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KNOWLEDGE, ATTITUDES, AND PRACTICES REGARDING URINARY TRACT INFECTIONS AMONG WOMEN IN LAHORE

Hamna Ghaffar¹, Humna Zaheer¹, Emaan Arif¹, Aqsa Jameel¹, Zurriat Fatima¹, Ali Akhtar^{1*}

¹Faculty of Pharmaceutical Sciences, University of Central Punjab, 54000-Lahore, Pakistan

*Corresponding Author: Ali Akhtar. E. mail: aliakhtar5657@gmail.com



Abstract

Background: Urinary tract infections are among the most common bacterial infections worldwide, disproportionately affecting women and contributing significantly to morbidity. Knowledge, attitudes, and practices play a crucial role in the prevention, early diagnosis, and management of UTIs. However, limited data are available regarding women’s awareness and behaviors related to UTIs in Lahore, Pakistan.

Methods: A descriptive cross-sectional study was conducted among women in Lahore using a structured questionnaire. A total of 789 participants were included. The questionnaire assessed demographic characteristics and KAP regarding UTIs. Data were analyzed using SPSS version 21. Descriptive statistics were applied, and associations between demographic variables and knowledge levels were evaluated using the chi-square test, with a significance level of $p < 0.05$. This was a self-reported study, only in Lahore, and mostly among educated young women from urban areas.

Results: All participants had heard of UTIs; however, a significant study found that there was definitely a shortage in terms of knowledge regarding Urinary tract infections. However, only 30% correctly identified the condition as affecting the entire urinary tract. Bacteria were recognized as the most common cause by 39.8% of respondents. Pain during urination was the most commonly identified symptom (30.2%). Most participants reported drinking more water (32.2%) or visiting healthcare facilities (27.8%) as appropriate management strategies, although a proportion reported self-medication with antibiotics. Overall, 56.5% of participants demonstrated high knowledge, which was significantly associated with younger age, higher education level, and urban residence ($p < 0.05$).

Conclusion: Although awareness of UTIs among women in Lahore is high, gaps in accurate knowledge and appropriate practices persist. Targeted educational interventions and improved public health strategies are essential to promote early diagnosis, rational antibiotic use, and effective prevention of UTIs.

Keywords: Attitudes, Knowledge, Lahore, Pakistan, Practices, Urinary tract infections (UTIs), Women

INTRODUCTION

Urinary tract infections (UTIs) are among the most prevalent bacterial infections in the world and are a major public health problem (1, 2). The systematic reviews and global analyses (2023–2025) have found that UTIs are associated with high incidence in community and healthcare settings (2-4). Recent studies revealed that women are affected disproportionately; at least one episode occurs in almost 50-60% of women in their lifetime, this high prevalence is due to shorter urethra and its proximity to the anal region (3-5).

UTIs can affect any component of the urinary tract (UT): the ureters, kidney, the bladder, and the urethra, and most frequently are caused by uropathogenic bacteria, especially *Escherichia coli* (3, 6, 7). Other pathogens, such as *Staphylococcus saprophyticus*, *Klebsiella* spp., and *Proteus* spp., also contribute to infection (3, 8). In the clinic, a UTI might manifest as dysuria, urinary frequency, urgency, suprapubic pain, and hematuria, or it can be asymptomatic and clinically significant (5, 9).

Several risk factors predispose women to an increased risk of urinary tract infections (UTIs), including sexual activity, inadequate genital hygiene, pregnancy, menopause, diabetes mellitus, and the use of contraceptives such as spermicides (6, 8, 9). If left untreated, UTIs may lead to serious complications, including pyelonephritis, renal damage, recurrent infections, and adverse pregnancy outcomes (4, 10).



However, these infections are largely preventable through adequate hydration, appropriate personal hygiene practices, and timely medical intervention (7).

Over the past few years, more focus has been placed on the knowledge, attitudes and practices (KAP) of people relating to UTI and how these affect disease prevention, early detection, and management (1). Awareness levels among women have also been found to be different in different geographic regions, with women lacking awareness often delaying their health seeking behavior (1, 11, 12). A recent study in the UAE, for example, showed that while there was a good understanding of basic facts around UTIs, there were still cases of misconceptions and suboptimal practices (1).

In developing countries like Pakistan, the burden of UTIs is further compounded (10) by limited health literacy, cultural barriers, and restricted access to healthcare services (13). As an urban area with high population density, Lahore has its own unique socio-cultural and healthcare challenges that could impact women's perception and treatment of UTIs. But, there is limited comprehensive study that has been conducted on KAP of UTIs among women in this region (1, 6).

