Bangladesh J. Zool. ***54****(1): 61-74, 2026* ISSN: 0304-9027
eISSN: 2408-8455

PREVALENCE OF URINARY TRACT INFECTIONS AMONG OUTPATIENTS AT A TERTIARY CARE HOSPITAL IN BANGLADESH

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Abstract: Urinary tract infections (UTIs) are one of thecommon bacterial infections in Bangladesh. This study was conducted to determine the prevalence of UTIs among adult male and female outpatients at a tertiary care hospital in Bangladesh and to identify age groups and seasonal variations associated with higher prevalence rates. A total of 170 midstream urine samples were collected from 70 males and 100 females (16 -75 years old), at Dhaka Medical College Hospital (DMC) in Dhaka for microscopic analysis. The streak plate method was used, where a loopful of each urine sample was inoculated onto selective and differential media for bacteriological analysis. The participants were categorized into three age groups: 16–35 years, 36–50 years, and 51–75 years. The study was conducted during two seasons: spring and summer. The results revealed that 110 samples (64.71%) tested positive for *Escherichia coli*, with 62.86% of males and 66% of females testing positive. Among females, the highest prevalence (87.5%) was found in middle-aged adults (36–50 years), while the lowest (44.44%) was in older adults (51–75 years). For males, the highest prevalence (83.33%) was also observed in the middle-aged group, and the lowest (58.33%) was in young adults (16–35 years). Additionally, prevalence was higher in summer, where 70% for females and 66.67% for males, compared to spring, where 63.33% for females and 58.82% for males. The high prevalence of UTIs underscores the importance of early diagnosis and treatment, highlighting the need for future research on microbial patterns and antibiotic resistance in Bangladesh.

Key words: Urinary tract infections (UTIs), *Escherichia coli***,** Prevalence, Season, Outpatients.

INTRODUCTION

Urinary tract infections (UTIs) are one of the most common clinical conditions affecting people across all age groups. They present a significant global health issue, contributing substantially to morbidity, healthcare burden,

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and hospital admissions (Foxman 2010, Lambie and Robson 1984). UTIs account for approximately 25% of all bacterial infections (Ronald 1991) and are widespread in both community and hospital settings, often requiring prompt medical attention(Orrett and Davis 2006). Globally, UTIs impact an estimated 150 million individuals each year (Stamm and Norrby 2001). Women are especially vulnerable, withabout 50% ofwomen experiencing at least one UTI episode in their lifetime. Alarmingly, 25% of those affectedsuffer from recurrent infections (Stapleton 1999).

The primary causative agent of UTIs is *Escherichia coli* (*E. coli*), accounting for more than 80% of uncomplicated cases and approximately 50% of hospital-acquired infections(Samarawickrama *et al.* 2024, Stefaniuk *et al.* 2016, Parkash and Saxena 2012, Nicolle 2002). Other common bacterial pathogens include *Enterococcus faecalis*, *Staphylococcus saprophyticus*, and various Gram-negative members of the Enterobacteriaceae family (Lee and Neild 2007). Although fungi and parasites may also cause UTIs, bacterial agents remain the most prevalent (Ramanath and Shafiya 2011, Barate and Ukesh 2012).

Urinary tract infections (UTIs) are a principal cause of outpatient visits, particularly among women. UTIs represent a significant percentage of consultations in hospital outpatient departments (OPDs). UTIs are among the most prevalent bacterial infections in outpatient settings, especially in women (Foxman 2014). Moreover, complicated UTIs make up 30% to 50% of all UTI cases in hospital outpatient departments (Gould *et al.* 2012). Additionally, research demonstrates that seasonal patterns influence the frequency of UTI-related outpatient visits, with higher incidence rates recorded during the summer months, particularly in warmer temperatures. A study involving over 300,000 outpatient visits in the U.S. revealed a remarkable proliferation in community-acquired UTIs during the summer, mostly among younger women (Eliakim-Raz *et al.* 2013).

