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Pattern of Organisms and their Sensitivity to Antibiotics in Patients Suffering from UTI Attending in Private Chamber a Prospective Study from 2016-2018

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Abstract **Original Research Article**

***Background*:** Urinary tract infections (UTIs) are a prevalent health concern globally, with bacterial pathogens causing significant morbidity. Effective UTI management requires accurate pathogen identification and antibiotic susceptibility profiling, especially amid rising antibiotic resistance, which complicates treatment. In Bangladesh, private clinics frequently cater to patients seeking prompt care, but limited data exists on UTI pathogen patterns and resistance in these settings. ***Objective*:** This study aimed to assess the prevalence of UTI-causing organisms and their antibiotic sensitivity profiles in patients attending a private clinic in Bangladesh from 2016 to 2018, with a focus on understanding regional resistance patterns. ***Methodology*:** A prospective observational study was conducted, analyzing urine samples from 63 UTI patients. The pathogens were isolated using standard microbiological techniques, and antibiotic susceptibility was evaluated using disk diffusion methods. Data were analyzed to determine the most and least effective antibiotics for each pathogen, alongside demographic analysis of UTI occurrence. ***Results*:** *Escherichia coli* emerged as the primary UTI pathogen (66.7%), followed by Methicillin-Sensitive *Staphylococcus aureus* (MSSA) (25.4%). Antibiotic susceptibility showed high sensitivity to Imipenem, Meropenem, and Amikacin for *E. coli*, while Cephradine and Cefixime exhibited significant resistance. MSSA showed high sensitivity to similar antibiotics but notable resistance to Co-trimoxazole and Doxycycline. The majority of UTI cases were in patients aged 21–30 years (44.4%). ***Conclusion*:** The study reveals high resistance to commonly used antibiotics in a private clinical setting, emphasizing the need for localized antibiotic stewardship to manage UTI treatment effectively and mitigate resistance. Ongoing surveillance in private clinics is recommended to tailor interventions and adjust treatment protocols based on resistance trends.

Keywords: Urinary tract infections, antibiotic resistance, *Escherichia coli.*

INTRODUCTION

Urinary tract infections (UTIs) are among the most common bacterial infections, affecting millions of people worldwide and significantly impacting public health [1-3]. These infections are caused by a variety of microorganisms, primarily bacteria, that invade the urinary tract and can lead to symptoms ranging from mild discomfort to severe pain and systemic complications if left untreated. In clinical practice, effective management of UTIs requires accurate identification of the causative organisms and an understanding of their antibiotic susceptibility patterns to ensure the selection of the most effective treatment. However, the increasing prevalence of antibiotic-resistant strains poses a challenge to the effective treatment of UTIs, particularly in community settings [4-7].

The pattern of UTI-causing organisms and their antibiotic sensitivity can vary significantly across regions, influenced by local healthcare practices, antibiotic usage patterns, and population characteristics. In Bangladesh, the use of antibiotics without prescriptions and limited public awareness about antibiotic resistance contribute to the high incidence of drug-resistant UTI pathogens [8-11]. Understanding these regional patterns is essential for clinicians to prescribe appropriate treatments, minimize the risk of

treatment failure, and help combat the rise of antibiotic resistance. Despite the high prevalence of UTIs, there is limited data on the patterns of causative organisms and their antibiotic sensitivity specifically in private healthcare settings, where patients often seek quicker and more personalized care [12-14].

This prospective study conducted from 2016 to 2018 aims to analyze the patterns of organisms causing UTIs and their antibiotic sensitivity profiles in patients attending a private clinic. The study provides valuable insights into the most common pathogens responsible for UTIs, including both gram-negative and gram-positive bacteria, and their resistance to commonly prescribed antibiotics. By examining a targeted population attending a private clinic, this research aims to shed light on unique patterns that may differ from those observed in public hospitals, where patient demographics and antibiotic practices might vary.

In addition to identifying prevalent UTI pathogens, this study also seeks to address the pressing issue of antibiotic resistance. As multidrug-resistant strains become more common, the choice of effective antibiotics becomes narrower, leading to more complicated and costly treatment regimens. By analyzing resistance patterns over a multi-year period, this study can provide information on trends in antibiotic susceptibility, offering a basis for adapting treatment protocols to current resistance patterns.

OBJECTIVE

The findings of this study have significant implications for both clinical practice and public health policy. For clinicians in private practice, these insights enable more precise and effective treatment strategies, reducing the risk of recurrence and complications associated with ineffective therapies. For public health authorities, the study highlights the need for updated guidelines and interventions to curb antibiotic misuse and promote rational prescribing practices across healthcare sectors.

