

Original article

Determinants and Clinical Patterns of Recurrent Urinary Tract Infections Among Women in Primary Care Settings: A Cross-Sectional Study from Tripoli, Libya

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Corresponding Email: alaaemtir61@gmail.com**Abstract**

Recurrent urinary tract infections (rUTIs) are a common clinical and public health issue among women, associated with morbidity and frequent antibiotic use. Data from low- and middle-income settings remain limited. This study was conducted to assess the prevalence, clinical features, and predictors of rUTI among adult women in outpatient clinics in Tripoli, Libya. A retrospective cross-sectional study included 180 women with UTI symptoms (April–August 2025). Data were collected via structured questionnaires covering demographics, medical history, behavioral factors, recurrence, and treatment. rUTI was defined as ≥ 3 episodes within 12 months. Associations were tested using chi-square, and logistic regression identified independent predictors ($p < 0.05$). rUTI prevalence was 39.4%. Most participants were aged 25–34 years (34.4%) and married (57.2%). Dysuria (75.0%) and frequency (60.6%) were the most common symptoms. Antibiotics were prescribed in 86.7%, with 24.4% reporting no improvement. No significant associations were found between rUTI and age, menopausal status, diabetes, sexual activity, contraceptive use, water intake, or prior urinary conditions (all $p > 0.05$). Logistic regression showed no independent predictors (Nagelkerke $R^2 = 0.038$). rUTIs were highly prevalent, with no significant predictors identified. The findings highlight the complexity of recurrence and the need for improved diagnostic accuracy and more individualized management strategies.

Keywords. Recurrent Urinary Tract Infection, Women, Risk Factors, Antibiotic Use.

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Introduction

Urinary tract infections (UTIs) are among the most common bacterial infections in women, contributing substantially to outpatient visits and antibiotic prescriptions (1). Uncomplicated UTIs occur in otherwise healthy, nonpregnant, premenopausal women without structural or functional urinary tract abnormalities (2). Diagnosis is largely clinical, based on symptoms such as dysuria, urinary frequency, and urgency, with laboratory testing reserved for selected cases (2). Most episodes respond well to short-course antimicrobial therapy, including nitrofurantoin, trimethoprim-sulfamethoxazole, or fosfomycin. However, inappropriate antibiotic use remains a concern due to its role in antimicrobial resistance, prompting guidelines to recommend effective agents with minimal ecological impact and to avoid unnecessary broad-spectrum antibiotics (3).

Recurrent UTIs (rUTIs), defined as two or more episodes within six months or three or more within one year, represent a significant clinical problem due to their impact on quality of life and repeated healthcare utilization (4–6). They are also a major driver of repeated antibiotic exposure in outpatient settings (7). Distinguishing symptomatic infection from asymptomatic bacteriuria (ASB) is essential to prevent unnecessary treatment and support antimicrobial stewardship (1,4). Several risk factors have been identified. In premenopausal women, frequent sexual activity, spermicide use, and new sexual partners are consistently associated with increased risk, while early onset of UTI and maternal history suggest longer-term influences (5,8). In postmenopausal women, estrogen deficiency, changes in vaginal environment, and increased post-void residual volume contribute to susceptibility (6,7).

Preventive strategies increasingly emphasize non-antibiotic approaches, including behavioral modifications, increased fluid intake, vaginal estrogen therapy, and agents such as cranberry products, D-mannose, and methenamine hippurate (4,6,9). Despite this, antibiotic prophylaxis—continuous or postcoital—remains necessary in selected patients when conservative measures fail (4,9).

In Libya, particularly in outpatient settings such as Abu Salim in Tripoli, data on rUTI risk factors and antibiotic prescribing patterns remain limited. This highlights the need for locally relevant evidence to guide clinical practice and antimicrobial stewardship. Therefore, this study aims to assess these factors among adult women attending outpatient clinics in Abu Salim, Tripoli, Libya.

