DOI: https://doi.org/10.53350/pjmhs22166967

ORIGINAL ARTICLE

Antimicrobial Susceptibility Pattern of E. Coli in Patients with Urinary Tract Infection at a Tertiary Care Hospital, Rawalpindi

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ABSTRACT

Background: Urinary tract infections caused by bacteria are the most prevalent type of hospital-acquired infection. They are also responsible for the greatest number of patient fatalities, lengths of hospital stays, and overall costs associated with medical care. Even though Escherichia coli is the bacteria that is found the most frequently, several studies have found different levels of prevalence for it. The current dilemma with antibiotic resistance is being caused, in large part, by the inappropriate and excessive use of antibiotics.

Methodology: Laboratory records were searched in order to obtain information regarding the organisms that were isolated from urine samples as well as the pattern of antibiotic susceptibility. The urine samples that were obtained were processed according to the normal procedures, and a Kirby-Bauer Disk Diffusion test was used to determine the antibiotic susceptibility of the bacteria.

Results: E. coli was found to be the most frequent causative agent of UTI (40.6%) followed by candida spp. (28%), Enterococcus spp (10.6%), Klebsiella spp (9.8%), Staphylococcus aures (1.58%) and Acinatobacter spp (1.97%). E. coli showed variable antimicrobial resistance to various antibiotics such as AMP (95.6%) followed by CRO (91.5%), CAZ (86.5%), CTX (82.09%), and MXF (80.8%) while most sensitive antibiotic was fosfomycin (93.2%) followed by sulzone (83.5%), imepinem (78.1%) and amikacin (77.1%).

Keywords: Pathogens, susceptibility pattern, urinary tract infection

INTRODUCTION

UTIs are significant health issues that affect the people all over the world. In community practice, it is the second most typical infectious presentation [1, 2]. Each year, around 150 million people are given a UTI diagnosis globally [3]. Microbial invasion and subsequent growth in the urinary tract are what lead to UTIs. The virulence traits and pathogenic processes that enable different uropathogens to colonize and infect the urinary system are different [4, 5]. Pathogens like E. coli, Enterobacter spp., Proteus, and Klebsiella are the most prevalent cause of UTIs among the individuals presenting at hospital setups [6, 7]. The microorganisms that persisted in spreading illnesses in spite of the administration of these more modern antibiotics once again represented a new type of infectious disorders brought on by drug resistance [8]. Because of their new mutations, it is anticipated that microorganisms would eventually become more resistant. The most frequent pathogen responsible for both community- and hospital-acquired UTIs is E. coli [9]. Due to its easy colonization of the urinary system due to its membership in the typical flora of the human intestine. Community-acquired UTIs are typically mild, populating ideally the bladder and resulting in cystitis [10]. To the contrary, E. coli can pass through the ureters and reach the kidneys, where it can cause more serious infections such pyelonephritis [11]. One of the most significant inventions of the previous century, antibiotics are used to either kill or prevent the growth of germs. A significant issue in the treatment of infectious diseases around the globe is microbial drug resistance. Microbial resistance has risen as a result of the improper use of antibiotics in clinical treatment [12]. A severe public health issue is the resulting spread of bacterial resistance strains. Early UTIs treatment lowers the rate of morbidity, suggesting that empirical antibiotic medication is typically administered. Knowing the primary microorganisms often associated in infections of the urinary tract and their distinct patterns of antibiotic resistance are essential for administering an effective empirical therapy [13]. This process enables the global public health issue of the rise in antibiotic resistance and the propagation of resistant bacterial strains to be controlled. The present study was aimed to estimate the prevalence of the E. coli and to assess the antimicrobial sensitivity pattern so that the clinicians are able to effectively treat UTIs using the appropriate drugs.

MATERIAL AND METHODOLOGY

This descriptive study looked back at data from 1,000 people who'd been diagnosed with urinary tract infections. The microbiology department of Holy Family Hospital in Rawalpindi conducted the study from January to May of last year, and it included all patients whose complete medical histories were mentioned. In the microbiology lab of Holy Family Hospital in Rawalpindi, researchers gathered information on the frequency and type of bacteria found in urine cultures. A standardized coil of 0.002 L was immersed vertically into the urine sample and then used to inoculate CLED agar plates using the streak plate method. The colony forming unit (CFU) technique was used to analyze microorganisms after an overnight incubation. The presence of a significant bactriuria was defined as a colony count greater than 105 in a given sample. It was thought that CFU counts under 105 represented insignificant expansion. Biochemical tests on the positive urine culture were conducted based on the appearance of the recovered bacteria and the results of the microscopic examination of the Gram-stained smear. The isolates were tested for Ampicillin (AMP), Ceftazidime (CAZ) , Ceftriaxone (CRO) , Fosfomycin (FOS) , Nitrofurantoin (F) , Moxifloxicin (MXF), Cefexime (CFM) , Ciprofloxacin (CIP) , Amikacin (AKN) , Sulzone (SCF) ,Tazocin (TZP) and Imipenem (IPM) . On Muller Hinton agar plates, the antibiotic sensitivity pattern of E. coli isolates was determined by employing the Kirby-Bauer disc diffusion method. The susceptibility of bacterial strains was determined by measuring the diameter of the inhibitory zone and assigning them to one of three categories: susceptible (S), intermediate (I), or resistant (R) [19].

