

## Prescribing pattern of antibiotics and guideline adherence in acute community-acquired uncomplicated urinary tract infections in Pakistani women

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### ABSTRACT

**Aim:** Acute urinary tract infection is one of the most predominant community-acquired infections. These infections are often treated with antibiotics, but its inappropriate usage leads to *Clostridium difficile* infections, resistance development and higher cost. To evaluate the prescribing pattern of antibiotic and adherence to Infectious Diseases Society of America (IDSA) guidelines in uncomplicated urinary tract infections (cystitis and pyelonephritis) among females.

**Material and Method:** A retrospective, chart-review study was conducted in a teaching hospital in Pakistan. Consecutively two hundred (n=200; cystitis: n=100, pyelonephritis: n=100) medical charts of female patients kept for the last 1 year (May 2018 to April 2019) were enrolled through random systematic sampling technique. Important information was extracted from medical charts and compared with IDSA recommendations. Finally, collected data were entered into SPSS, version 22.0 for statistical analysis, such as; frequency, percentage and chi-square test. A p-value <0.05 was considered statistically significant.

**Results:** The most frequently prescribed antibiotic was ciprofloxacin (58, 29%), followed by nitrofurantoin (39, 19.5%) and ceftriaxone (32, 16%). About, 86 (43%) patients received an appropriate antibiotic. The dose was given according to the guidelines in 84.5% of patients, whereas the duration of prescribed antibiotic was appropriate in 61% of the patients, with a significant inappropriate dose and duration in pyelonephritis patients. A total of 58 patients were completely correct in all steps (drug, dose and duration). The appropriate prescribing of antibiotic with respect to selection/choice, dose and duration were more in cystitis as compared to pyelonephritis (P=0.001).

**Conclusions:** A low adherence rate with guidelines was observed. Real actions are needed for educative interventions and implementation of standard guidelines for the improved good prescribing practices of antibiotic and better care of patients.

**Keywords:** Urinary tract infection, women, antibiotics, Pakistan, guidelines

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## INTRODUCTION

Acute urinary tract infection (UTI) is among the most predominant community-acquired infection (1). Antibiotics are commonly prescribed for uncomplicated cystitis and pyelonephritis in healthy non-pregnant women (2,3). Infectious diseases are often treated with antimicrobials, but its inappropriate usage leads to *Clostridium difficile* infection, antimicrobial resistance (AMR) due to Gram-negative bacteria and also increase the emergence of extended-spectrum beta-lactamase (ESBL) producing microorganisms (4,5).

The unnecessary antimicrobial prescription reported throughout the world and more often in previous studies (4,6,7). To combat these trends, antimicrobial stewardship programs (ASPs), antibiotic awareness campaigns, surveillance of consumption of antibiotics, guidelines adherence and audits of antibiotic prescribing are important limited resources interventions for addressing a wide scope of antimicrobial misuse (4, 8). It is crucial that physicians adhere to such programs in order to obtain the ultimate goal of reducing unnecessary and inappropriate antibiotic usage (4,6-10).

However, the extent of antibiotics usage pattern and guideline adherence in selected infectious diseases are poorly explored. Furthermore, no similar investigations were carried out in this setting. Thus, the aimed of this study was to evaluate antibiotic prescribing practices and adherence to IDSA guidelines for the treatment of two common uncomplicated UTIs (cystitis and pyelonephritis) among Pakistani women.

## MATERIAL AND METHOD

### Ethics

The study was conducted according to the **Helsinki Declaration of Principles**. A retrospective cross-sectional and medical chart-based study was carried out in a teaching hospital, which is both a tertiary

referral center for the Karachi city (Pakistan) population and a main referral government-based hospital with a wide range of health facilities. The **ethical approval** was waived by the Institutional review board of concerned hospital due to medical chart, retrospective and observational nature of the study.

### Patients and Method

Consecutively two hundred (n=200; cystitis: n=100, pyelonephritis: n=100) medical charts of female patients were collected from the prescription kept for the last 1 year (May 2018 to April 2019) through random systematic sampling technique for comparison purpose. Female patients aged 18 years or older, diagnosed with uncomplicated UTI, and received antibiotics were included in this study. Male patients, females diagnosed with complicated UTI, previous infections and pregnant women were excluded.

