

## Original Research

# Evaluation of antibiotic prescribing patterns and post-treatment follow-up in patients with urinary tract infections: A Comprehensive analysis of clinical practices and outcomes

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### Abstract

**Introduction:** Urinary tract infections (UTIs) are a leading cause of Emergency Department (ED) visits and hospitalizations worldwide, with the Middle East showing a rising incidence. However, limited data exists on the prevalence and antibiotic prescribing patterns for UTIs in this region. Women, particularly in the 16–35 years age group, are at an increased risk of UTI. The study explores empiric antibiotic therapy for UTIs based on national recommendations, the recurrence rates, and factors influencing relapse and reinfection. **Objective:** This study aims to evaluate empiric antibiotic prescribing patterns for UTIs in a tertiary hospital, assess the outcomes of treatment, and analyze factors related to relapse and recurrence of UTIs. **Methodology:** A retrospective review of medical records was conducted for patients aged 18 years or older diagnosed with a UTI at a tertiary care hospital in the Northern Emirates, UAE. Data were collected from the Internal Medicine, Urology, and Obstetrics & Gynecology departments between January 2022 and December 2023. A structured data collection form captured demographic, clinical, microbiological, and pharmacotherapeutic details. Antibiotic treatments and patient outcomes were analyzed using SPSS software, with chi-square tests and multiple regression analyses conducted to assess risk factors for relapse and recurrence. **Results:** Out of 273 reviewed records, 198 patients were included, with 59.6% being female. The most common bacterial pathogen identified was *Escherichia coli* (33.3%). Carbapenems were the most prescribed antibiotics, used in 56% of cases, followed by ceftriaxone (14.8%). The average treatment duration was 8.5 days, with 25.3% achieving a complete cure during hospitalization. Complications such as febrile UTI were noted in 37.9% of patients, with 11.6% experiencing prolonged symptoms. Factors significantly associated with relapse included a history of anatomical defects ( $p = 0.006$ ). Regression analysis showed that the type and duration of antibiotics significantly affected UTI recurrence ( $p < 0.001$ ). **Conclusion:** The study highlights the pattern of antibiotic use in the treatment of UTIs. The recurrence of UTIs was significantly influenced by anatomical defects, underscoring the need for targeted therapeutic strategies. A tailored approach to antibiotic therapy, aligned with local resistance patterns, is essential for optimizing treatment outcomes and preventing recurrent infections.

**Keywords:** Cystitis, pyelonephritis, United Arab Emirates, Urinary tract infection, UTI guidelines.

## INTRODUCTION

UTI is among the fifteen most common presentations in the Emergency Department (ED) annually and one of the top conditions that lead to hospitalization. Globally, the incidence of UTIs stands at 150 million every year with symptomatic UTIs ranging from seven million of which 100,000 people require hospitalization.<sup>1,2</sup> Data on UTI prevalence in the Middle East is limited. In a study conducted in Saudi Arabia for instance, the overall incidence of Community-Acquired (CA) UTIs was estimated to be 25% of all cases presenting to the ED.<sup>3</sup>

Women are known to have the highest rate of those cases with at least one episode of urinary tract infection affecting up to 50% of females.<sup>4</sup> In the age group of 16–35 years, women are 35 times more likely to be infected with UTI than men.<sup>5</sup> Many antibiotics are available to manage UTI, and choices depend on many factors, including whether the infection is complicated, uncomplicated, primary, or recurrent. Local resistance

pattern is another factor affecting the treatment choice and necessitating adherence to local guidelines. Presently, the Centers for Disease Control and Prevention (CDC) advises healthcare professionals to act to enhance the practice and utilization of antibiotics in human health and to implement an Antimicrobial Stewardship Program.<sup>6</sup>

This study intends to analyse the prescribing pattern of empiric therapy based on national recommendations for UTIs. It seeks to assess the success or failure of the treatment regimen by exploring possible related factors leading to the infection. In addition, it examines the rate of relapse and recurrence of UTIs among the study population one and three months after treatment completion and assesses possible related factors. This research is crucial due to the lack of information on UTIs in Middle Eastern countries despite their rising occurrence in both communities and healthcare facilities.