Women's increased susceptibility to UTIs is mainly due to anatomical and physiological factors—specifically, their shorter urethra and its closer proximity to the anus (Jawetz and Melnick 1995, Calvin 1994). It is estimated that over 60% of women will experience a UTI once in their lifetime (Foxman 2002, Foxman *et al.* 2000). UTIs can range from asymptomatic bacteriuria to severe kidney infections like pyelonephritis, which can potentially lead to sepsis (Fujita *et al.* 2023). Lower UTIs such as cystitis and urethritis typically cause symptoms like dysuria, foul-smelling or dark urine, and lower abdominal discomfort (Flores-Mireles *et al.* 2015). Approximately a quarter of lower UTIs may progress to kidney infections such as pyelonephritis (Najar *et al.* 2009, Nahar *et al.* 2010).Individuals with chronic kidney disease (CKD) are particularly vulnerable

to UTIs due to anatomical and functional abnormalities in the urinary tract, urinary retention, and weakened immune defenses (Swartz *et al.* 2020, Fujita *et al.* 2023). Elderly patients, especially those with conditions like diabetes mellitus, face even greater risks due to poor metabolic regulation and recurrent infections (Shakya *et al.* 2021, Saleem *et al.* 2022).

In the context of Bangladesh, despite the high disease burden, there is limited epidemiological data on UTIs. However, existing research indicates that women are the primary sufferers of UTIs. For instance, a study by Islam *et al.* (2010) reported that 92% of patients had pyuria, while Nahar *et al.* (2006) found that 64.1% of *E. coli* infections occurred in females. Earlier research by Haque *et al.* (1976) noted that 78.8% of *E. coli* infections were in women, and Nahar and Selim (1989) identified the bacterium in 70.9% of urinary samples from adult female patients. Notably, *E. coli* infections remained prevalent for up to six months after childbirth in about one-third of women (Khanum *et al.* 2006, Nahar *et al.* 2010).

Recurrent UTIs and improper treatment, often due to inadequate diagnostic facilities and antibiotic misuse, contribute to increased morbidity and public health challenges in Bangladesh. Addressing these issues effectively requires identifying the causative organisms, understanding patient demographics, and implementing appropriate prevention and treatment strategies. The current study aimed to determine the comparative prevalence of UTIs in adult male and female outpatients at a tertiary care hospital in Bangladesh. It further sought to identify the age groups and seasonal variations associated with higher UTI incidence. The findings from this study provide insights into UTI patterns in this population and underscore the urgent need for further research into microbial causes and antibiotic resistance profiles in UTIs in Bangladesh.

MATERIAL AND METHODS

Sources of specimens: A total of 170 midstream urine samples were randomly collected from adult outpatients at Dhaka Medical College Hospital (DMC) in Dhaka over six months, from January to June. The study was conducted across two seasons: spring (January to March) and summer (April to June). The participants involved adult males and females aged 16 to 75 years old.

The participants were categorized into three age groups: A) young adults (16–35 years), B) middle-aged adults (36–50 years), and C) older adults (51–75 years). Young adults were further divided into four sub-groups: i) 16–20 years, ii) 21–25 years, iii) 26–30 years, and iv) 31–35 years. Middle-aged adults were further categorized into three age groups: i) 36–40 years, ii) 41–45 years, and iii)

46–50 years. Older adults were divided into five sub-groups: i) 51–55 years, ii) 56–60 years, iii) 61–65 years, iv) 66–70 years, and v) 71–75 years.

Microscopic Examination: Each urine sample was subjected to microscopic examination. A fresh drop of un-centrifuged urine was placed on a clean glass slide, covered with a cover slip, and examined under a clinical microscope using high dry objective and reduced light intensity. Microscopic assessment focused on detecting epithelial cells, pus cells, red blood cells (RBCs), and different urinary crystals, for instance, amorphous phosphate, calcium oxalate, uric acid, urates, and triple phosphate.

Culture and Identification of Escherichia coli: For bacteriological study, a loopful of each urine sample was inoculated onto selective and differential media by the streak plate method. The plates were incubated at 37°C for 24 hours. Only *Escherichia coli* tested positive, while other bacterial pathogens, such as *Enterococcus faecalis*, *Staphylococcus saprophyticus*, and members of the Enterobacteriaceae family, were negative. For confirmation, suspected *E. coli* colonies were further subjected to standard biochemical tests, which were typically performed. Colony counts were accomplished to determine the bacterial load, and a count of $\geq 10^5$ CFU/mL was considered indicative of a substantial infection.