METHODOLOGY

Study Type

This study is a prospective observational analysis conducted over a two-year period from 2016 to 2018. The objective was to assess the patterns of causative organisms in urinary tract infections (UTIs) and their antibiotic susceptibility in a private clinical setting. The design was selected to allow for real-time, consistent data collection from UTI patients over a fixed period, aiming to identify trends in pathogen prevalence and resistance patterns.

Population

The study population consisted of patients diagnosed with UTIs who attended a private clinic in Bangladesh from 2016 to 2018. A total of 63 patients were included, selected based on confirmed diagnosis of UTI, willingness to participate, and provision of informed consent. Demographic data such as age were recorded, with the majority of participants falling within the 21-30 years age group (44.4%), followed by those aged 31-40 years (20.6%).

Data Collection

Data was collected from patients' urine samples, which were analyzed to identify the type of causative organisms and determine their sensitivity to various antibiotics. Standard microbiological procedures were followed, where urine samples were cultured to isolate bacterial pathogens, and their susceptibility to antibiotics was assessed using disk diffusion methods. Antibiotics tested included a range of commonly used agents, such as Cephradine, Ceftriaxone, and Imipenem, among others.

Data Analysis

The data analysis was conducted using descriptive statistics to summarize the frequency and percentage of each type of organism and their antibiotic sensitivity patterns. The primary organisms were identified, and their susceptibility to different antibiotics was categorized into sensitive, resistant, and intermediate responses. Percentages were calculated to represent the proportion of patients with sensitive, resistant, and intermediate responses to each antibiotic, enabling identification of the most effective and least effective treatments for each pathogen.

RESULTS

Table 1: Type of organism (N=63)

Type of organism	Frequency (n)	Percentage (%)
Escherichia Coli	42	66.7
MSSA	16	25.4
Acinetobacter spp	2	3.2
Staphylococcus	2	3.2
Enterococcus spp	1	1.6

Most of the organism found in this study was Escherichia Coli (66.7%) followed by MSSA (25.4%), Acinetobacter spp (3.2%), Staphylococcus (3.2%) and Enterococcus spp (2.5%).

Table 2: Demographic profile of the study subjects (N=63)

Age (years)	Frequency (n)	Percentage (%)
≤20	12	19.0
21 - 30	28	44.4
31 - 40	13	20.6
41 - 50	7	11.1
>50	3	4.8

Most of the study subjects were in age group 21 – 30 years (44.4%) followed by 31 – 40 years (20.6%), ≤20 years (19.0%), 41 – 50 years (11.1%) and >50 years (4.8%).

Table 3: Sensitivity and resistant pattern of different organism (N=63)

	Cephradine	Ceftriaxone	Cefixime	Ceftazidime	Cefepime	Imipenem	Meropenem	Co-trimoxazole	Gentamicine Gentabac	Netilmycine	Ciprofloxacine Civox	Levofloxacine Levobac	Doxycyline	Nitrofurantoin	Amikacin Amibac	Aztreonam
Escherichia Coli																
Sensitive	2 (22.2)	20 (51.3)	18 (46.2)	36 (94.7)	34 (91.9)	40 (100.0)	38 (100.0)	23 (57.5)	33 (86.8)	38 (100.0)	30 (73.2)	30 (73.2)	20 (51.3)	36 (92.3)	39 (100.0)	31 (81.6)
Resistant	7 (77.8)	19 (48.7)	21 (53.8)	2 (5.3)	2 (5.3)			17 (42.5)	4 (10.5)		10 (24.4)	10 (24.4)	18 (46.2)	2 (5.1)		5 (13.2)
Intermediate									1 (2.6)		1 (2.4)	1 (2.4)	1 (2.6)	1 (2.6)		2 (5.3)
MSSA																
Sensitive	13 (100.0)			1 (100.0)	14 (100.0)	16 (100.0)	15 (100.0)	11 (68.8)	13 (86.7)				9 (56.3)	14 (100.0)	14 (100.0)	
Resistant	0 (0.0)			0 (0.0)				5 (31.3)	1 (6.7)				7 (43.8)	0 (0.0)	0 (0.0)	
Intermediate									1 (6.7)				0 (0.0)	0 (0.0)	0 (0.0)	
Acinetobacter spp																
Sensitive	0 (0.0)	2 (100.0)	0 (0.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	2 (100.0)	0 (0.0)		2 (100.0)
Resistant	1 (100.0)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)		0 (0.0)

Staphylococcus																
Sensitive	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)				1 (50.0)	0 (0.0)	1 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)	1 (100.0)	1 (50.0)	
Resistant	1 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)				1 (50.0)	1 (100.0)		0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (50.0)	
Enterococcus spp																
Sensitive				1 (100.0)	1 (100.0)						1 (100.0)	1 (100.0)	0 (0.0)	1 (100.0)		
Resistant				0 (0.0)	0 (0.0)						0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)		

Most sensitive antibiotics for Escherichia Coli were Imipenem (100.0%), Meromenem (100.0%), Netilmycine (100.0%), Amikacin Amibac (100.0%), Ceftazidime (94.7%), Nitrofurantioin (92.3%), Cefepime (91.9%), Gentamicine gentabac (86.8%), Aztreonam (81.6%), Ciprofloxacine Civox (73.3%) and Levofloxacine (73.2%). Most resistant antibiotics for Escherichia Coli were Cephradine (77.8%), Cefixime (53.8%), Ceftriaxone (48.7%), Doxycyline (46.2%) and Co-trimoxazole (42.5%).

