

## SCREENING OF BACTERIURIA IN ASYMPTOMATIC UNDERGRADUATE STUDENTS OF SARHAD INSTITUTE OF ALLIED HEALTH SCIENCES, PESHAWAR

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### Abstract

Urinary tract infections (UTIs) are among the most common bacterial infections worldwide and often caused by *Escherichia coli*, *Klebsiella*, *Staphylococcus*, *Enterococcus*, and *Enterobacter* species. They present a significant health burden, ranging from mild cystitis to severe pyelonephritis, and are complicated by the emergence of antimicrobial resistance due to the widespread and inappropriate use of antibiotics. A descriptive cross-sectional study was conducted at the Sarhad Institute of Allied Health Sciences, Peshawar, from April to July 2025. A total of 52 undergraduate students, selected through convenience sampling were enrolled. Midstream urine samples were collected and urine routine examination was done at lab of Sarhad Institute of Allied Health Sciences. Those samples which were positive for bacteria are then cultured on CLED and MacConkey agar for the isolation and identification of uropathogens using standard biochemical tests and Gram staining. Out of 52 enrolled students the male and female ratio was equal with the majority aged 18–22 years. Bacterial growth was detected in 4 (7.7%) urine samples and all of the positive samples belong to female participants. Our finding indicated that females having more chances of bacteriuria although they are asymptomatic as compared to male in our study population.

## INTRODUCTION

Urinary tract infections (UTIs) occur when microorganisms invade, multiply, and spread within the urinary system. In most cases, bacteria originating from the digestive tract travel upward into the urethra, where they begin to grow and cause infection. UTIs are among the most frequent bacterial infections encountered in clinical practice, particularly in developing countries (Mandrachiaet *al.*, 2020). Globally, they are second only to respiratory and gastrointestinal infections among patients in outpatient care. A UTI is confirmed when pathogenic microorganisms are identified in urine, the urethra, bladder, kidneys, or prostate, regardless of whether symptoms are present (Shah *et al.*, 2021). Both Gram-negative and Gram-positive bacteria, as well as certain fungi, may cause UTIs. However, uropathogenic *Escherichia coli* (UPEC) remain the leading culprit, followed by *Klebsiella pneumoniae* (Behzadiet *al.*, 2023).

The type of symptoms depends on the location of the infection, the responsible microorganism, severity, and the patient's immune response (Foxmanet *al.*, 2021). For example, bladder infections are known as cystitis, while infections of one or both kidneys are called pyelonephritis. Less commonly, the ureters the tubes connecting the kidneys to the bladder may be affected. Infection of the urethra, which drains urine from the bladder to the outside, is termed urethritis (Omoregieet *al.*, 2023). Intestinal Gram-negative bacteria are a particular concern as they frequently contribute to UTIs worldwide. In the United States alone, symptomatic UTIs account for roughly seven million emergency visits and about 100,000 hospital admissions each year (Mandrachiaet *al.*, 2020). UTIs are also the most common hospital-acquired infections, responsible for around 35% of all nosocomial infections and ranking as the second leading cause of sepsis among hospitalized patients (Shaifaliet *al.*, 2021).

Although bacteria are the primary cause, UTIs may occasionally be triggered by fungi or viruses (Flores Mireleset *al.*, 2020). More than 80% are linked to Gram-negative organisms, with Gram-positive strains accounting for a smaller proportion. *E. coli* is the dominant uropathogens (60–90%), followed by *Staphylococcus* species (10–15%). Other species, such as *Streptococcus*, *Proteus*, *Klebsiella*, *Neisseria*, *Corynebacterium*, and *Pseudomonas*, have also been isolated in clinical cases (Ashuret *al.*, 2021). Symptoms can vary but commonly include urgency, dysuria (painful urination), pyuria (pus in urine), lower abdominal or back pain, and a persistent urge to urinate. Host related factors such as urine composition, sexual activity, vaginal pH, and local immune defenses also influence susceptibility (Nigussie&Amsalu., 2017). The severity of disease often reflects both bacterial virulence and the host's immune status (Hannanet *al.*, 2021). Widespread misuse of antibiotics has further complicated treatment, as resistance is now common across nearly all drug classes (Khan *et al.*, 2022).