Estimation of Prevalence: Prevalence was calculated as the total number of UTI-positive cases divided by the total number of individuals in the study population. It represents the proportion of individuals affected by urinary tract infection at a definite point or period in time.

RESULTSAND OBSERVATION

The present study was done to determine the prevalence of urinary tract infections (UTIs) among the outpatients at Dhaka Medical College Hospital (DMC), Dhaka, from January to June. This study offers valuable insights into urinary tract infections (UTIs) among adult patients in Bangladesh, highlighting their prevalence across gender, age groups, and seasonal variations.Urine samples were investigated during the spring and summer seasons to detect the presence of *E. coli*. A total of 170 urine samples were collected, of which 110 samples (64.71%) tested positive for UTIs, while 60 samples (35.29%) tested negative (Figure 1). The study found that, among 70 males, 44 samples (62.86%) tested positive for *E. coli*, while among 100 females, 66 samples (66%) were positive (see Fig. 2).

Some pathogens exhibit distinct seasonal patterns in their prevalence. The prevalence of *E. coli* also varied across seasons. The highest proportion of UTI

cases was recorded during the summer (72.22%), whereas the lowest prevalence occurred in the spring (59.18%) (Table 1). In spring, 98 samples were collected

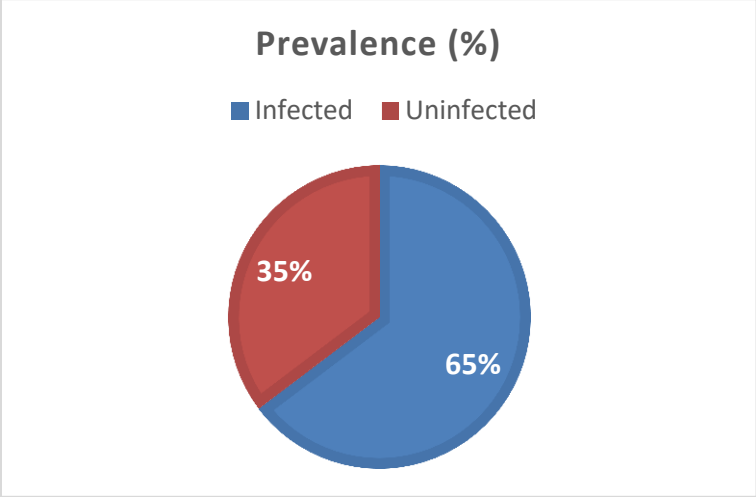

Fig.1: Total prevalence of *E. coli*-infected and uninfected patients

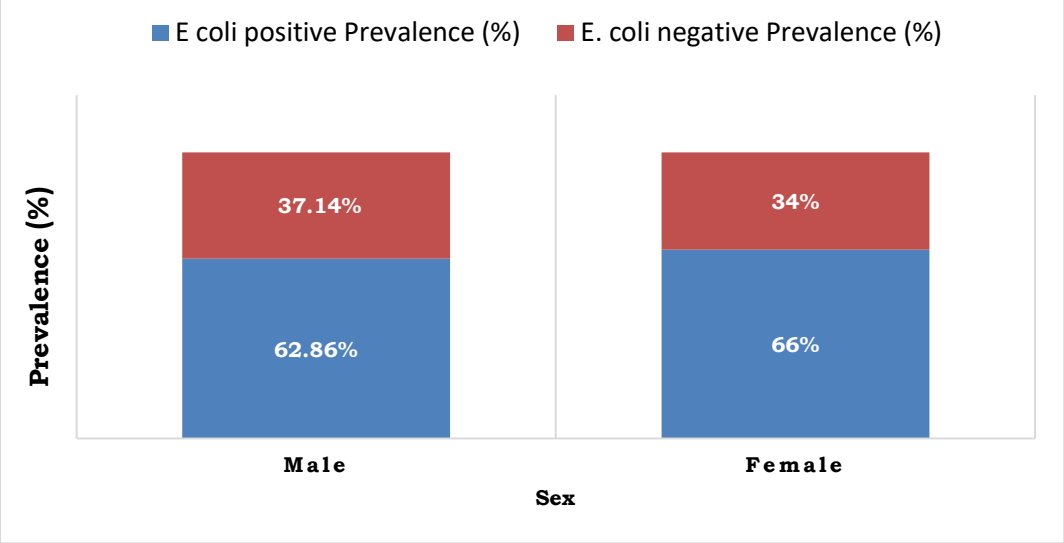

Fig. 2: Prevalence of UTI among male and female patients

and examined, with 58 samples testing positive, resulting in a prevalence of 59.18%. Specifically, in January, 30 patients were assessed, and 15 (50%) were found to be *E. coli* positive. In February, 28 patients were evaluated, with 18 (64.29%) testing positive. In March, 40 patients were examined, and 25 (62.5%)

tested positive (Table 1). During the summer, 72 samples were collected and examined, revealing that 52 samples (72.22%) were *E. coli* positive. In April, 26 patients were evaluated, with 22 (84.62%) testing positive. In May, 30 patients were examined, and 22 (73.33%) were found to be positive. Finally, in June, 16 patients were assessed, with 8 (50%) testing positive (see Table 1).