RESULTS

A total of 1000 urine samples were processed at Microbiology laboratory Holy Family Hospital. Significant bacteriuria was found in 27 % (270) cases while 73 % (730) urine samples showed no growth as shown in figure no 1. Males constitute 45.5% while females were 54.5%.Most of the sample received were as shown in Table no 1. Overall, E. coli was the most common micro-organism isolated in both sexes followed by candida and enterococcus.

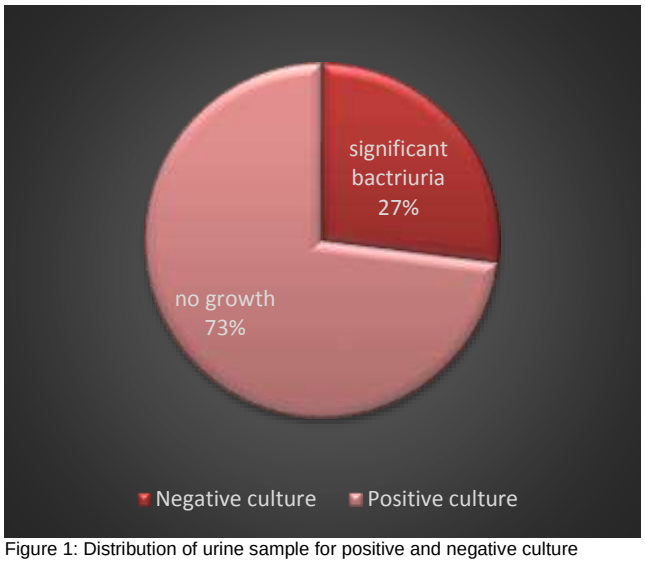

Figure 1: Distribution of urine sample for positive and negative culture

Table 1: Percentage distribution of samples received from different areas of hospital.

Urine culture	Percentage of request
OPD	47.3%
WARDS	33%
ICU'S	15.9%
DID	3.8%

Overall, E. coli was the most prevalent isolate in both sexes followed by Candida spp. (28%), Enterococcus spp. (10.6%), Klebsiella spp. (9.8%), Coliform spp. (7.1%), Acinatobacter spp. (1.97%), and Staph aures was (1.58%) as shown in table 2.

Table 2: Prevalence of different organisms causing UTIs

Organisms isolated	Frequency of organisms
E. coli	40.7%
Candida	28%
Enterococcus	10.6%
Klebsiella	9.8%
Coliform Species	4.3%
Acinatobacter	1.97%
Staphlococcus Aures	1.58%
Pseudomonas Aurigenosa	2.76%

Most predominant organism isolated was E. coli. Its highest prevalence was observed in females (64%) while in males with (36%) and the different areas from which it was isolated as shown in table no 3.

Table 3: Frequency of UTI caused by E. coli in out patients and in patients.

Wards/Area	Percentage of E.Coli
OPD PATIENTS	61.2%
WARDS	12.8%
ICU'S	21%
DID	4.8%

Antibiotic sensitivity pattern of E. coli isolates was determined as shown in table no. 4. Highest percentage of resistance was observed in Ampiciliin (95.6%) followed by Ceftriaxone (91.5%) , Ceftazidime (86.5%), Cefoaxime (82.09%), Moxifloxicin (80.8%) while most sensitive antibiotic was Fosfomycin (93.2%) followed by Sulzone (83.5%), Imepinem (78.1%) and Amikacin (77.1%).

Table 4: Antimicrobial susceptibility pattern of E. coli.

Antibiotics	Codes	Antibiotics Susceptibility Profile		
		S	I	R
Ampicillin	AMP	4.3%	-	95.6%
Ceftriaxone	CRO	8.5%	-	91.5%
Cefixime	CFM	13%	-	87%
Ceftazidime	CAZ	13.4%	-	86.5%
Cefotaxime	CTX	17.9%	-	82.09%
Moxifloxacin	MXF	19.2%	-	80.8%
Fosfomycin	FOS	93.2%	-	6.8%
Sulzone	SCF	83.5%	83.5%	13%
Imipenem	IPM	78.15%	6.25%	15.6%
Amikacin	AKN	77%	3.1%	19.7%
Tazocin	TZP	75.6%	20.9%	3.5%
Meropenem	MRP	63.8%	-	36.2%
Nitrofurantion	F	59.7%	-	32.4%
Ciprofloxacin	CIP	37.5%	2.1%	60.4%