Knowledge, attitudes, and practices of women are important because they can help develop targeted educational programs and public health policies to reduce the incidence and complications associated with UTIs. Better awareness can help with timely recognition of symptoms, timely medical consultations and preventive measures and hence reduce the disease burden. Although UTIs are preventable, poor public awareness drives inappropriate antibiotic use, delayed care, and antimicrobial resistance. Assessing women's KAP in Lahore identifies local knowledge gaps. This data helps design health programs and guidelines to reduce Pakistan's UTI burden.

MATERIALS AND METHODS

STUDY DESIGN AND SETTING

This descriptive, cross-sectional survey was carried out to evaluate women's knowledge, attitudes, and practices related to Urinary Tract Infections (UTIs) in Lahore (LHR) (14, 15).

This study was conducted using a structured questionnaire adapted from a previously published study conducted in the UAE, with minor modifications to suit our study (16). The minimum sample size required for our study was 389, calculated using the Raosoft Sample Size Calculator with a confidence interval of 95%, a margin of error of 5%, and a population size of 3.2 million. The population data for women in Lahore, Pakistan, was taken from the latest statistics. However, data were ultimately collected from 789 participants. The inclusion criteria comprised females of all ages, whereas the exclusion criteria included males, females who were not residents of Lahore, and those who had never heard of a urinary tract infection (UTI).

ETHICAL STATEMENT

The data was gathered from the participants after informed consent was obtained prior to completion of the questionnaire. Before answering the survey, participants were provided with a brief overview explaining the purpose and content of the questionnaire. It was clearly stated that participation was entirely voluntary and anonymous, and only individuals who agreed to participate were allowed to proceed with the survey. Participants were assured that all information they provided would remain confidential. The study was carried out following approval from the relevant ethical committee, Ethical Review Board UCP (Reference Number: ORIC/ERC/IRB/2025/19).

DATA COLLECTION AND STATISTICAL ANALYSIS

Data were collected using a 22-item questionnaire developed based on previously published literature and expert recommendations (17). A pilot study was additionally performed to validate the questionnaire and confirm that the items were clear, relevant, and capable of accurately obtaining the required information. The questionnaire was organized into four sections: (i) demographic characteristics, (ii) knowledge-related questions, (iii) attitude-based questions and (iv) practice-related questions. Data collection was carried out using only the English version of the questionnaire. Data collection was started in

December 2025, and we completed collecting data in February 2026. It was then analyzed using IBM Statistical Package for Social Sciences (SPSS) for Windows, Version 21 (IBM Corp, Armonk, NY, USA) (18). A descriptive analysis was performed. A knowledge score was calculated, where a 0-1 score was categorized as poor knowledge, a 2–3 score was categorized as moderate knowledge, and a 4–6 score was categorized as high knowledge. To study the association of factors with knowledge, a chi-square test was used, and a p-value < 0.05 was used as the level of significance (19, 20).

RESULTS

POPULATION CHARACTERISTICS

A total of 789 participants were included in the present study. Overall, the majority of participants reported that they were unmarried (58.4% of all respondents) while 41.6% were married. In terms of age distributions, the majority were 18 to 28 years old (60.5%) , followed by 29 to 39 years old (19.6%), 40 to 49 years old (11.9%), and above 49 years old (8.0%). Approximately 58.4% of the overall sample reported completing their education through their graduation; however, there were also a sizeable number of individuals in the sample who completed their secondary education (15.2% of the sample), their Master's degrees (17.4% of the sample), and primary school (9.0% of the sample). For the type of area they lived in, the majority of the participants lived in urban areas (74.1% of the sample), while 25.9% of the sample reported living in rural areas. The other demographic characteristic regarding the way the participants were housed was broken down to 65.5% of participants reported living in their own home, while 34.5% of participants lived in a hostel. All of the above descriptive information is presented in Table I.

Table I. Demographic characteristics of participants (n=789)

Variables	Number of participants	Percentage (%)
Marital status		
Married	328	41.6
Unmarried	461	58.4
Age		
18-28	477	60.5
29-39	155	19.6
40-49	94	11.9
Above 49	63	8.0
Educational status		
Primary	71	9
Secondary	120	15.2
Graduation	461	58.4
Master level	137	17.4
Residential Area		
Urban	585	74.1
Rural	204	25.9
Lives in		
Own house	517	65.5
Hostel	272	34.5