Table 1. Prevalence of total UTI patients during two seasons (Spring and Summer)

Name of the seasons	Name of the months	Total no. of patients tested	Number of positive cases (n)	Prevalence(%)
	January	30	15	50
	February	28	18	64.29
Spring	March	40	25	62.5
	Total	**98**	**58**	**59.18**
	April	26	22	84.62
	May	30	22	73.33
Summer	June	16	8	50
	Total	**72**	**52**	**72.22**

A higher prevalence of *E. coli* was observed in both female and male patients during the summer (70% for females and 68.75% for males) compared to spring (63.33% for females and 57.89% for males) (Table 2).

Table 2. Prevalence of UTI in female and male patients according to different seasons

	Female			Male		
Name of the seasons	**Total no. of patients tested**	**Number of positive cases (n)**	**Prevalence %**	**Total no. of patients tested**	**Number of positive cases (n)**	**Prevalence %**
Spring	60	38	63.33	38	22	57.89
Summer	40	28	70	32	22	68.75
Total	100	66	66	70	44	62.86

The study population, comprising both males and females, was divided into three age groups: young adults (16–35 years), middle-aged adults (36–50 years), and older adults (51–75 years). Among female patients, the highest prevalence of *E. coli* (87.5%) was found in the middle-aged group (36–50 years), while the lowest prevalence (44.44%) was observed in older adults (51–75 years). In male patients, the highest prevalence (83.33%) was also in the middle-aged group (36–50 years), and the lowest prevalence (58.33%) was found in young adults (16–35 years) (Table 3).

Among female patients aged 16 to 35 years, the highest prevalence of *E. coli* infections was found in the 16 to 20 age group, with a positive result rate of

66.67%. In contrast, the lowest prevalence (50%) occurred in the 21 to 25 age group.

In middle-aged female patients, aged 36 to 50 years, the highest percentage of positive cases (100%) was observed in all the middle-aged groups (36 to 40, 41 to 45 and 46 to 50).

Among older female patients aged 51 to 75 years, the highest prevalence of *E. coli* infections (50%) was recorded in the 51 to 55, 56 to 60, 61 to 65, and 71 to 75 age groups. Notably, no infections were found in the 66 to 70 age group (Table 4).