Most sensitive antibiotics for MSSA were Cephradine (100.0%), Ceftazidime (100.0%), Cefepime (100.0%), Imipenem (100.0%), Meromenem (100.0%), Nitrofurantioin (100.0%), Amikacin Amibac (100.0%) and Gentamicine gentabac (68.7%). Most resistant antibiotics for MSSA were Doxycyline (43.8%) and Co-trimoxazole (31.3%).

DISCUSSION

This study, focusing on UTI pathogens in a private clinical setting, reveals similarities and distinctions when compared to previous research on the prevalence and antibiotic resistance patterns of UTI-causing organisms. One similarity is the predominance of *Escherichia coli* (E. coli) as the most common causative agent in UTIs. In this study, E. coli accounted for 66.7% of cases, which aligns with other studies globally and regionally that also identify E. coli as the leading UTI pathogen [14]. This consistency underscores E. coli's role as a primary UTI pathogen due to its ability to colonize and infect the urinary tract effectively. Additionally, MSSA (Methicillin-Sensitive *Staphylococcus aureus*) was the second most prevalent organism, accounting for 25.4% of cases, which is notable but not universally observed in other studies, where *Klebsiella* and *Proteus* species often rank higher in prevalence.

However, distinct patterns in antibiotic resistance were observed in this study compared to other research. For example, E. coli in this study displayed high sensitivity to Imipenem and Meropenem (100%), Amikacin (100%), and Ceftazidime (94.7%), which is consistent with findings from other studies highlighting carbapenems and aminoglycosides as effective treatments against E. coli UTIs [15]. However, significant resistance was observed to antibiotics such as Cephradine (77.8%) and Cefixime (53.8%). In contrast, other studies have reported lower resistance rates to these antibiotics, indicating regional differences in resistance patterns potentially influenced by local prescribing practices, antibiotic misuse, and public health awareness levels [16].

The age distribution of UTI patients in this study also presents similarities and differences with other research. In this study, the majority of cases occurred in patients aged 21–30 (44.4%), followed by those aged 31–40 (20.6%), which aligns with research indicating a higher prevalence of UTIs in young adults. This pattern is often attributed to lifestyle factors, anatomical vulnerability, and reproductive activity, which are prominent in this demographic. Nevertheless, some studies, especially those conducted in hospital settings, report a higher prevalence of UTIs among older adults due to factors like weakened immune function and increased catheter use, showing that setting may influence demographic findings [17].

Furthermore, the antibiotic resistance pattern observed for MSSA differs from other studies, especially concerning Co-trimoxazole and Doxycycline, to which MSSA showed significant resistance (31.3% and 43.8%, respectively). In other studies, resistance rates for these antibiotics are often lower, possibly due to less frequent use in certain regions. This variation highlights the

importance of localized antibiotic stewardship programs, as resistance profiles can vary significantly between private and public healthcare settings and between countries with different antibiotic policies.

In terms of less common organisms, Acinetobacter spp. and *Staphylococcus* species accounted for 3.2% each, and *Enterococcus spp.* was rare at 1.6%. While Acinetobacter is not a typical UTI pathogen, it is increasingly recognized in settings with high antibiotic use, such as hospitals. The appearance of these organisms in a private clinical setting suggests that even in outpatient settings, attention to atypical pathogens is necessary. Some studies report higher incidences of *Proteus* and *Klebsiella* species, [13] which were not observed in this study, indicating that healthcare environment and patient population could influence pathogen profiles.

CONCLUSION

The findings of this study highlight the predominance of *Escherichia coli* as the leading causative organism of UTIs in a private clinical setting, with significant antibiotic sensitivity to carbapenems (Imipenem and Meropenem) and Amikacin, while showing substantial resistance to commonly used antibiotics like Cephradine and Cefixime. *Methicillin-Sensitive Staphylococcus aureus* (MSSA) was the second most prevalent organism, displaying similar sensitivity patterns but also notable resistance to Co-trimoxazole and Doxycycline. The demographic profile indicates a higher prevalence of UTIs among young adults, particularly those aged 21–30. These results underscore the critical need for localized antibiotic stewardship programs in private healthcare settings to address high resistance rates and optimize treatment protocols, as well as the importance of ongoing surveillance to adapt to evolving resistance patterns effectively.

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