PARTICIPANTS' KNOWLEDGE TOWARDS URINARY TRACT INFECTIONS

In spite of the fact that all the participants were well aware of UTI, the study reveals that there was certainly an insufficiency in terms of knowledge related to the infection. However, very few participants were clear about the definition of UTIs, with only 30.0% (n = 237) noting that a UTI is an infection of the entire urinary tract. Additionally, 26.1% (n = 206) identified a UTI as only an inflammation of the urethra, and 20.9% (n = 165) as an inflammation of the bladder. When questioned about the most common cause of UTIs, the greatest number of participants (39.8%, n = 314) identified bacteria as the most common cause of UTI; 31.1% (n = 245) identified it as a result of poor hygiene; 18.6% (n = 147) included fungus; and 10.5% (n = 83) indicated that the cause was a virus. Most (30.2%, n = 238) believed that pain during urination is the most common symptom associated with UTI; 16.1% (n = 127) indicated abdominal pain; 11.8% (n = 93) back pain; and 10.6% (n = 84) reported increased urination frequency. For the habits that increase the risk for UTI,

the most common risk factor that was mentioned was not drinking enough water (34.5%, n = 272), followed by delaying urination (30.3%, n = 239) and cleaning from front to back (22.2%, n = 175). The majority of respondents (37.0%, n = 292) noted that drinking a lot of water was a preventative factor for UTI; 33.8% (n = 267) believed that cleaning from front to back reduces the risk of developing a UTI. All of the above descriptive information is presented in Table II.

Table II. Participants' knowledge towards urinary tract infections (n=789)

Variables	Number of participants	Percentage (%)
Have they heard of the term UTI?		
Yes	789	100
No	0	0
Definition of UTI		
Inflammation of the bladder	165	20.9
Inflammation of the kidney	88	11.2
Inflammation of the urethra	206	26.1
None of the above	93	11.8
All of the above	237	30
The most common cause of UTI		
Bacteria	314	39.8
Bad hygiene	245	31.1
Fungi	147	18.6
Viruses	83	10.5
Which symptom/s do you think occur with UTI?		
Pain during urination	238	30.2
Change in urine color/appearance	75	9.5
Abdominal pain	127	16.1
Back pain	93	11.8
Increase in frequency of urination	84	10.6
Leg pain	45	5.7
Fever	43	5.4
Constipation	37	4.7
A sudden desire to go to the bathroom to urinate	47	6
Which habit/s do you think increase the chances of having UTI?		
Drinking a small amount of water	272	34.5
Delaying urination	239	30.3
Cleaning the genitalia from front to back	175	22.2
Drinking large amounts of water	103	13.1
Which factor/s do you think prevent UTI?		
Drinking a small amount of water	132	16.7
Delaying urination	98	12.4
Cleaning the genitalia from front to back	267	33.8
Drinking large amounts of water	292	37

PARTICIPANTS' ATTITUDES TOWARDS URINARY TRACT INFECTIONS

Most participants reported drinking more water (32.2% of participants, n = 254) or attending a hospital/clinic (27.8% of participants, n = 219) as appropriate ways to manage UTIs. They also mentioned showering more often (8.7%, n = 69) and taking antibiotics on their own (7.2%, n = 57). About 12.2% of participants (n = 96) did not know how to manage UTIs. 62.7% of participants (n = 495) believed that UTIs are common; 21.0% (n = 166) disagreed, and 16.2% (n = 128) were unsure. Regarding UTIs as gender-based illnesses, 44.1% of participants (n = 348) correctly identified that UTIs are more prevalent amongst women than men. 34.9% (n = 275) thought that men and women were equally affected by UTIs, and 21.0% (n = 166) thought that UTIs affect men more than women. The most common perceived complication of a UTI was renal damage (32.1%, n = 253). Other complications included decreased quality of life (30.2%, n = 238) and recurrent UTIs (29.3%, n = 231). 60.5% of participants (n = 477) perceived UTIs as serious; 23.8% (n = 188) perceived them as uncertain, and 15.7% (n = 124) perceived them as not serious. All of the above descriptive information is presented in Table III.