## METHODS

This retrospective study was conducted in the Internal Medicine, Urology, and Obstetrics & Gynecology departments of a tertiary care teaching hospital in the Northern Emirates of UAE. Carried out between November 2023 and March 2024, the study reviewed medical records of patients aged 18 years or older who were diagnosed with a UTI either at admission

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or during hospitalization between January 2022 and December 2023. Patients with incomplete records or those who received only outpatient care were excluded.

A structured data collection form was developed, comprising nine sections that included demographic details, medication history, vitals during hospitalization, clinical and microbiological data, UTI treatment, and potential risk factors. Patient outcomes, relapse data, and any documented drug-related problems (DRPs) were also recorded. DRPs were identified and categorized according to Hepler and Strand's classification. Causality assessment of reported ADRs were done using Naranjo's algorithm. Drug interactions were identified and categorised based on Lexicomp drug interaction classification. Data analysis was performed using Statistical Package for the Social Sciences 21 (SPSS 21). Chi-square tests were used to assess the association between various factors (such as gender, pregnancy, diabetes, etc.) and UTI relapse/reinfection. Additionally, multiple regression analyses were conducted to examine the effect of antibiotic type and duration on the recurrence rate of UTI and relapse, with model significance assessed using ANOVA

The ethical clearance of the study was obtained from the localised institutional review board prior initiating the study.

## RESULTS

During the study period, a total of 273 medical records were reviewed. Of these, 75 records (27.47%) were excluded due to duplication (n=26), absence of a UTI diagnosis (n=42), outpatient treatment (n=4), or missing documentation (n=3). Consequently, the final study population comprised 198 patients, including 80 males (40.4%) and 118 females (59.6%). The majority of the study population (58.6%) belonged to Asian ethnicity, with a mean Body Mass Index of 28.45±6.28. Marital status analysis revealed that 88.9% of participants were married. Additionally, a total of 78.8% of the study population had a chronic medical condition, with hypertension being the most common (14.1%). The majority (75.7%) were hospitalized for 1–3 days, and 10.6% had a documented drug allergy. Urine cultures were positive in 33.3% of cases, with *E. coli* being the

most frequently identified pathogen. The demographic and clinical characteristics of the study population are summarized in Table 1.

During hospitalization, patients received various antibiotic regimens, with 128 (64.6%) receiving a single antibiotic and 30 (15.15%) receiving two. Meropenem was the most frequently prescribed antibiotic (37.5%), followed by Ceftriaxone (14.8%). Carbapenems were the most commonly used antibiotic class, administered to 111 patients (56%), with 30.6% of eligible cases not undergoing de-escalation. Among UTI admissions in 2022 (n=83), 45 patients (54.2%) received carbapenems, while in 2023, 66 out of 115 admissions (57.3%) were treated with this class. The most frequently prescribed antibiotic combination was Ciprofloxacin with carbapenems, specifically Meropenem (13.2%) or Ertapenem (10.0%), totaling 23.3%. Table 2 provides a detailed overview of antibiotic prescriptions.

A total of 14 adverse drug reactions (ADRs) were reported in the study population, with diarrhea being the most common ADR following antibiotic use. All ADRs were mild in severity, and 64% were classified as probable based on Naranjo's Causality Assessment Algorithm. Additionally, 24 potential drug interactions were identified, 92.6% were categorized as Category C, requiring therapy monitoring. The details of the ADRs and Drug Interactions are provided in Table 3.

The outcomes of UTI treatment are summarized in Table 3, with each outcome detailed separately. The average treatment duration was 8.5 days, with 25.3% of patients achieving cure during hospitalization, while 42.7% were discharged with an incomplete cure. The majority of patients experienced symptom duration of less than 7 days (25.8%), and recovery was most commonly observed between 7 to 14 days after treatment initiation. However, 23 patients (11.6%) continued to experience symptoms. Additionally, 37.9% (75 patients) presented with severe symptoms, and fever was the most common symptom(58.1%).

