patients attending in the department of microbiology, ACS Medical college & Hospital from May 2022 to July 2022

Inclusion criteria: All patients clinically suspected of having UTI from various wards and OPDs.

The anti-microbial profile in the urinary pathogens were conducted in 348 consecutive urine samples received in laboratory. Samples were collected from patients presented to the out patients and those who were admitted.

Procedure: Clean-catch midstream urine specimens will be collected using sterile Containers from the adult patients with symptoms of Urinary tract infections attending the ACS Medical College and Hospital. Then, culture and antimicrobial susceptibility tests will be performed by standard microbiological techniques

Specimen Processing: Urine specimens were cultured semi-quantitatively for isolation of the microbial agents of UTI on Urine chrome agar (Himedia, India & Merck, Germany). All the bacteria isolated from urine in this study were identified using conventional biochemical tests. Bacterial identification Semi-quantitative culture of urine samples was done by calibrated loop method Urine chrome agar plates and incubated in aerobic conditions at 37°C for 24-48 hours.

The urine cultures of colony count > 10^5 colony forming units (CFU)/mL with no more than two species of microorganisms were considered as positive for UTI and cultures showing growth of more than two types of bacteria were considered contaminated. Positive cultures were further subjected to biochemical reactions for identification up to species level.
Antimicrobial susceptibility testing Antimicrobial susceptibility testing was done on Mueller-Hinton agar (Merck, Germany) using standard disk diffusion (Kirby Bauer) technique. This test and interpretation of result was done according to Clinical and Laboratory Standards Institute (CLSI) guidelines to determine susceptibility of agents causing UTIs.

Results

Table 1: Distribution of Gender

	Frequency	Percent	Valid Percent
F	244	70.2	70.2
M	104	29.8	29.8
Total	348	100.0	100.0

Table 2: Distribution of Gram +ve or gram -ve or No growth

	Frequency	Percent	Valid Percent
Gram Negative	62	17.8	17.8
NG	243	69.8	69.8
Gram positive	38	11	11
Yeast	5	1.4	1.4
Total	348	100.0	100.0

Table 3: Distribution of Organism

	Frequency	Percent	Valid Percent
Acinetobacter	5	1.43	1.43
Candida	5	1.43	1.43
Citrobacter	1	0.28	0.28
CONS	9	2.58	2.58
E coli	42	12.06	12.06
Enterococcus	25	7.18	7.18
Klebseilla pneumoniae	8	2.29	2.29
MRSA	2	0.57	0.57
Proteus vulgaris	2	.57	.57
Pseudomonas aeruginosa	6	1.72	1.72
Total	105	100.0	100.0

Table 4: Overall sensitivity and resistance profile of antimicrobial agents tested for bacterial isolates

Antimicrobial agent	Susceptibility pattern		
	Sensitive, N (%)	Intermediate, N (%)	Resistant, (%)
Ciprofloxacin	48 (13.4)	9 (2.4)	58 (15.7)
Ampicillin	45 (12.2)	0	45 (12.2.)
Amikacin	87 (23.6)	3 (0.8)	18 (4.8)
Amoxicillin/clavulanate	44 (11.9)	0	23 (6.2)
HLG/ G	**85** (23.0)	**2** (0.5)	25 (6.7)
Erythromycin	14 (3.8)	5 (1.3)	24 (6.5)
Penicillin	22 (5.9)	0	8 (2.1)
Nitrofurantoin	**75** (20.3)	**4** (1.0)	**15** (4.0)
Cefataxime	22 (5.9)	5 (1.3)	29 (7.8)
Vancomycin	39 (10.5)	0	1 (0.2)
Linezolid	0	0	14 (3.8)
Cotrimoxazole	**32** (8.6)	**0**	**25** (6.7)

Ofloxacin	11 (2.9)	1 (0.2)	6 (1.6)
Norfloxacin	22 (5.9)	1 (0.2)	20 (5.4)
Novobiocin	9 (2.4)	0	1 (0.2)
Nalidixic acid	**5** (1.3)	**2** (0.5)	**15** (4.07)
Cefoxitin	**2** (0.5)	**0**	**2** (0.5)
Piperacillin/Tazobactum	**32** (8.6)	**0**	**14** (3.8)
Imepenem	**33** (8.6)	**0**	**11** (2.9)
Meropenem	**34** (9.2)	**0**	**10** (2.7)
Cefazolin	**17** (4.6)	**0**	**13** (3.5)
Cefipime	**18** (4.8)	**0**	**13** (3.5)
Azithromycin	**26** (7.0)	**0**	**13** (3.5)
Ceftazidime	**12** (3.2)	**0**	**15** (4.0)