Methods

Study Design and Setting

This study was designed as a retrospective cross-sectional analysis conducted across multiple healthcare settings, including public and private outpatient clinics as well as primary healthcare centers in Abu Salim district, Tripoli, Libya. Data collection was performed over 5 months (April 2025 to August 2025), allowing for the evaluation of recent patterns in urinary tract infection (UTI) occurrence and management within a real-world clinical context.

Study Population

The study population comprised adult women aged ≥ 18 years who presented to outpatient clinics with symptoms suggestive of urinary tract infection (UTI).

Data Collection

Data were collected using a structured, interviewer-administered questionnaire developed based on previously validated approaches in UTI research (10,12). Prior to formal data collection, the questionnaire was pilot-tested on a subset of participants to assess clarity, reliability, and content validity, with necessary modifications implemented accordingly.

Data Management and Statistical Analysis

All collected data were coded, verified, and entered into Statistical Package for the Social Sciences (SPSS), version 29, for analysis.

Ethical Considerations

The study was conducted in accordance with established ethical standards for human research. Informed consent was obtained from all participants prior to enrollment. Participant data were handled with strict adherence to confidentiality and anonymity principles. No identifiable personal information was recorded or disclosed.

Results

Table 1 provides a clear overview of demographic, reproductive, and medical characteristics of the study population. The age distribution shows a predominance of younger adults, with more than one-third aged 25–34 years, while only 7.8% were ≥ 55 years. Marital status indicates that the majority were married (57.2%), which aligns with the high proportion reporting a history of childbirth (83.9%). The relatively small proportion of postmenopausal participants (12.2%) reflects the younger age profile of the sample. From a medical perspective, diabetes mellitus was reported in 12.8% of participants, and nearly one-fifth (19.4%) had a history of urinary tract problems. Together, these findings highlight a predominantly young, reproductive-age population with modest rates of chronic conditions, which is an important context for interpreting subsequent clinical outcomes.

Table 1: Patient characteristics

Variable	Category/Response	n	%
Age Group (years)	<25	28	15.6
	25–34	62	34.4
	35–44	42	23.3
	45–54	34	18.9
	≥ 55	14	7.8
Marital Status	Single	52	28.9
	Married	103	57.2
	Divorced	15	8.3
	Widowed	10	5.6
Reproductive Characteristics	History of childbirth (Yes)	151	83.9
	History of childbirth (No)	29	16.1
	Postmenopausal (Yes)	22	12.2
	Postmenopausal (No)	158	87.8
Medical History	Diabetes mellitus (Yes)	23	12.8
	Diabetes mellitus (No)	157	87.2
	Previous urinary tract problems (Yes)	35	19.4
	Previous urinary tract problems (No)	145	80.6

Table 2 highlights the burden and clinical profile of urinary tract infections among participants. Nearly two-fifths (39.4%) experienced recurrent UTI, defined as ≥ 3 episodes per year, underscoring a significant subgroup with persistent disease. Laboratory evaluation was performed in 63.9% of cases, though more than one-quarter reported no testing, suggesting gaps in diagnostic follow-up. Symptomatically, dysuria was the most prevalent complaint (75.0%), followed by urinary frequency (60.6%), while systemic signs such as fever and flank pain were less common (around 30%). These findings emphasize that recurrent UTI is a notable issue in this population, with clinical presentation dominated by lower urinary tract symptoms and variable diagnostic practices, which may have implications for management strategies and healthcare resource allocation.