Table III: Participants' attitudes towards urinary tract infections (n=789)

Variables	Number of participants	Percentage (%)
In your opinion, what is the appropriate way of dealing with UTI?		
Drink more water	254	32.2
Go to the Hospital/Clinic	219	27.8
I don't know	96	12.2
Rest at home	56	7.1
Shower more frequently	69	8.7
Take analgesics	38	4.8
Take antibiotics directly	57	7.2
Do you think UTIs are common?		
Yes	495	62.7
No	166	21
I don't know	128	16.2
Which of the following statements do you think is true regarding UTI?		
UTIs affect both genders equally	275	34.9
UTIs affect females more	348	44.1
UTIs affect males more	166	21
Which complications do you expect from having a UTI?		
It can damage the kidneys	253	32.1
It can decrease the quality of life	238	30.2
It can lead to recurrent UTIs	231	29.3
It can affect pregnancies	46	5.8
It can lead to death	15	1.9
It can cause weight loss	6	0.8
Do you feel UTI is a serious condition/disease?		
I don't know	188	23.8
Yes	477	60.5
No	124	15.7

PARTICIPANTS' PRACTICE TOWARDS URINARY TRACT INFECTIONS

There were a total of 789 people participating in the study at least once. None of the participants indicated that they had not experienced a UTI before. When experiencing a UTI symptom, the most common response among participants was to drink more water (37.3%), visit a hospital or clinic (28.6%), stay home and rest (11.4%), or take antibiotics without a prescription (6.2%). A significant number of participants (6.8%) indicated they could not remember how they responded. A majority of participants waited between 24 and 48 hours before seeking medical attention at a hospital or clinic (43.1%). Nineteen percent of participants waited 2 to 5 days, and 16.3% of participants sought medical attention within 24 hours. Additionally, 14.3% of participants did not seek any medical attention. The primary complaint that participants reported was back pain (30.8%), followed by painful urination (20.0%), increased frequency of urination (19.3%), and changes in urine color/appearance (15.3%). In terms of daily water consumption, most participants reported drinking between 1 and 2 liters/day (42.8%), followed by those who drank more than 2 liters (28.9%), 0.5-1 liter (18.6%), and less than 0.5 liters (9.6%). All of the above descriptive information is presented in Table IV.

Table IV. Participants' practice towards urinary tract infections (n=789)

Variables	Number of participants	Percentage (%)
Have you ever had a UTI before?		
Yes	789	100
No	-	-
What did you do when you felt symptoms of UTI?		
Drank more water	294	37.3
Go to the hospital/clinic	226	28.6
Had rest at home	90	11.4
Took antibiotics directly	49	6.2
Took more showers	47	6.0
Took analgesics (painkillers)	29	3.7
I don't remember	54	6.8

If yes, how long did you wait before visiting the hospital/clinic?

< 24 hours	129	16.3
24–48 hours	340	43.1
2–5 days	153	19.4
More than 5 days	54	6.8
I did not go to the hospital	113	14.3

Which symptoms do you have?

Pain during urination	158	20
Change in the urine color and appearance	121	15.3
Back pain	243	30.8
Increase in the frequency of urination	152	19.3
A sudden desire to go to the bathroom to urinate	71	9
Fever	19	2.4
Abdominal pain	25	3.2

How much water do you drink per day?

< 0.5 Liters	76	9.6
0.5 Liters to 1 Liters	147	18.6
1 Liter to 2 Liters	338	42.8
More than 2 Liters	228	28.9

LEVEL OF KNOWLEDGE AND DEMOGRAPHIC CHARACTERISTICS ASSOCIATED WITH UTI

Participants aged 18-28 had the highest percentage of possessing high knowledge (59.1%, n=282). Each age category tended to demonstrate a similar trend of high knowledge being the most common category present. In the group of participants aged 29-39 years, 60.0% (n=93) were classified as having high knowledge, while high knowledge was also present among 55.3% (n=52) of individuals aged 40-49 and 54.0% (n=34) of individuals aged 50 years and older. In addition, the prevalence of poor knowledge was located in the 40-49 age group (16.0%, n=15). In terms of marital status, participants in the unmarried group possessed a greater percentage of high knowledge (60.0%, n=278) compared to participants in the married group (56.1%, n=183). In terms of education level, the percentage of individuals with at least graduation-level education (62.0%, n=286) was greater than the percentage of individuals with a master's degree (60.6%, n=83) and the percentage of individuals with secondary education (51.7%, n=62). In addition, 42.3% (n=30) of individuals with a primary-education level had high knowledge. In terms of place of residence, participants living in urban settings demonstrated a greater percentage of high knowledge (60.2%, n=352) than participants living in rural areas (53.4%, n=109). Individuals living in rented housing had a slightly higher percentage of possessing high knowledge (60.3%, n=164) than participants living in their own home (57.4%, n=297). Overall, the total sample consisted of 58.4% of participants (n=461) with high knowledge, 30.1% of participants (n=238) with moderate knowledge, and 11.4% of participants (n=90) with poor knowledge. All of the above descriptive information is presented in Table V.