Table 5: Clinical presentation and the bacteria identified

	1-10 years M F	**11-20 years M F**	**21-30 years M F**	**31-40 years M F**	**41-50 years M F**	**51-60 years M F**	**61-70 years M F**	**71-80 years M F**	**81-90 years M F**
High fever	**18 12**	**11 17**	**5 53**	**18 56**	**15 36**	**11 35**	**14 25**	**10 8**	**2 2**
Pelvic pain	**0 0**	**2 8**	**1 44**	**7 50**	**5 34**	**7 30**	**10 22**	**7 6**	**2 2**
Frequent	**16 10**	**10 15**	**5 50**	**16 54**	**12 34**	**10 32**	**12 20**	**8 8**	**2 2**
Painful Micturition									
Confusion	**0 0**	**0 0**	**0 0**	**0 0**	**2 2**	**2 30**	**10 22**	**10 8**	**2 2**
Bacteria Isolated									
E. Coli	**5 2**	**0 3**	**0 3**	**3 4**	**0 3**	**3 6**	**3 2**	**3 1**	**1 1**
Enterococcus	**2 0**	**1 1**	**0 3**	**0 5**	**1 5**	**1 0**	**3 1**	**0 1**	**1 0**
CONS	**0 0**	**0 0**	**0 2**	**0 2**	**0 2**	**0 1**	**0 2**	**0 0**	**0 0**
Klebsiella	**0 0**	**0 0**	**0 0**	**3 0**	**0 0**	**1 1**	**1 1**	**0 0**	**0 0**
Pseudomonas	**0 0**	**1 1**	**0 0**	**1 0**	**0 0**	**0 1**	**1 0**	**1 0**	**0 0**
Acinitobacter	**0 0**	**0 0**	**0 0**	**1 2**	**0 1**	**0 1**	**0 0**	**0 1**	**0 0**
Candida	**0 0**	**0 0**	**0 0**	**1 0**	**0 0**	**0 0**	**0 0**	**0 1**	**1 1**
MRSA	**1 0**	**0 0**	**0 1**	**0 0**	**0 0**	**0 1**	**0 0**	**0 0**	**0 0**
Proteus V	**0 0**	**0 0**	**0 0**	**1 0**	**0 1**	**0 0**	**0 0**	**0 0**	**0 0**
Citrobacter	**0 1**	**0 0**	**0 0**	**0 0**	**0 0**	**0 0**	**0 0**	**0 0**	**0 0**

Discussion

Infection of the urinary tract is one of the most common infectious diseases and it would affect all age groups peoples including men, women and children in worldwide [12]. The increasing prevalence of infections caused by antibiotic-resistant bacteria makes the empirical treatment of UTIs difficult and outcome unpredictable [13]. In poor resource settings where the availability of alternative effective antibiotics is limited, serious problems are anticipated in the treatment of multidrug resistant strains. Women are predisposed for UTI infections with 56% being infected in our study, the short urethra is considered to be a primary risk factor [14].

This study is consistent with the findings of previous studies in which E. coli was the predominant pathogen isolated from patients with UTIs [15]. Many studies worldwide have also reported a sharp increase in ciprofloxacin resistant E. coli isolates from UTIs. The prevalence of ciprofloxacin resistance in Bangladesh was 26% [16]. We also find increased resistance for norfloxacin and ciprofloxacin in E. coli.

In this study E .coli mostly caused urinary tract infections followed by Enterococcus followed by CONS, Pseudomonas, Klebsiella and Candida . Pseudomonas aeruginosa is an established pathogen of urinary tract. Pseudomonas spp. was the commonest non-fermenter isolate in the present study being significant in 6% of cases. This study revealed that for Pseudomonas spp. amikacin followed by ciprofloxacin in the group of first and second line antibiotics and also meropenem to be effective followed by cephalosporins in the group of third line reserved antibiotics. A previous study has reported that for Pseudomonas aeruginosa, amikacin, ceftazidime and piperacillin are the recommended antibiotics [18]. Many other studies reported multiple drug resistance in Pseudomonas aeruginosa isolates [19].

The rate of isolation of Klebsiella pneumoniae described is consistent to other studies. Candida spp. was commonly isolated; however, their clinical significance was not always evident. This might also contribute its share for problem of drug resistance. Generally, this study demonstrated that ciprofloxacin, gentamycin, norfloxacin and piperacillin were the current effective drugs from most uropathogens in the study area.

This study lack extended spectrum betalactamase production status of some the isolates due limited resources in the lab. However, our study is one of the reports that provide current information on the type of bacterial isolates and their antimicrobial resistance profile from urine culture.

Looking at the clinical presentation all the patients (N=348) presented with high fever to the hospital. Pelvic pain was notably present in all age groups (Table 5) except the paediatric age group. Frequent painful micturition was reported in most of the age groups.[20,21] Of the 348 urine samples collected for culture and sensitivity,105 samples turned positive for bacteria and fungi(30.11%).The remaining samples had no growth. Confusion as a symptom was present in every male and female between the age group of 70 and 90 years. None of the patients between the age group of 1 and 40 had any confusion as a symptom. Women had been tested positive for bacteria more than men in all age groups.No association could be made between any particular bacteria and the presenting symptoms.

Conclusion

The study showed that UTI is one of the common health problems mainly in females of the reproductive age groups. *E. coli*, Enterococcus and Coagulase negative Staphylococci followed by Pseudomonas Aeruginosa. ,*Klebsiella pneumonia* were the predominant bacterial isolates. Most of the isolates showed high levels of antimicrobial resistance to commonly

prescribed drugs like ciprofloxacicilin, Amphicilin, Amoxicillin/clavulanate and Amikacin. Therefore, continued antimicrobial resistance surveillance is indispensable for better management of patients. Though this study shows less resistance levels to third generation Cephalosporins, which are commonly used drug in most of the cases irrespective of causative organism, it is better to use this antibiotics for complicated UTIs. We conclude that the clinicians should encourage accurate bacteriological diagnosis of each symptomatic patient as far as possible and refer to the record of local microbial isolation and their antibiogram in cases of emergency or in areas where the culture facility is not available, thus minimising the antimicrobial resistance.

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