The analysis of factors associated with UTI relapse or recurrence revealed several variables with varying levels of association. Gender did not show a significant association, as the Chi-square test yielded a p-value of 0.208, indicating no notable difference

**Table 1.** Demographic and Clinical details of the Study Population

Variables	Category	Frequency (%)
Age in years	Less than 20	1 (0.5)
	20 – less than 30	34 (17.2)
	30 – less than 40	76 (38.4)
	40 – less than 50	36 (18.2)
	50 – less than 60	22 (11.1)
	≥ 60	29 (14.6)
	Mean, SD	42.64 , 15.53
	Range	18 – 93
Gender	Male	80 (40.4)
	Female	118 (59.6)



Ethnicity	Arab	65 (32.8)
	Asian	116 (58.6)
	African	16 (8.1)
	European	1 (0.5)
Body Mass Index	< 20	9 (4.5)
	20 - less than 25	40 (20.2)
	25 - less than 30	88 (44.4)
	30 - less than 35	38 (19.2)
	35 - less than 40	14 (7.1)
	≥ 40	9 (4.5)
	Mean, SD	28.45, 6.28
	Range	14.02 – 47.3
Social History	Single	20 (10.1)
	Married	176 (88.9)
	Divorced	0 (0.0)
	Widow	2 (1.0)
Chronic diseases	Total	156 (78.8)
	Hypertension	22 (14.1)
	Diabetes	36 (23.1)
	Kidney disease	12 (7.7)
	Cholesterol	16 (10.3)
	Liver cirrhosis	2 (1.3)
length of Stay (days)	01-Mar	139 (75.7)
	04-Jun	35 (17.7)
	07-Sep	4 (2.0)
	10-Dec	2 (1.0)
	≥ 13	7 (3.5)
	Mean, SD	3.02, 2.57
	Range	Jan-15
Allergic Status	Total	21 (10.6)
	Food allergy	8 (38.1)
	Drug allergy	11 (52.4%)
	Dust allergy	2 (9.5)
Urine Culture	Negative	68 (34.3)
	Positive	66 (33.3)
	Improperly performed	21 (10.6)
	Not performed	43 (21.7)
Urine Pathogens in positive cultures (n=66)	E. coli (non ESBL)	19 (28.7)
	E. coli ESBL	23 (34.8)
	K. pneumonia (non ESBL)	1 (1.5)
	K. pneumonia ESBL	2 (3)
	Morganella morganii	1 (1.5)
	Staphylococcus Aureus	1 (1.5)
	Enterobacter cloacae	1 (1.5)
	Enterococcus faecalis	1 (1.5)
	Proteus mirabilis ESBL	1 (1.5)

Drug	Dose	Frequency	Route	Number of doses received during hospital stay	Frequency (%)
Cefepime	1-2g	Q12H	IV	1-4	2 (01.6)
Ceftizoxime	1g	Q12 H	IV	1-4	6 0(4.7)
Ceftriaxone	1-2g	Q12H-Q24H	IV	1-4	23 (18.0)
Cefuroxime	500mg	Q12 H	Oral, IV,	3-5	3 (02.3)
Ciprofloxacin	200-500mg	Q12 H	Oral, IV	1-5	7 (05.5)
Co-Amoxiclav	1.2g	Q8 H	IV	1-4	3 (02.3)
Ertapenem	1g	Q24 H	IV	1-12	8 (06.3)
Fosfomycin	3g	Once	Oral	1	2 (01.6)
Imipenem/Cilastatin	1g	Q8 H	IV	4-6	15 (11.7)
Levofloxacin	500mg	Q24 H	IV, Oral	1-3	2 (01.6)
Meropenem	1g	Q8 H	IV	1-29	48 (37.5)
Nitrofurantoin	100mg	Q12 H	Oral	35	1 (0.8)
Piperacillin/tazobactam	4.5g	Q8 H	IV	3-34	6 (04.7)
<b>Total</b>					<b>128 (100.0)</b>