While UPEC remains the most frequent cause of both community acquired UTIs and catheter-associated UTIs (CAUTIs), Gram positive bacteria and fungi are increasingly implicated in catheterized patients. A recent U.S. study identified *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacterbaumannii*, *Pseudomonas aeruginosa*, and *Enterobacter* species as major healthcare associated pathogens following *E. coli* (Magill *et al.*, 2023). These organisms are not only linked to nosocomial infections but also exhibit significant drug resistance (Rice *et al.*, 2022). Prolonged catheter use allows bacteria direct access to the bladder, with infection risk rising in proportion to the duration of

catheterization. While short-term use (under a week) often avoids serious infection, long-term catheterized patients, particularly the elderly and chronically ill, face inevitable bacteriuria (Warren *et al.*, 2020). Preventive strategies such as limiting catheter use, following clinical guidelines, and avoiding unnecessary treatment of asymptomatic bacteriuria are crucial to lowering CAUTI rates and controlling resistance (Daniels *et al.*, 2023).

In most clinical settings, diagnosis and treatment are based primarily on symptoms, often before laboratory confirmation. Standard practice relies on oral antibiotics, with choices guided by local resistance patterns or culture results when available. However, standard urine cultures have relatively low sensitivity compared to enhanced culture methods (Hochstedler *et al.*, 2022). Advanced molecular techniques, such as sequencing, are not yet part of routine care (Mueller *et al.*, 2023). Since UTIs can mimic other conditions, physicians often rely on rapid but less accurate point of care tests like urinalysis to confirm decisions (Gajdácset *et al.*, 2020). Although culture testing provides more accurate pathogen identification and helps guide antibiotic therapy, its slow turnaround typically at least 48 hours limits its clinical usefulness (Shallcross *et al.*, 2021).

Resistance patterns vary across populations. Pediatric UTIs, for instance, show diverse microbial profiles depending on geography (Prakash *et al.*, 2021). Studies consistently report *E. coli* as the most common pathogen in children, with an alarming rise in resistance, particularly due to extended spectrum beta lactamase (ESBL)-producing strains (Taneja *et al.*, 2023). Novel approaches, such as biofilm dispersal agents like Bactisure, have demonstrated promise in preventing biofilm formation on urinary catheters, reducing infection risk from resistant pathogens (Siddiqui *et al.*, 2020; Banerjee *et al.*, 2021). In terms of therapy, European guidelines recommend nitrofurantoin and Fosfomycin trometamol as first-line treatments for uncomplicated cystitis (Bartoletti *et al.*, 2022; Karamet *et al.*, 2021). Trimethoprim sulfamethoxazole (SXT) is generally discouraged due to widespread resistance. Fluoroquinolones such as ciprofloxacin should be reserved for more severe infections like pyelonephritis or septicemia, rather than routine use in cystitis. Amoxicillin clavulanic acid (AMC) may be prescribed as an alternative for complicated UTIs or pyelonephritis (Cheung *et al.*, 2023).

## METHODOLOGY

### 3.1. Study Design

A descriptive cross-sectional study was conducted at Sarhad Institute of Allied Health Sciences, Sarhad University of Science and Information Technology, Peshawar.

### 3.2. Study Setting

The current study was conducted at lab of Sarhad Institute of Allied Health Sciences, Sarhad University of Science and Information Technology, Peshawar.

### 3.3. Study Duration

The duration of this study was 4 months from 15 April 2025 to 15 July 2025.

### 3.4. Inclusion Criteria

1. In current study we included undergraduate students of Sarhad Institute of Allied Health Sciences of both sexes (male and female) and all age group.

2. Only those undergraduate students of Sarhad Institute of Allied Health Sciences who voluntarily agreed to provide samples were included in this study.

### 3.5. Exclusion Criteria

1. Those students who were on **antibiotic therapy** or completed an antibiotic course within last 7 days were excluded from this study.
2. Those students who were unable or unwilling to provide urine sample are excluded from this study.