Table 2. Clinical and Laboratory Characteristics of Urinary Tract Infections in Participants (n = 180)

Variable	Category/Response	n	%
Frequency of UTI Episodes (Past Year)	Once	49	27.2
	Twice	60	33.3
	≥ 3	71	39.4
Recurrent UTI Status	Recurrent (≥ 3 episodes/year)	71	39.4
	Non-recurrent	109	60.6
Urine Testing Status	Yes	115	63.9
	No	51	28.3
	Unknown	14	7.8
Reported Clinical Symptoms	Burning urination	135	75.0
	Urinary frequency	109	60.6
	Lower abdominal pain	82	45.6
	Change in urine appearance	66	36.7
	Fever	54	30.0
	Flank pain	53	29.4

The majority of participants (86.7%) reported receiving antibiotic therapy, reflecting widespread use in this population. Among treated individuals, nearly half (46.2%) were prescribed a short course of 3–5 days, while one-third received ≥ 5 days, suggesting variability in prescribing practices. Clinical outcomes were mixed: although 59.0% reported improvement, a notable proportion (24.4%) experienced no benefit, and 16.7% only temporary relief. These findings highlight both the reliance on antibiotics and the limitations of therapeutic response, underscoring the need for optimized treatment strategies and stewardship interventions.

Table 3. Antibiotic Use, Duration, and Clinical Response (n = 180; Antibiotic subgroup n = 156)

Variable	Category/Response	n	%
Antibiotic Use	Received antibiotics	156	86.7
	Did not receive	24	13.3
Duration of Therapy (n = 156)	<3 days	33	21.2
	3–5 days	72	46.2
	≥ 5 days	51	32.7
Clinical Response (n = 156)	Improved	92	59.0
	Temporary improvement	26	16.7
	No improvement	38	24.4

Table 4 illustrates key lifestyle characteristics of the study population. Sexual activity was reported by 70% of participants, with nearly equal proportions engaging in ≤ 1 time/week (38.3%) and ≥ 2 times/week (31.7%). Contraceptive use was common, though 42.2% reported no method, while oral contraceptives (24.4%) and IUDs (23.3%) were the most frequently used. Daily water intake was adequate in just over half of participants (53.3%), leaving a substantial proportion (46.7%) with inadequate hydration. These findings highlight variability in sexual and reproductive behaviors, contraceptive practices, and lifestyle habits, which may influence urinary tract health outcomes in this cohort.

Table 4. Lifestyle Characteristics of Participants (n = 180)

Variable	Category/Response	n	%
Frequency of Sexual Activity	None	54	30.0
	≤1 time/week	69	38.3
	≥2 times/week	57	31.7
Contraceptive Methods	None	76	42.2
	Oral contraceptives	44	24.4
	IUD	42	23.3
	Topical methods	18	10.0
Daily Water Intake	Adequate	96	53.3
	Inadequate	84	46.7

The chi-square analysis revealed no statistically significant associations between recurrent UTI and any of the evaluated demographic, reproductive, or lifestyle variables (all $p > 0.05$). Although higher recurrence rates were observed among certain subgroups—such as IUD users and women with prior urinary tract problems—these differences did not reach statistical significance. This suggests that recurrent UTI in this cohort may be influenced by multifactorial or unmeasured variables rather than the individual factors assessed.

Table 5. Bivariate Analysis of Factors Associated with Recurrent UTI (n = 180)

Variable	χ^2 Value	p-value
Age group	2.49	0.647
Menopausal status	1.17	0.280
Diabetes mellitus	0.24	0.624
Previous urinary tract problems	1.52	0.218
Sexual activity	1.44	0.487
Contraceptive method	5.78	0.123
Water intake	0.07	0.791
Parity	0.03	0.856

The multivariable logistic regression model did not achieve statistical significance ($\chi^2 = 5.104$, $df = 8$, $p = 0.746$), indicating that the combined predictors failed to explain variation in recurrent UTI occurrence. The limited explanatory power suggests that recurrent UTI in this cohort may be influenced by unmeasured or multifactorial determinants beyond the variables included in the model. This underscores the need for broader clinical and behavioral factors to be considered in future analyses.