UTI Management Outcomes		Frequency (%)
Treatment duration (days)	Mean, SD	8.49 , 3.60
Clinical cure during hospitalization	Yes	50 (25.25)
	No	148 (74.75)
Recovery period	< day 7 from initiation of treatment	52 (26.3)
	by day 7-14 from initiation of treatment	103 (52.0)
	By day 15-21 from initiation of treatment	6 (03.0)
	During medical follow-up	2 (01.0)
	Unknown	35 (17.7)
Persistence or progression or appearance of new signs or symptoms	Yes	23 (11.6)
	No	138 (69.7)
	Unknown	37 (18.7)
Symptoms duration	Mean, SD	10.80 , 15.33
Adverse treatment reactions	Diarrhea	5 (02.5)
	Skin rash	3 (01.5)
	Vaginal candidiasis	4 (02.0)
	Gastritis	2 (01.0)
	None	184(92.92)
Drug Interactions	Number of patients with interactions	24 (100)
	Category B Interactions	1 (04.2)
	Category C Interactions	22 (91.6)
	Category D Interactions	1 (04.2)



between males and females in terms of recurrence. While the presence of diabetes showed a trend toward a potential association ( $p = 0.087$ ), it was not statistically significant. A history of genitourinary infections and previous UTIs did not demonstrate significant associations with relapse, with  $p$ -values of 0.302 and 0.086, respectively. However, a history of anatomical defects leading to stasis, obstruction, or urinary reflux showed a significant association with UTI relapse, with a  $p$ -value of 0.006. Chronic diarrhea, chronic constipation, use of contraceptives, immunosuppressant use, and recent antibiotic use within the last 3 months were not significantly associated with relapse, as indicated by  $p$ -values greater than 0.05. Overall, history of anatomical defects emerged as a significant risk factor for UTI recurrence in this study. Analysis of factors associated with UTI relapse/ recurrence is presented in Table 4.

The regression analysis examining the rate of urinary tract infections (UTIs) showed that both the type of antibiotic and duration of antibiotic treatment had significant negative effects. The model indicated a moderate correlation between these variables and the rate of UTIs ( $R = 0.623$ ,  $R^2 = 0.388$ ), with

the relationship being statistically significant ( $F = 124.050$ ,  $p = 0.000$ ). Specifically, the type of antibiotic used was associated with a decrease in UTI rates ( $\beta = -0.133$ ,  $t = -11.138$ ,  $p = 0.000$ ), and the duration of antibiotic use was similarly linked to a reduction in UTIs ( $\beta = -0.144$ ,  $t = -8.726$ ,  $p = 0.000$ ). This suggests that the choice and length of antibiotic treatment play an important role in reducing UTI occurrences. For relapse or recurrence of UTIs, the analysis found a strong correlation ( $R = 0.735$ ,  $R^2 = 0.540$ ) between the use of Carbapenems and the likelihood of recurrence, with a significant negative impact ( $\beta = -0.544$ ,  $t = -15.268$ ,  $p = 0.000$ ). Furthermore, the duration of Carbapenem use also showed a significant negative effect on relapse ( $\beta = -0.222$ ,  $t = -6.110$ ,  $p = 0.000$ ). These findings highlight the importance of Carbapenem treatment and its duration in preventing UTI recurrence. Overall, the study suggests that appropriate antibiotic selection and treatment duration are crucial in managing both the initial infection and preventing relapse or recurrence. The analysis of the effect of initial antibiotic type and duration on the recurrence rate of UTI is presented in Table 5.