### 3.6. Sample Size

The sample size for this study was calculated using Cochran's Sample Size formula:

$$n = \frac{Z^2 \cdot P \cdot (1-p)}{d^2}$$

Where:

Z=1.96 for a 95% confidence level

Based on a previously reported prevalence of UTI was reported as 8% in a five years duration study conducted at Lahore, Pakistan (Safdaret *al.*, 2018). So, the prevalence for our four-month studies is 4%. d=0.05 (margin of error)

$$n = \frac{(1.96)^2 \times 0.04 \times (1-0.04)}{(0.05)^2}$$

$$n = \frac{3.84 \times 0.04 \times 0.96}{0.0025}$$

$$n = \frac{0.147}{0.0025}$$

$$n = 52$$

Thus, a total of 52 isolates were taken to achieve statistically significant results for this study.

### 3.7. Sampling Technique

Anon-probability convenience sampling technique was used in this study.

### 3.8. Requirement

The materials required for bacteriuria include urine samples collected in sterile bottle, dip strip, microscopic slides, cover slips, centrifuge, test tubes and microscope

### 3.9. Sample Collection and Processing

To ensure proper sample collection, a standardized protocol was followed. Each participant's urine sample, approximately 50ml in volume, was collected using a sterilized bottle. After collection of samples physical examination (color, volume, clarity, turbidity and specific gravity) was done by naked eye. The urine dip strips were used for the chemical examination (glucose, protein and PH) of urine. For the microscopic examination of urine 15ml of urine was centrifuge for 3 minutes at 1500 rpm. After centrifugation the supernatant was discarded of each sample and the sediment were poured at clean microscopic slide and covered by cover slips. At last the sediment was analyzed for different types of cells through microscope.

## RESULTS

### Age Wise Distribution

All the patients that were included in this study were divided into three age groups. The first group includes those participants who were having age between 18 to 22 years. In first group fall 31 participants out of 52. In second group we included those participants with age between 23 to 27 years fall 19 participants in this

age group. In third group includes participants with age between 28 to 32 years falls only 02 participants in this age group as shown in table 4.1.

Table 4.1: *Age Wise Distribution of Participants*

		Frequency	Percent	Cumulative Percent
Age	18 to 22 Years	31	59%	59%
	23 to 27 Years	19	36%	95%
	28 to 32 Years	02	05%	100%
	Total	52	100.0	

#### Gender Wise Distribution

In this study total 52 undergraduate students were included are categorized into male and female. Out of total 26 participants were male and 26 participants were female as shown in table 4.2.

Table 4.2: *Gender Wise Distribution of Participants*

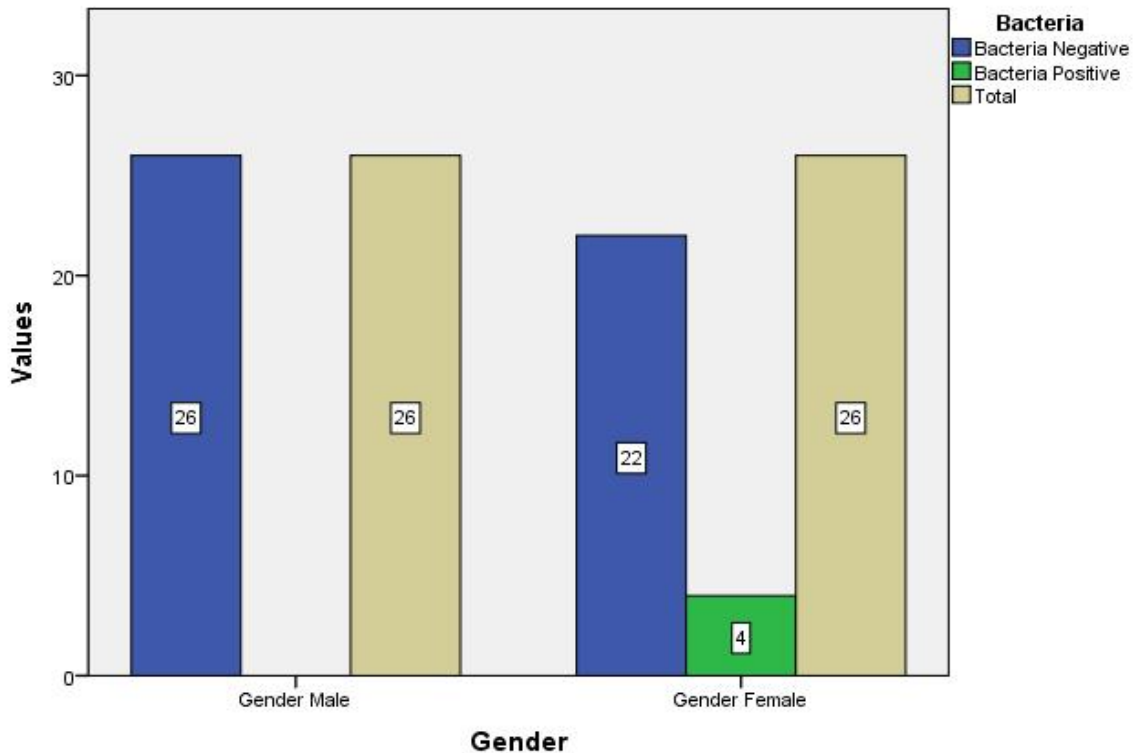
		Frequency	Percent
Gender	Male	26	50%
	Female	26	50%
	Total	52	100%