Important data about patients' demographics and antibiotic usage (name, dose, duration, frequency) was collected from medical charts. The observed practices were compared with updated standard treatment guidelines of the Infectious Diseases Society of America (IDSA) and European Society for Microbiology and Infectious Diseases for the acute uncomplicated cystitis and pyelonephritis treatment in women (11). The details recommendations are listed in **Table 1**.

The antibiotic selection, dose, and duration were considered as appropriate or non-appropriate. The overall treatment regimen was marked as appropriate when all the three parameters (selection/choice, dose and duration) were appropriate. Appropriateness of prescription was assessed according to IDSA guidelines (11).

### Statistics

Finally, collected data were entered into SPSS, version 22.0 for statistical analysis, such as; frequency, percentage and chi-square test. A p-value <0.05 was considered statistically significant.

**Table 1.** Recommendation of guidelines about appropriate antibiotic in uncomplicated cystitis and pyelonephritis in women.

Uncomplicated Urinary tract infection	Antibiotic	Choice	Dose	Duration
Cystitis	First line	Nitrofurantoin	100 mg twice daily	5 days
		Trimethoprim-sulfamethoxazole	160/800 mg twice daily	3 days
	Alternative	Fosfomycin	3 g	Single dose
Pyelonephritis	First line	Oral fluoroquinolones	500 mg twice daily	7 days
	Alternative	Nil	Nil	Nil

Abbreviations: **g** Gram, **mg** Milligram.

**Table 2.** Patient demographics and appropriateness of treatment (n=200)

Antimicrobial	Cystitis n	Pyelonephritis n	Total n
Age			
18–30	30	41	71
30–40	27	19	46
40–50	22	17	39
50–60	13	21	34
60–70	7	2	9
>70	1	0	1
Prescribed antibiotic			
Ciprofloxacin	19	39	58
Nitrofurantoin	23	16	39
Ceftriaxone	11	21	32
Amoxicillin plus clavulanate	12	14	26
Fosfomycin	15	2	17
Trimethoprim-sulfamethoxazole	9	3	12
Cefazolin	6	2	8
Cefoperazone plus Sulbactam	3	2	5
Ampicillin	2	1	3
Total	100	100	200
Appropriateness of treatment	Appropriate /Non-appropriate	Appropriate /Non-appropriate	Appropriate /Non-appropriate
Choice/Selection	47/53	39/61	86/114
Dose	91/9	78/22	169/31
Duration	63/37	59/41	122/78
Overall Appropriateness	33/67	25/75	58/142

**Abbreviation:** n Number

## FINDINGS

### Pattern of Antibiotics

Out of 200 patients, the most frequently prescribed antibiotic was ciprofloxacin (58, 29%), followed by nitrofurantoin (39, 19.5%). Other different types of antibiotics were also used for the management of cystitis and pyelonephritis. Complete details are given in **Table 2**.

### Choice/Selection of Antibiotics

The prescribed antibiotic was appropriate in 86 (43%) patients. About 47 patients in cystitis and 39 in pyelonephritis received appropriate antibiotic choice according to the guidelines (**Table 2**).

### Dose of Antibiotics

The right dose was prescribed to one hundred and sixty-nine (84.5%) patients, whereas 31 (15.5%) patients were received non-appropriate dose with more

appropriateness in cystitis (45.5%; n=91) as compared to pyelonephritis (39%; n=78) (**Table 2**).

### Duration of Antibiotics

The overall duration of treatment was appropriate in 122 (61%) cases and non-appropriate in 78 (39%) cases. Mean duration of antibiotic use in patients with cystitis and pyelonephritis was 7.2 days and 9.8 days respectively. The appropriate duration of nitrofurantoin was observed in 21 out of 23 (91.3%) cystitis patients, whereas ciprofloxacin duration was acceptable in 19 out of 39 (47.7%) pyelonephritis patients. Treatment durations were statistically longer than the recommended by the guidelines and statistical difference in terms of duration of antibiotic usage was observed in cystitis and pyelonephritis patients (p=0.001).