Table V. Level of knowledge and demographic characteristics associated with UTI

Variables	Total	Poor knowledge		Moderate knowledge		High knowledge		P value
		n	%	n	%	n	%	
Age								
18-28	477	52	10.9	143	30.0	282	59.1	0.808
29-39	155	16	10.3	46	29.7	93	60.0	
40-49	94	15	16.0	27	28.7	52	55.3	
Above 49	63	7	11.1	22	34.9	34	54.0	
Marital Status								
Unmarried	463	47	10.2	138	29.8	278	60.0	0.350
Married	326	43	13.2	100	30.7	183	56.1	
Educational Level								
Primary	71	14	19.7	27	38.0	30	42.3	0.004
Secondary	120	22	18.3	36	30.0	62	51.7	
Graduation level	461	41	8.9	134	29.1	286	62.0	
Master level	137	13	9.5	41	29.9	83	60.6	
Residential Area								

Urban	585	61	10.4	172	29.4	352	60.2	0.172
Rural	204	29	14.2	66	32.4	109	53.4	
Lives with								
Own House	517	60	11.6	160	30.9	297	57.4	0.739
Rented house	272	30	11.0	78	28.7	164	60.3	
Total	789	90	11.4	238	30.1	461	58.4	

LEVEL OF KNOWLEDGE AND ITEMS OF KNOWLEDGE ASSOCIATED WITH UTI

Table VI outlines how the level of knowledge is associated with individual knowledge-related responses. In Table VI, among the entire samples of 789 participants, high-knowledge participants reported that they are aware of what a UTI is. Moderate knowledge participants and poor knowledge participants did not report that they had any knowledge of a UTI. In Table VI, While most (n=209) of high knowledge participants selected "All of the Above" as a definition for UTI, only 0.8% (n=2) of participants with poor knowledge did so. The most common cause of UTI for high knowledge participants was bacteria (84.4%, n=265), whereas the most common causes for those with poor knowledge were bad hygiene (11.8%, n=29) and fungi (28.6%, n=42).

Table VI. Knowledge regarding definition and causes, symptoms and habits & preventive factors associated with UTI

Variables	Total	Poor knowledge		Moderate knowledge		High knowledge		P value
		n	%	n	%	n	%	
Definition of UTI?								
Inflammation of the bladder	165	28	17.0	63	38.2	74	44.8	<0.001
Inflammation of the kidney	88	20	22.7	27	30.7	41	46.6	
Inflammation of the urethra	206	27	13.1	90	43.7	89	43.2	
None of the above	93	13	14.0	32	34.4	48	51.6	
All of the above	237	2	0.8	26	11.0	209	88.2	
Most common cause of UTI?								
Bacteria	314	1	0.3	48	15.3	265	84.4	<0.001
Bad hygiene	245	29	11.8	95	38.8	121	49.4	
Fungus	147	42	28.6	56	38.1	49	33.3	
Viruses	83	18	21.7	39	47.0	26	31.3	
Which symptom/s do you think occur with UTI?								
Pain during urination	238	10	4.2	66	27.7	162	68.1	<0.001
Change in urine color/appearance	75	30	40.0	28	37.3	17	22.7	
Abdominal pain	127	6	4.7	37	29.1	84	66.1	
Back pain	93	5	5.4	24	25.8	64	68.8	
Increase in frequency of urination	84	4	4.8	29	34.5	51	60.7	
Leg pain	45	3	6.7	14	31.1	28	62.2	<0.001
Fever	43	15	34.9	14	32.6	14	32.6	
Constipation	37	14	37.8	16	43.2	7	18.9	
Sudden desire to go to the bathroom to urinate	47	3	6.4	10	21.3	34	72.3	
Which habits do you think increase the chances of having UTI?								
Drinking a small amount of water	272	18	6.6	64	23.5	190	69.9	<0.001
Delaying urination	239	6	2.5	47	19.7	186	77.8	
Cleaning the genitalia from front to back	175	33	18.9	81	46.3	61	34.9	
Drinking large amounts of water	103	33	32.0	46	44.7	24	23.3	
Which factor/s do you think prevents the UTI?								
Drinking a small amount of water	132	35	26.5	54	40.9	43	32.6	<0.001
Delaying urination	98	36	36.7	33	33.7	29	29.6	
Cleaning the genitalia from front to back	267	8	2.99	82	30.7	177	66.3	
Drinking large amounts of water	292	11	3.76	69	23.6	212	72.6	
Total	789	17	2.15	326	41.3	446	56.5	



Regarding symptom acknowledgment, high-knowledge participants identified the signs of UTI like pain when urinating (68.1%, n=162), pain in the lower back (68.8%, n=64), and an immediate need to urinate (72.3%, n=34) more accurately than low-knowledge participants (Table VI).