Table 6. Multivariable Logistic Regression Model Performance for Factors Associated with Recurrent UTI (n = 180)

Statistic	Value
χ^2	5.104
Degrees of freedom (df)	8
p-value	0.746
Model significance	Not significant
Explanatory power	Limited

The logistic regression model demonstrated poor sensitivity in predicting recurrent UTI cases, with overall accuracy limited to 62.8% and particularly low performance for recurrent cases (16.9%). None of the evaluated predictors retained independent statistical significance, as all p-values exceeded 0.05. Although variables such as menopausal status and previous urinary tract problems showed odds ratios above 1, these associations did not reach significance. This indicates that recurrent UTI in this cohort is not adequately explained by the measured demographic, reproductive, or lifestyle factors, reinforcing the likelihood of multifactorial influences or unmeasured determinants.

Table 7. Classification Accuracy

Outcome	Accuracy
Non-recurrent cases	92.7%
Recurrent cases	16.9%
Overall accuracy	62.8%

Table 8. Multivariable Logistic Regression Analysis

Variable	OR	p-value
Menopause	1.57	0.346
Diabetes	0.79	0.617
Sexual activity	1.03	0.882
Contraception	1.25	0.142
Water intake	0.86	0.624
Previous UT problems	1.59	0.232
Weight	0.99	0.617
Parity	1.04	0.929

Discussion

This study provides real-world insight into recurrent urinary tract infections (rUTIs) among women attending outpatient clinics in Tripoli, Libya. A high prevalence of rUTI was observed (39.4%), accompanied by extensive antibiotic use (86.7%) and a considerable rate of poor clinical response (24.4%). Importantly, no statistically significant associations were identified between rUTI and the assessed demographic, clinical, or behavioral factors.

The prevalence reported here exceeds rates commonly cited in the literature (~25%) (10,11), which may reflect differences in healthcare access, reliance on symptom-based diagnosis, and inconsistent laboratory confirmation. Such practices can lead to overestimation of recurrence and highlight diagnostic variability across settings. Traditional risk factors—including sexual activity, menopausal status, and contraceptive use—were not significantly associated with rUTI in this cohort. Prior studies have consistently emphasized the role of sexual and hormonal factors in recurrence (10,12–14). Their absence in the present analysis may be explained by underreporting of sensitive variables, limited sample size, or unmeasured host-related factors such as genetic susceptibility and immune response (10,15).

The multivariable logistic regression model demonstrated very low explanatory power (Nagelkerke $R^2 = 3.8\%$), reinforcing the multifactorial nature of rUTI and suggesting that conventional demographic and behavioral variables alone are insufficient to explain recurrence. This finding aligns with evidence that rUTI is shaped by complex interactions between host, microbial, and environmental determinants (15,16).

Antibiotic prescribing was widespread, yet nearly one-quarter of participants reported no improvement, raising concerns about empirical treatment, suboptimal antibiotic selection, and inconsistent use of urine testing. These findings highlight a gap between guideline recommendations and real-world practice (10,18). Diagnostic challenges are further compounded by symptom overlap with conditions such as overactive bladder and the mismanagement of asymptomatic bacteriuria, both of which contribute to overtreatment and antimicrobial resistance (16,19).

Clinically, these results support a shift toward more individualized management strategies. Greater emphasis should be placed on accurate diagnosis, reduced reliance on empirical antibiotics, and incorporation of non-antibiotic preventive measures. Evidence supports behavioral interventions, vaginal estrogen therapy in postmenopausal women, and patient-initiated therapy in selected cases (13,14,20–22). Such approaches may improve outcomes while mitigating the risks of antimicrobial resistance and treatment failure.

This study is limited by self-reported data (recall bias), lack of consistent laboratory confirmation, modest sample size, and single-center design, which may affect generalizability. Improving diagnostic accuracy through appropriate testing and strengthening antimicrobial stewardship are essential. Clinicians should adopt a broader management approach incorporating prevention and patient education.

Future research should include larger, multicenter studies to better identify predictors of rUTI and optimize management strategies.

Conclusion

In summary, this study demonstrates a high burden of recurrent urinary tract infections and substantial antibiotic use among women in outpatient settings in Libya, with no significant complexity of rUTI

pathogenesis and underscore the need for improved diagnostic strategies, rational antibiotic prescribing, and the integration of non-antibiotic preventive approaches

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