### Overall Adherence to the Guidelines

A total of 58 (29%: cystitis =33, pyelonephritis=25) patients were completely correct in all steps (choice,

dose, duration). However, incorrect therapy was given to 142 (71%) patients, according to the guidelines (**Table 2**). The appropriate prescribing of antibiotic with respect to selection/choice, dose and duration were more in cystitis as compared to pyelonephritis;  $p=0.001$ .

## DISCUSSION

We demonstrated the antibiotic prescribing practices, according to the updated IDSA guidelines in order to guide healthcare prescribers on the optimal therapy (choice, the dose and duration of treatment) for an antimicrobial agent. The study provides a comprehensive overview about antibiotic usage in two common uncomplicated UTIs, and we do believe that our data provided insights into daily clinical practice. The findings revealed low compliance rate with the IDSA guidelines for antibiotic prescribing in community-acquired uncomplicated urinary tract infections at the selected tertiary care hospital.

Ciprofloxacin was the most commonly prescribed antibiotic (29%), followed by nitrofurantoin (19.5%) in this retrospective observational study. These findings were supported by the study conducted in Lebanon (1) and Texas, USA (12) however Kim M, et al (13) reported that trimethoprim-sulfamethoxazole and ciprofloxacin were the frequently prescribed antibiotics in their settings. The higher utilization of ciprofloxacin reported in this study also revealed by Kim M, et al. (13) and Grigoryan L, et al. (12). Prescribers' lack of awareness about IDSA guidelines, certain antibiotics familiarity, and their preference may be a possible explanations of low concordance rate in this research and also reported by previous studies (1,7,12,13). Real actions are needed for educative interventions and implementation of updated regional and international guidelines for the improved good prescribing practices of antibiotic and better care of patients.

The antibiotic first drug of choice was administered as an empiric treatment in only 86 (43%) women according to the protocols. Similar findings were also reported by Kahan, et al. (40.5%) (14). This value was higher than the study of Grover, et al (25%) (15) but, lower as compared to Llor C, et al (52.3%) (16) study. The duration of treatment was inappropriate in 78 (39%) patients, which may responsible for side effects, the risk of resistance, wastage of resources, and the financial burden (12,14). The inappropriate duration was also reported in previously published studies (1,2,12,14,16). According to the review conducted by Lutters M, et al. showed that, no difference in short-term clinical failure between short-treatment course (3 to 6 days) and long-treatment course (7 to 14 days) antimicrobial therapy (17). Unawareness and lack of updated knowledge of physicians about the evidence

supporting shorter-treatment duration for UTI than for many other infectious diseases may be a reason behind such practices (12).

The overall adherence to the IDSA guidelines was 29%. This value was higher than the study conducted by Kabbara et al (21%) (1). The higher rate of overall compliance was reported by Kim M, et al (34%) (13). The low adherence rate in this study was aligned with previously published studies (1,2,12,13). The importance of adherence to clinical practice guidelines cannot be denied and crucial for the reduction of unnecessary antibiotic practices (16,18). The lack of knowledge and awareness of prescribers about standard recommendations, and their preference for certain antibiotics based on their clinical expertise may be a possible reason of non-adherence.

This study had some limitations. Firstly, this was a retrospective observational study so the cause-effect relationship between elements could not be assessed. Secondly, convenience samples of only 200 female patients were included in the study. Thirdly, the present study used evidence-based international guidelines to measure compliance rate because there were no available local guidelines in the selected hospitals. Finally, patients were recruited for only two common UTIs infection in women from one hospital hence, findings of this study may not be representative of the entire country. However, these findings add a piece of useful information, particularly around appropriate antibiotic use (choice, dose, duration) and adherence to standard IDSA guidelines in two common uncomplicated UTIs among the women population and health care system.

In conclusion, this study demonstrates a low adherence rates with guidelines. The main identified problems were the inappropriate choice, dose and duration of therapy. Identifying barriers to guideline adherence and urgent steps for improved prescribing practices are required. The suboptimal adherence rate can be improved through periodic audit of antibiotic practices, use of computerized systems for better treatment record, continuous education, evidence-based training and development of local guidelines as per the international guideline recommendations.

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