In relation to risk-affecting behaviors, high-knowledge respondents were statistically significantly more likely to also correctly recognize delaying urinating (77.8%, n=186) and not drinking enough water (69.9%) as behaviors that will increase their likelihood of developing a UTI. High-knowledge respondents were also statistically significantly more likely to recognize drinking enough water (72.6%, n=212) and cleaning genitalia from front to back (66.3%, n=177) as preventative behaviors. Overall, there were 446 with high knowledge in the sample, representing 56.5% of those sampled, 326 representing 41.3% with moderate knowledge, and 17 with a poor level of knowledge, representing 2.15% of those sampled (Table VI).

ASSOCIATION OF LEVEL OF KNOWLEDGE WITH ATTITUDES OF PARTICIPANTS REGARDING UTI

Attitudes about UTIs vary depending on knowledge level. In Table VII, high-knowledge participants often identified two options to treat their urinary tract infection: drinking more fluids (50.7%, n=129) and visiting an ER or a doctor (48.8%, n=107). A significant number of those with poor knowledge demonstrated confusion as to what the correct approach is (41.6%, n=40). High-knowledge participants had almost equal numbers believing UTIs are either common (47.8%, n=237) or uncommon (9.63%, n=16), while those with poor knowledge were much more likely to think there are fewer than expected (28.9%, n=48).

Table VII. Association of level of knowledge regarding management and perception & complications of UTI

Variable	Total	Poor knowledge		Moderate knowledge		High knowledge		P value
		n	%	n	%	n	%	
		In your opinion, what is the appropriate way of dealing with UTI?						
Drink more water	254	7	2.75	118	46.4	129	50.7	
Go to the Hospital/Clinic	219	11	5.02	101	46.1	107	48.8	
I don't know	96	40	41.6	47	48.9	9	9.37	
Rest at home	56	11	19.6	37	66.0	8	14.2	<0.001
Shower more frequently	69	19	27.5	42	60.8	8	11.5	
Take analgesics	38	9	23.6	26	68.4	3	7.89	
Take antibiotics directly	57	8	14.0	41	71.9	8	14.0	
Do you think UTIs are common?								
Yes	495	22	4.44	236	47.6	237	47.8	
No	166	48	28.9	102	61.4	16	9.63	<0.001
I don't know	128	35	27.3	74	57.8	19	14.8	
Which of the following statements do you think is true regarding UTI?								
UTIs affect both genders equally	275	39	14.1	180	65.4	56	20.3	
UTIs affect females more	348	14	4.02	134	38.5	200	57.4	<0.001
UTIs affect males more	166	52	31.3	98	59.0	16	9.63	
Which complications do you expect from having a UTI?								
It can damage the kidneys	253	11	4.34	107	42.2	135	53.3	
It can decrease the quality of life	238	53	22.2	147	61.7	38	15.9	<0.001
It can lead to recurrent UTIs	231	12	5.19	127	54.9	92	39.8	
It can affect pregnancies	46	14	30.4	26	56.5	6	13.0	
It can lead to death	15	11	73.3	3	20.0	1	6.66	
It can cause weight loss	6	4	66.6	2	33.3	0	0	
Do you feel UTI is a serious condition/disease?								
I don't know	188	50	26.5	96	51.0	42	22.3	
Yes	477	20	4.19	239	50.1	218	45.7	
No	124	35	28.2	77	62.0	12	9.67	<0.001
Total	789	17	2.15	326	41.3	446	56.5	

High-knowledge participants accurately believed that females have a higher rate of UTIs than males (57.4%, n=200), whereas those with limited knowledge felt that males have a higher rate of UTIs than

females (31.3%, n=52) or that both genders have the same rate (14.1%, n=39). In terms of seriousness, higher knowledge participants showed awareness that a UTI can cause kidney damage (53.3%, n=135), while moderate knowledge participants were aware of recurrent UTIs (54.9%, n=127) as a complication. More high-knowledge (45.7%, n=218) than low-knowledge (4.19%, n=20) participants believe that a UTI is a serious health issue (Table VII).