**Table 4.** Factors Associated with UTI Relapse/Reinfection

Variable	No Relapse n (%)	Relapse n (%)	Chi <sup>2</sup>	p-value	Significance
Gender			3.144	0.208	Not significant
Male	51 (25.8)	14 (7.1)			
Female	79 (39.9)	11 (5.6)			
Pregnancy	8 (4.0)	2 (1.0)	0.525	0.769	Not significant
Diabetes	32 (16.2)	11 (5.6)	4.088	0.087	Not significant
Genitourinary Infection	14 (7.1)	1 (0.5)	4.859	0.302	Not significant
Previous UTI	50 (25.3)	12 (6.1)	4.903	0.086	Not significant
Chronic diarrhea	1 (0.5)	0 (0.0)	7.788	1.000	Not significant
Chronic Constipation	8 (4.0)	3 (1.5)	3.603	0.462	Not significant
Anatomical defects (stasis/obstruction/reflux)	28 (14.1)	11 (5.6)	14.527	0.006	Significant
Contraceptives	6 (3.0)	0 (0.0)	6.798	0.147	Not significant
Immunosuppressant use	4 (2.0)	1 (0.5)	2.041	0.728	Not significant
Antibiotics (last 3 months)	47 (23.7)	12 (6.1)	6.440	0.169	Not significant

**Table 5.** The Effect of Initial Antibiotic Type and Duration on the Recurrence Rate of UTI

Dep. variable	Model Summary				ANOVA			Coefficients				
	R	R <sup>2</sup>	Adj.R <sup>2</sup>	Std. Error	DF	F	Sig F*	Ind. Variable	B	Beta	t	Sig T*
Rate of urinary tract infections	0.623	0.388	0.384	0.55	1	124.05	0	Constant	2.256		53.571	0
								type of antibiotic	-0.133	-0.623	-11.138	0
	0.529	0.28	0.276	0.596	1	76.143	0	Constant	2.207		49.298	0
								Duration of antibiotic	-0.144	-0.529	-8.726	0
Relapse or recurrence	0.735	0.54	0.538	0.326	1	233.112	0	Constant	2.465		5.368	0
								Carbapenem used	-0.544	-0.735	-15.268	0
	0.667	0.449	0.446	0.314	1	240.025	0	Constant	2.067		30.98	0
								Carbapenem duration	-0.222	-0.667	-6.11	0



## DISCUSSION

The purpose of this study was to evaluate the prescribing pattern of antibiotics as UTI treatment. In addition, it analysed the possible risk factors that likely lead to the possibility of having UTI among adults. Out of 198 medical records of admitted patients with UTI diagnosis, 118 were females, showing a percentage of 59.6% of the study population. These numbers presented similar results in most studies in the same field. In a previous study conducted in Jordan by Rama Alkhalwaldeh et al.<sup>7</sup>, which enrolled 800 patients with positive urine culture results, females formed 69.4% of the study population. In a study investigating similar objectives, females encountered 66.67% of the sample of UTI-diagnosed adults.<sup>8</sup> Moreover, from the demographic data analysis, patients with chronic diseases formed almost 79% of the sample, with diabetes at the top. Diabetic patients are at a higher risk of all types of infection compared to non-diabetic patients including lower respiratory infections, UTI, sepsis, infective endocarditis, skin, bone, and joint infections, and mucous membrane infections.<sup>9</sup> Based on the data currently available, it has been identified that the predominant bacterial infection prevailing in diabetic patients is UTI.<sup>10</sup> Various investigations supported the previous assertion that high blood glucose levels that are not well managed could act as a source of nutrition for bacteria. In a cross-sectional study done in the Kingdom of Saudi Arabia, the total rate of UTI among diabetic patients was 25%, 7.2%, and 41.1% in males and females, respectively. Many risk factors increase UTI frequency among diabetic patients.<sup>11,12</sup>

The average length of stay of admitted patients was 2.5 days, considered less than some other studies. An average hospital stays of 10 days in the study mentioned previously and conducted by Hongying Zhu et al 30, and 12 days in another conducted by Rama Alkhalwaldeh et al in Jordan.<sup>7</sup>