Table 3. Prevalence of *E. coli* among male and female patients in relation to age groups

Sex	Age Groups								
	16-35yr			36-50yr			51-75yr		
	Total no. of patients tested	Number of positive cases (n)	Prevalence(%)	Total no. of patients tested	Number of positive cases (n)	Prevalence (%)	Total no. of patients tested	Number of positive cases (n)	Prevalence (%)
Female	50	30	60	32	28	87.5	18	8	44.44
Male	48	28	58.33	12	10	83.33	10	6	60

Table 4. Prevalence of *E. coli* in relation to age groups among female patients

Age groups	Female patients			
	Age limits (years)	Total no. of patients tested	Number of positive cases (n)	Prevalence (%)
Young adults (16-35yr)	16-20	12	8	66.67
	21-25	12	6	50
	26-30	16	10	62.5
	31-35	10	6	60
Middle-aged adults (36-50yr)	36-40	6	6	100
	41-45	10	10	100
	46-50	12	12	100
Older adults (51-75yr)	51-55	4	2	50
	56-60	4	2	50
	61-65	4	2	50
	66-70	2	0	0
	71-75	4	2	50

In male patients aged 16 to 35 years, the highest prevalence of *E. coli* was found in the 26 to 30 age group, with 80% testing positive. In contrast, the lowest prevalence, at 25%, was observed in the 31 to 35-year age group. Among middle-aged adults (ages 36 to 50), both the 36 to 40 and 41 to 45 age groups showed a prevalence of 100% for positive cases of *E. coli*.

In older male patients (ages 51 to 75), the highest prevalence of positive cases was found in those aged 61 to 65, also at 100%. No cases of *E. coli*

infection were recorded in the age groups 56 to 60, 66 to 70, and 71 to 75 years (see Table 5).

Table 5. Prevalence of *E. coli* in relation to age groups among male patients

Male patients				
Age groups	**Age limits (years)**	**Total no. of patients tested**	**Number of positive cases (n)**	**Prevalence (%)**
Young adults (16-35yr)	16-20	22	14	64
	21-25	8	4	50
	26-30	10	8	80
	31-35	8	2	25
Middle-aged adults (36-50yr)	36-40	4	4	100
	41-45	2	2	100
	46-50	6	4	66.67
Older adults (51-75yr)	51-55	6	4	66.67
	56-60	0	0	0
	61-65	2	2	100
	66-70	2	0	0
	71-75	0	0	0

Microscopic examination of urine sediment revealed pus cells, white blood cells, epithelial cells, red blood cells, amorphous phosphates, and various casts. In this study, pus cells and epithelial cells were present in the majority of cases.

DISCUSSION

In this study, 65% of urine samples tested positive for *Escherichia coli*. Other researchers, such as Khanum *et al.* (2013) and Rahman *et al.* (2014), also reported a high prevalence of *E. coli* in urinary tract infection (UTI) patients in Bangladesh, with rates of 64% and 69%, respectively. *Escherichia coli* (*E. coli*), the most common species in the Enterobacteriaceae family, is responsible for 75–90% of UTIs in both hospitalized and non-hospitalized patients (Dromigny *et al.* 2005). The gastrointestinal tract acts as the primary reservoir for *E. coli*, making it the main source of UTIs (Sharma *et al.* 2013, Raksha *et al.* 2003). The high prevalence of *E. coli* in UTIs is largely because of its presence as a common component of intestinal flora. Certain uropathogenic strains of *E. coli* have an adherence structure called P fimbriae, or pili, which permits them to attach to uroepithelial cells (Abubakar 2009). However, detecting organisms in urine alone is not enough to identify a UTI (Kass 1975). Quantitative bacteriology and colony counting are essential to accurately differentiate between contamination and an actual infection—especially when multiple organisms are present (Wemambu and Obi 1983). A UTI is usually characterized by the colonization and subsequent invasion of the urinary tract by microorganisms (Metha *et al.* 1981).

The progression of these infections mostly relies on the pathogens' capability to evade the body's complex defense mechanisms (Funfotuck *et al.* 1989).