ASSOCIATION OF LEVEL OF KNOWLEDGE WITH PRACTICES OF PARTICIPANTS REGARDING UTI

In Table VIII, participants with higher levels of knowledge demonstrated not only more proactive measures towards their health, but they also did so in a manner that was appropriate as well. All participants who had experienced a urinary tract infection (UTI) in the past belonged to the group of highly knowledgeable participants. Conversely, those with lower or moderate levels of knowledge had no history of having ever experienced a UTI. Additionally, high-knowing participants exhibited the health-promoting behaviors of drinking more fluids (69.0% [n=203]) and/or seeking medical care through either a hospital or clinic (75.6% [n=171]) when and if they had experienced UTI symptoms. On the other hand, a majority of moderate knowledge participants reported they would stay home (54.4%, n=49), take antibiotics without a prescription (67.3%, n=33), or take analgesics without consulting a doctor (79.3%, n=23). Most high-knowledge participants (88.8%) sought medical care within 24–48 hours, compared to 76.1% of moderate-knowledge participants. A chi-square analysis confirmed that participants' practices were significantly associated with their knowledge levels. Self-medication, specifically taking antibiotics directly differed significantly across groups ($p<0.001$), occurring in 2.04% of poor, 67.3% of moderate, and 30.6% of the high knowledge groups. Similarly, the duration participants delayed seeking professional medical care at a hospital or clinic was strongly dependent on their base-line knowledge level ($p<0.001$).

Table VIII. Association of level of knowledge with history & initial practices and healthcare seeking, symptoms experiencing & daily water intake practices regarding UTI

Variables	Total	Poor knowledge		Moderate knowledge		High knowledge		P value
		n	%	n	%	n	%	
Have you ever had a UTI before?								
Yes	789	0	0	0	0	789	100	
No	0	0	0	0	0	0	0	
What did you do when you felt symptoms of UTI?								
Drank more water	294	3	1.02	88	29.9	203	69.0	
Go to the hospital/clinic	226	1	0.44	54	23.8	171	75.6	
Had rest at home	90	2	2.22	49	54.4	39	43.3	
Took antibiotics directly	49	1	2.04	33	67.3	15	30.6	
Take more showers	47	7	14.8	35	74.4	5	10.6	<0.001
Took analgesics (painkillers)	29	2	6.89	23	79.3	4	13.7	
I don't remember	54	1	1.85	44	81.4	9	16.6	
If yes, how long did you wait before visiting the hospital/clinic?								
< 24 hours	129	2	1.55	83	64.3	44	34.1	
24–48 hours	340	2	0.58	36	10.5	302	88.8	
2–5 days	153	5	3.26	83	54.2	65	42.4	<0.001
More than 5 days	54	4	7.40	38	70.3	12	22.2	
I did not go to the hospital	113	4	3.53	86	76.1	23	20.3	
Which symptoms do you have?								
Pain during urination	158	1	0.63	73	46.2	84	53.1	
Change in the urine color and appearance	121	9	7.43	69	57.0	43	35.5	
Back pain	243	2	0.82	87	35.8	154	63.3	<0.001
Increase in the frequency of urination	152	3	1.97	50	32.8	99	65.1	
A sudden desire to go to the bathroom to urinate	71	0	0	24	33.8	47	66.1	
Fever	19	1	5.26	9	47.3	9	47.3	
Abdominal pain	25	1	4	14	56.0	10	40.0	

How much water do you drink per day?

< 0.5 Liters	76	6	7.89	57	75.0	13	17.1	
0.5 Liters to 1 Liter	147	6	4.08	106	72.1	35	23.8	
1 Liter to 2 Liters	338	5	1.47	108	31.9	225	66.5	<0.001
More than 2 Liters	228	0	0	55	24.1	173	75.8	
Total	789	17	2.15	326	41.3	446	56.5	

Those participants who sought care within 24 hours, the majority (34.1%; n=44) were in the high knowledge group (Table VIII). Back pain (63.3%, n=154), increased urination frequency (65.1%, n=99), and immediate urge to urinate (66.1%, n=47) were the three most frequently reported signs of UTI by high knowledge participants. The high knowledge group reported consuming a greater quantity of water than the moderate knowledge group, with approximately 66.5% (n=225) of high knowledge group participants drinking 1-2 liters of water per day, and 75.8% (n=173) of high knowledge group participants drinking more than 2 liters per day.

DISCUSSION

This study examines UTI-related KAP in Lahore. The results show notable similarities and differences to data from the UAE and Bangladesh. Similar to international research, UTIs are still a major health issue for females due to anatomic, physiologic, and behavioral reasons (21, 22). The prevalence rate of awareness in this study (100%) is quite high and consistent with that seen in UAE-based research, where the awareness of UTIs was relatively high too (1). At the same time, like in Bangladesh, the study revealed several limitations in conceptual knowledge concerning UTIs (9).