During the study, we found notable variation in the handling of ordering urine cultures and urinalysis. In 22 (11%) cases, urine cultures were not performed in good practice in which the results were negative because the patient was on antibiotics either prescribed in OPD before admission or started empirically before performing urine sample cultures upon admission. And this can limit the assessment of its efficacy as well as the likelihood of successful antimicrobial stewardship, 9.6% (19 out of 198) of urine cultures were performed after empiric antibiotic initiation. In 21.7% (43) of the study sample, cultures were not done at all and therefore there could have been instances of difficulty in the diagnosis and management of the infection. Pyuria was absent in 43.94% of cases treated for UTI, and some of these cases were even negative cultures however having all clinical symptoms. From the properly performed urine cultures, *Escherichia coli* was the most frequently isolated pathogen, 43 (32%), and approximately half of them were ESBL, 23 (53.4%). Followed by *Klebsiella pneumoniae* (6%). These results match those of a similar study, describing *E. coli* as the most common UTI pathogen (75.6%) and *K. pneumoniae* (19.1%).<sup>13</sup>

WHO prescribing indicators were the evaluating tool. During

hospitalization, patients received various antibiotics with 128 (64.6%) patients receiving one type of antibiotic, 29 (14.6%) receiving two, and an average of 1.39 antibiotics per patient. Among these, the largest group was administered Carbapenems with a percentage of 55.6%, with Meropenem at the top of the list forming 37.5% and Imipenem (6.3%) of the whole sample. However, not all the cases were candidates for the Carbapenem class. This overuse of broad-spectrum antibiotics will in one way, or another enhance the development of antimicrobial resistance. Since this class ranks among the broadest and most effective at the moment, increased resistance against it complicates the treatment of many infections. As described in the previous section, the use of carbapenems has risen from 54.2% in 2022 to 57.3% in 2023. The most common combination used empirically was carbapenem class with fluoroquinolones, especially Ciprofloxacin.

Similarly, a recent study conducted in China, showed that among their study sample, Fluoroquinolones and beta-lactams were the most common empiric treatment for UTI. Knowing that according to the China Antimicrobial Surveillance Network (CHINET) in 2018, the resistance rate of *E. coli* to Ciprofloxacin was 70% which classified this intervention as an improper drug selection.<sup>14,15</sup> An assessment of UTI complications among the population was done using combining documented vital signs and signs and symptoms. This enabled us to decide whether this patient needed broad-spectrum antibiotics at admission or not or needed pseudomonas coverage or not. Cephalosporin class comes in second place with 25.8%, and Ceftriaxone is the most frequent antibiotic from this class at 28.1%. Then fluoroquinolones with 7.1%. Nitrofurantoin was only used in 0.8% of the cases although it was the first choice in the guidelines. We considered the antibiotics taken on discharge to finish the full course.

In our study, the prescription ordering of antibiotics either by generic or brand names was analyzed based on the documented physicians' orders. It was found that 78.16% were ordered by generic name and 21.84% were ordered by brand name. However, the hospital's local system used only drug brand names to enter the prescription. Knowing that Meropenem was the most frequently used followed by Imipenem from the same class, actual de-escalation was achieved in only 26% of participants, despite global guidelines recommending de-escalation once urine cultures are available. However, urine cultures were not performed in all cases and were negative in many cases. Carbapenems in these cases were continued based on the patient's clinical presentation. As mentioned previously, carbapenem class use has increased in the second year of study compared to the first, this could be an indicator of a rise in its need because of its overuse. The second antibiotic on the list was Ceftriaxone, especially for uncomplicated pyelonephritis. Furantoin and Fosfomycin were only used in 11.4%. Fluoroquinolone class was the most frequently prescribed on the discharge and widely used empirically, with Ciprofloxacin on the top.

In the same region, a Jordanian study concluded that the most frequently prescribed empiric antibiotics were ceftriaxone