This study showed that the prevalence of *E. coli*-positive cases was higher among female outpatients (66%) than male outpatients (62.86%) at a tertiary medical college hospital in Bangladesh. Several studies in Bangladesh have revealed that urinary tract infections (UTIs) are more frequently observed in women. For example, Haque *et al.* (1976) recorded a high prevalence of UTI-positive cases among females (78.8%) compared to males (19.4%). Similarly, Moue *et al.* (2015) reported 79% of UTI cases were in females, while only 21% were in males. Rustom *et al.* (2020) also noted an increased prevalence of UTIs in adult females (64%) than in males (31%) at a diagnostic center in Bangladesh. Moreover, Islam *et al.* (2025) indicated a higher prevalence of UTIs among females (54.5%) than males (45.5%) at a tertiary care hospital in Bangladesh. These findings of a higher incidence of UTIs among women are supported by studies from other countries, including Pakistan (Ahmed *et al.* 2014), Nepal (Sharma *et al.* 2013; Chaudhry *et al.* 2012, Khadka *et al.* 2012), and South India (Razak and Gurushantappa 2012). In India, Pardeshi (2018) reported that the prevalence of UTIs was also higher in females (66.78%) than in males (33.22%). The higher rate of UTIs in adult women is mainly due to anatomical factors, particularly the shorter urethra and its proximity to the vagina, which facilitates the entry of bacteria into the bladder. Additional factors, including hormonal fluctuations, sexual activity, and pregnancy, also contribute to the increased risk (Smith and Bullen 1965, Kass 1975). Women's susceptibility to UTIs can also be connected to their urinary tract structure as well as inadequate personal hygiene (Prakash and Saxena 2013). Overall, the urinogenital tract's position makes women more susceptible to bacterial infections originating from both internal and external flora (Shanthi *et al.* 2012).

In our study, we analyzed the age distribution of *E. coli* prevalence among patients. We found that the highest prevalence (87.5%) was in middle-aged females (36–50 years), while the lowest prevalence (44.44%) was observed in older adult females (51–75 years). For male patients, the highest prevalence (83.33%) was also in the middle-aged group (36–50 years), while the lowest prevalence (58.33%) occurred in young adults (16–35 years). Pardeshi (2018) reported that the overall prevalence of *E. coli* was high in older patients (over 45 years). In women, a high prevalence was noted among those aged 31-45 years, whereas in men, it was observed in older patients (over 45 years), which contradicts our findings. Moue *et al.* (2015) noted that among patients with urinary tract infections (UTIs), females were predominantly in the age group of 21-40 years, while males were typically between 41-60 years. Ahmed *et al.* (2014) identified 21-30 years as the most infective age group for *E. coli*

infestations, with a prevalence of 21.1%. UTIs may affect women of all age groups, especially those who are sexually active (Foxman *et al.* 1997). The high incidence of UTIs among middle-aged to older males may be linked to prostate disease, which contributes to the increased occurrence of these infections.

In this study, the prevalence of *E. coli* in urine samples was higher in the summer (72.22%) compared to spring (59.18%). Additionally, a greater prevalence was observed for both female and male patients during the summer (70% and 66.67% respectively) than in spring (63.33% and 58.82% respectively). Rustom *et al.* (2020) also reported that the overall prevalence of urinary tract infections (UTIs) was higher in the summer for both adult female and male patients compared to other seasons. A similar finding was noted by Khanum *et al.* (2013), who indicated that the prevalence of *E. coli* in urine samples is greater in the summer than in other seasons. The higher occurrence of UTIs during the summer may be linked to elevated temperatures, which cause increased sweating and subsequently decreased urine production. This leads to more concentrated urine, creating a favorable environment for bacterial growth.

CONCLUSION

The high rate of urinary tract infections (UTIs) reported in this study is a noteworthy public health concern. The findings indicate that UTIs are more common among adult females than males. Moreover, *E. coli* has been identified as the leading causative organism in women suffering from UTIs. The results also suggest that middle-aged individuals (ages 36 to 50) are at greater risk of UTIs compared to younger and older adults. Furthermore, a higher prevalence of *E. coli* in urine samples was recorded during the summer season, possibly due to the warmer temperature creating favorable conditions for bacterial growth and transmission. These findings highlight the importance of early diagnosis and effective treatment strategies. Overall, the study offers valuable insights into the epidemiology of UTIs in this population and underscores the need for further research on microbial trends, antibiotic susceptibility, and resistance patterns of UTI-causing pathogens in Bangladesh.

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(Manuscript received on 2 August 2025 revised on 12 February 2026)