In the present research, even though all the respondents knew about UTIs, there were only a few individuals who could recognize UTIs as an infection that infects the whole urinary system. In line with other literature, these results also indicate that while people have adequate awareness about the topic, they have incomplete information (23, 24). These findings reveal that mere awareness of the issue does not guarantee the complete knowledge crucial for prevention and treatment. Additionally, the percentage of individuals who recognized bacteria as the main cause of UTIs was low. The trend is analogous to the observations made in Bangladeshi and UAE samples, as people had wrong beliefs regarding the etiology of UTIs (1, 9)

Moreover, pain during urination, abdominal pain, and frequent urination were found to be the most frequently identified symptoms. These results are consistent with the known clinical presentation as documented in the literature (25, 26). The lack of recognition of other significant symptoms like fever and hematuria, can suggest that the identification process is not comprehensive. As mentioned in previous studies, this could result in the delayed identification of the health problem (1, 27) Regarding risk factor knowledge in the current study, there was an average level of knowledge among respondents, who cited low water consumption and delayed urination as leading causes. This is in line with previous research, which has placed great importance on behavioral measures like proper hydration and urination patterns for UTIs' prevention (22, 28) Nonetheless, misperceptions about hygiene behaviors, specifically improper cleansing techniques, were found

to be prevalent, just as in research conducted in Thailand and Egypt (28, 29).

Concerning attitudes related to UTIs among the study participants, the findings suggest that most participants regarded UTIs as a severe disease that might result in complications, such as renal involvement and subsequent re-infection. This finding is consistent with previous research that has highlighted the importance of treating UTIs due to their ability to cause pyelonephritis, sepsis, and other complications that affect kidney function (3, 5) Similar attitudes towards UTIs were expressed in the UAE study, with patients who had higher levels of knowledge on UTIs being able to understand the seriousness of the disease and seek proper treatment (1, 10).

In practice, the study showed that the two most prevalent actions taken to UTI symptoms were an increase in water consumption and a visit to a health care facility. The results of this study concur with recommendations for the management and prevention of UTI (8, 30). But a small fraction of those involved said they used antibiotics on themselves, a very common problem documented in several studies in



developing nations (31, 32). The inappropriate use of antibiotics is a major driver of antimicrobial resistance, a global health threat (33, 34).

The reasons for the delay in seeking medical attention reported in this study are similar to those reported in UAE and Bangladesh studies (1, 35). Where a majority of participants waited for 24–48 hours or more to seek medical attention. These delays can be explained on cultural grounds, by lack of symptom severity perception or by use of home remedies. Prompt medical consultation is a public health priority. Delays worsen patient outcomes and increase complication risks (35, 36).

Demographic analysis also showed that the younger and more education and urban participants had higher levels of knowledge, which is consistent with other studies in the region and international (1, 37). Similarly, in cities, people might also have greater information and access to health care services, which could lead to better knowledge and practices.

This study is in keeping with the worldwide epidemiology findings which indicates that UTI is prevalent among women particularly in developing countries (38). Factors such as inadequate health care conditions, social problems, and lack of patient awareness are factors affecting this (39, 40). A similar difference has been observed in Pakistan in past studies which were done on diabetic women.

Importantly, in the present study, patient education is highlighted as a key strategy for enhancing outcomes for UTI. Patient education has been shown to be an effective way of raising awareness and ensuring that preventive measures are taken to help lower the incidence rate of UTIs (12, 41). Healthcare providers, particularly health care workers like pharmacists and primary care doctors, can play a crucial role in promoting healthy habits to their patients.

The present study found that awareness regarding UTIs among females in Lahore is quite high but still there is a huge gap in knowledge, attitude and practice about UTIs. The results obtained are similar to what has been previously reported in the UAE, Bangladesh and other parts of the world. Educating women on UTI is essential to minimize its morbidity and mortality.

CONCLUSION

Finally, the prevalence of awareness about UTI among women in Lahore is 100%, but there is a lack of knowledge about all aspects of UTI. Participants who were younger, more educated, and urban-based scored higher on their knowledge scores and exhibited more proactive and appropriate behaviors for seeking care for health issues. The high proportion of self-medication and low rate of medical consultation shows, however, a significant gap for targeted public health interventions. Structured educational programs and clinical counseling are crucial to improve antibiotic use and lower Pakistan's UTI burden.

Study Limitations:

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Conflict of interest:

Authors declared no conflict of interest.

Authors' contribution:

HG Conducted the study and writing original draft; HZ Data curation and investigation; EA Methodology and formal analysis; AJ Validation, review and editing; ZF Resources and Software; AA Conceptualization, supervision and project administration.

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