#### 4.3 Correlation of Gender with Bacteriuria

In total 52 asymptomatic undergraduate students that were included are categorized into male and female and their samples were processed. Out of 52 samples only 4 samples show bacterial growth which is then isolated and identified by several biochemical tests. All the isolated samples belong to female participants as shown in table 4.3 and figure 4.1.

Table 4.3: *Correlation of Bacteriuria with Gender*

		Gender	
		Male	Female
Bacteria	Negative	26	22
	Positive	0	4
Total		26	26



*Figure 4.1 Correlation of Bacteriuria with Gender*

## DISCUSSION

In this descriptive cross-sectional study conducted from April to July 2025 at Sarhad Institute of Allied Health Sciences, Peshawar, a total of 52 asymptomatic undergraduate students were screened for bacteriuria. Participants were divided into three age groups: 18–22 years (31 participants), 23–27 years (19 participants), and 28–32 years (2 participants). The study population was equally distributed by gender, with 26 males and 26 females. Among the 52 urine samples processed, bacterial growth was detected in 4 cases, all of which were isolated from female participants.

A study was conducted to investigate the presence of clinically important strains of *E. coli* in Pakistani women. Phylogroup B2 was identified as the most prevalent among patients, with 44% of isolates testing positive for CgA-specific SNPs in the *Fumarate hydratase* and *DNA gyrase subunit B* genes. Antibiotic susceptibility testing revealed widespread resistance to trimethoprim-sulfamethoxazole, along with notable extended-spectrum beta-lactamase (ESBL) production. Furthermore, infection analysis demonstrated that phylogroup B2 exhibited greater pathogenicity compared to other phylogroups. Whole-genome sequencing of *E. coli* strain U17 provided additional insights, revealing the presence of genes responsible for virulence, multidrug resistance, and host colonization, thereby underscoring its clinical significance and potential to contribute to recurrent and complicated urinary tract infections (Khan *et al.*, 2024).

A study conducted to evaluate the susceptibility profiles of uropathogenic strains isolated from inpatient and outpatient departments. The identified pathogens included *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Acinetobacter baumannii*, and *Enterococcus*

faecalis. Results showed that first-generation cephalosporins, nitrofurantoin, and fluoroquinolones (norfloxacin/ciprofloxacin) were effective against outpatient isolates, whereas inpatient isolates associated with nosocomial UTIs required parenteral therapy with newer aminoglycosides and third-generation cephalosporins due to higher resistance levels (Gupta *et al.*, 2022).

### CONCLUSION

The findings of our study revealed that bacteriuria was present in asymptomatic undergraduate students of Sarhad Institute of Allied Health Sciences, Peshawar. All the positive cases belong to females participants only which indicate a higher prevalence of asymptomatic bacteriuria in females compared to males. Our study finding highlights the importance of routine screening and early detection in order to prevent potential complications, particularly among female students.

### RECOMMENDATIONS

1. **Larger Sample Size:** Increasing the sample size will enhance the statistical power of the study, allowing for more reliable and generalizable results.
2. **Broader Demographic Inclusion:** Future studies should aim to include a more diverse demographic, including students from different universities and regions, to gain a more comprehensive understanding of antibiogram of uropathogens distribution across a wider population.

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