(n = 214, 24.5%), Imipenem/Cilastatin (n = 209, 23.9%), and Levofloxacin (n = 128, 14.7%) where 60.9% of them were considered proper empiric antibiotics.<sup>7</sup>The clinical outcomes associated with UTI treatment were analyzed based on previous studies. A follow-up period of 3 months following the patient's discharge was performed, assessing the clinical cure, the relapse, or reinfection clinically or microbiologically. It is shown that 69.9% of patients were cured within the first week of initiating antibiotics, and 8.5% within the second. Likewise, a symptom duration range of 1-7 days was frequently noticed among the population (69.7%). Despite the administered treatments, the symptoms persisted in only 23 patients (11.6%) who all experienced severe symptoms. The average duration of symptoms was calculated to be 8.5 days. Treatment administration duration was less than 10 days in 76.8% of our study population compared to similar study results showing a percentage of 24.8% of the sample treated to less than 1 week and 60.8% more 51. The major complications found among the population were febrile UTIs followed by urosepsis, 33.8% and 13.6% respectively. This may explain the need for extending to broad-spectrum classes of antibiotics, as in all these cases the use or escalation to Meropenem or Ertapenem was recorded.

In this study, we also investigated the risk factors associated with the recurrence based on previous studies, and local recommendations. Female gender, diabetes, history of UTI, use of contraceptives, immunosuppressants, corticosteroids, and others mentioned above were considered our predicted variables. Among them, it was clear that, unlike the other studies' results, males (7.1%) are more susceptible to experiencing at least 1 episode of recurrent UTI in the first 3 months following treatment completion compared to females (5.6%). In this field, a study conducted in KSA to assess the effectiveness of prophylactic antibiotics in recurrent UTI concluded that the recurrence rate in men is 14% compared to that in women with 50%<sup>18</sup> which is against our results. Additionally, diabetic patients are at high risk for RUTI, forming 48% of all recurrences. From our results, we consider a previous history of UTI within the past year as a risk factor for relapse as well (6.1%). A history of urinary tract obstruction 11 (5.6%), chronic constipation 3 (1.5%), and pregnancy 2 (1.0%) are also considered the most prominent factors associated with the recurrence and relapse of UTI. Besides assessing the clinical recurrence, the microbiological relapse rate was analyzed to be 8%, 9 (56.2%) of them were males, 7 (43.8%) were females and only 1 was pregnant. From all other predicted risk factors, a history of UTI was significant describing a percentage of 56.2% of all microbiological relapses recorded. However, it is important to mention that urine culture was performed only in

65.8% of total clinical relapses (27 out of 41), which could lead to inaccurate results interpretation.

During the study, we touched on an interesting finding within the results, which is the effect of the initial antibiotic administered for UTI on the recurrence rate. As per our results, the value of the correlation coefficient R reached 0.623, indicating a strong relationship between the type of initial antibiotic and the recurrence rate of UTI. For more specifications, we specially tested the effect of carbapenem class use and its duration in days on the rate of relapse. The results show a significant effect in the use and duration of carbapenem (mostly meropenem) This is an important addition to this field, as it illustrates the essential role of selecting the appropriate empiric therapy, not only to avoid microbial resistance but also to prevent reinfection.

## CONCLUSION

In conclusion, this study explored the prescribing patterns and outcomes of urinary tract infection (UTI) treatment, highlighting the impact of antibiotic choice and duration on clinical outcomes. The majority of the study population, which consisted primarily of females and patients with chronic conditions like diabetes and hypertension, were treated with broad-spectrum antibiotics, particularly carbapenems such as meropenem. *Escherichia coli* was the most common pathogen identified. While most patients (69.9%) achieved clinical cure within the first week, some continued to experience symptoms, and complications like febrile UTIs and urosepsis necessitated prolonged antibiotic use. The study also identified risk factors for UTI relapse, with anatomical defects associated with urinary stasis or obstruction being a significant factor. Although diabetes and a history of previous UTIs showed trends toward increased relapse risk, these factors did not reach statistical significance. The use and duration of carbapenem antibiotics were negatively correlated with UTI relapse rates. Hence institutional antibiograms in alignment with national guidelines shall detect the use of empiric antibiotics for the treatment of UTI.

## Limitations

The limitations of this study include its single-center setting, retrospective design, relatively small sample size, and a short follow-up period of three months. These factors may restrict the generalizability of the findings. Future studies should consider multi-center approaches with larger sample sizes and longer follow-up durations to validate these results and offer more thorough recommendations.

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