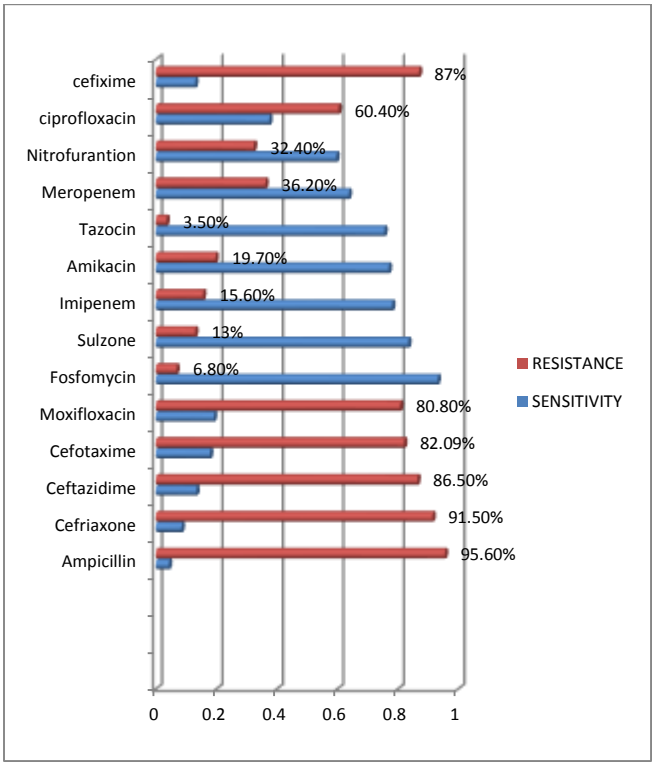

Figure 2: Antimicrobial susceptibility profiling of E. coli.

DISCUSSION

UTIs are the second most common type of infection behind respiratory illnesses [20], and they account for a disproportionately large number of antibiotic prescriptions. Researchers found that females account for 54.5% of the bacteria responsible for UTIs, whereas males account for 45.5%.Another study conducted in Pakistan showed that males were 71.5% while females were 87.5% [25] .In an another study, the cases of the UTIs in Iran females were 78.1% as compared to 44.45 % in males [23].it showed that females have a higher incidence of UTI. Prevalence of E. coli in present study is 40.7% that is closely related to other studies. MF bashir et al conducted a study in Pakistan showed that the prevalence of E. coli was 66 % [23]. Farhat ullah and sumera conducted studies which showed the prevalence of 33.9% and 80% respectively.[19, 22] It is a big public health issue that E. coli detected from UTIs are getting more and more resistant to medications. Recognizing antibiotic resistance trends in E. coli isolates is essential for making informed medical decisions. Although E. coli can be killed by a number of antibiotics, the number of drugs to which it responds is gradually decreasing owing to empirical use. Over time, there has been a growth in antimicrobial drug resistance. The level of opposition differs from nation to nation18. Our findings demonstrate that E. coli is very resistant to various drugs, with ampicillin having the highest

prevalence of resistance (95.6%), followed by ceftriaxone (91.5%), ceftazidime (86.5%), cefotaxime (82.09%), and moxifloxacin (80.8%). This shows that these antibiotics should only be used with caution to treat urinary tract infections. Extremely high usage of antibiotics making many of these ineffective for the treatment of UTIs.

Table 6: Comparison of resistance patterns of uropathogenic E. coli in various studies

AUTHOR	COUNTRY	Ampicillin	Ceftriaxone	Ceftazidime	Cefotaxime	Nitrofurantion	Ciprofloxicin
Present study	Pakistan	95.6%	91.5%	86.5%	82.095	32.4%	60.4%
Mf bashir (17)	Pakistan	92%	50%	35%	-	20%	62%
Farhat ullah et al (22)	Pakistan	88.8%	-	65.5%	62%	-	62.1%
Sumera shabir et al (19)	Pakistan	100%	43.3%	73.8%	89.7%	-	54.2%
Mohammad akram et al (3)	India	76%	55%	65%	56%	80%	69%
James A. Karlowsky1(20)	USA	27.3 to 98.8%)	-	-	-	0-2.8%	0-12.9%
Farrell et al(4)	UK	48.7	-	-	-	3.7	2.3
George G. Zhanel (21)	Canada	41%	-	-	-	0.1%	1.2%

Penicillin and cephalosporin are generally ineffective against UTI infections in underdeveloped nations like Pakistan, and our findings imply that these antibiotics shouldn't be used to treat UTIs. Penicillin and cephalosporin's ineffectiveness in this study does not mean that these antibiotics are not utilized everywhere in the globe to treat UTIs brought on by E. coli. A higher percentage of E. coli were discovered to be susceptible to penicillin or cephalosporin from European nations in some recent investigations.

CONCLUSION

In a short amount of time, the sensitivity pattern of organisms to antibiotics changes quickly. This is particularly true in developing nations when doctors inappropriately prescribe antibiotics and where people can buy them over-the-counter without a prescription. More bacterial strains become resistant to antibiotics when antibiotic treatments are given for shorter periods of time than necessary and/or without taking into account data on antibiotic sensitivity and microbiologic sensitivity.

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