

# A Study of Urinary Tract Infection in adolescent girls at tertiary care hospital, Kanpur Uttar Pradesh

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## Abstract:

**Introduction:** Urinary tract infection (UTI) is very common among females in all age groups. During adolescence, hormonal changes favor vaginal colonization by nephritogenic strains of bacteria, which can migrate to the periurethral area and cause urinary tract infection. It is associated with poor self-esteem, impaired quality of life, social isolation, and depression. Many factors like low water intake, infrequent voiding and poor menstrual and sexual hygiene have been implicated in UTI during adolescence.

**Objective:** The study aimed at determining the prevalence of *E. coli* and its antimicrobial susceptibility profiles among adolescence presenting with signs and symptoms of UTI.

**Material & Methods-** The present cross sectional study was conducted in Department of Microbiology for a period of 6 months i.e, January 2023 to June 2023 at Rama Medical College Hospital & Research Centre, Kanpur, Uttar-Pradesh. A total of 50 cases aged 10-19 years were included and clinical profile, laboratory reports including bacterial isolates in urine cultures and their sensitivity patterns were documented.

**Result:** Out of 50 cases of adolescent girls 13 were culture positive for *E. coli* and remaining 37 was culture positive for other bacterial pathogens. In which girls belonging to the age group 14-18 years of age are highly affected. The most common symptom was burning during micturition which was present in 30.67% girls followed by frequency and others. Inadequate water intake, poor menstrual and vaginal discharge was the important risk factors. Antibiotic sensitivity pattern of *E. coli* revealed that maximum sensitivity was seen for to Piperacillin-tazobactam (100%), Polymyxin-B (100%), and Colistin (100%), followed by Meropenem (95.9%) Imipenem (85.7%), Tobramycin (91.3%), Tigecycline (88.2%).

**Conclusion:** Infections of the urinary tract are one of the commonest infections in adolescent girls and are a major threat for morbidity and mortality. This study was carried out to determine the susceptibility patterns of the *E. coli*. This study suggests use of Piperacillin-tazobactam, Polymyxin-B, Colistin followed by Meropenem, Imipenem, Tobramycin and Tigecycline for treatment of UTI in adolescent girls based on antimicrobial susceptibility pattern in our region.

**Keywords:** Adolescent girls, menstrual hygiene, Urinary tract infection

## Introduction

UTIs are infections brought on by the development and presence of microorganisms in the urinary tract. The natural flora of the digestive system frequently ascends into the urinary tract through the opening of the urethra, producing lower urinary tract infections. Females with wider pelvises are more likely to have weak pelvic floors. Age-related hormonal and physiological changes make voiding disorder more likely. All urinary issues are more common, which is also related to socioeconomic position and poor urogenital cleanliness. Urinary tract infection (UTI) is characterized by bacterial invasion and multiplication involving the kidneys and urinary tract pathways [1,2].

The World Health Organization has defined adolescence as the age group 10-19 years.

Agreeably it is a transitional period from dependent childhood to independent adulthood. Therefore, a good physical and mental health of children and adolescents make for good health in adulthood.[3] Approximately 60% of women will have at least one episode of UTI during their lives.[4,5] The prevalence of UTI is higher during adolescence, a period in which hormonal changes favour vaginal colonization by nephritogenic strains of bacteria, which can migrate to the periurethral area and cause urinary tract infection. [6] It is associated with poor self-esteem, impaired quality of life, social isolation, and depression. [7] Significantly, this health problem is contributing to the overall morbidity of females in all ages of their life. [8,9].

The enterobacterales order is the most common etiological agent of urinary tract infections because they have several factors associated with their attachment to the uroepithelium such as possession of adhesins [10]. *Escherichia coli* has been documented to be the most common pathogen associated with urinary tract infections in many countries causing both community- and hospital-acquired UTI [11]. Other pathogens such as *Enterococcus* sp., *Staphylococcus saprophyticus* ("honeymoon cystitis"), *Klebsiella* sp., *Enterobacter* sp.,

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Citrobacter sp., and Proteus-Morganella-Providencia sp. may also occur [12].

Therefore, this study is to find out the prevalence of *E. coli* and its antimicrobial susceptibility profiles among adolescence girls presenting with signs and symptoms of UTI.

## Material and Methods

The present cross-sectional study was conducted at the RMCH&RC Kanpur between January 2023 to June 2023. Total 50 adolescent girls having signs and symptoms of UTI were recruited for the study. Freshly voided clean catch midstream urine specimens of suspected UTI patients were submitted to the clinical microbiology laboratory of RMCH&RC, Kanpur for processing.

### Collection and Analysis of Urine Samples:

A total of 50 midstream urine samples were collected into a sterile urine container on the same day of enrollment. The samples were sent to the laboratory for analysis, and most of the samples were analyzed within one hour after collection. 10 µl of well-mixed urine samples were inoculated on MacConkey agar using a sterile loop following standard culture procedures. The plates were incubated at 37°C for 24 hours. Morphological colony identification and biochemical tests were used to confirm the *E. coli* organisms. Disc diffusion method was used to determine the antibiotic susceptibility of *E. coli*. *Escherichia coli* isolates were suspended in peptone water and incubated at 37°C until turbid and turbidity adjusted to a standard uniform concentration of 0.5 McFarland solutions. The isolates were then inoculated on Mueller Hinton agar the antibiotic discs containing precise concentration of the antibiotics were individually placed 1 cm from the wall from each other. The plates were then incubated at 37°C for 24 hours. The diameter zones of clearance were measured in millimeters and interpreted according to the Clinical Laboratory Standard Institute (CLSI) guidelines 2022 [13]. For quality control, *E. coli* ATCC 25922 provided in the laboratory was used as a control strain.

The study included all adolescent girls with any of these complaints:

- Burning during micturition
- Increased frequency of micturition
- Pain during micturition

### Exclusion criteria

- Age between 10 and 19 years
- Any of the above complaints

### Exclusion criteria:

- Age above 19 years

## Statistical analysis

- Data recorded on the case report form and structured proforma were subsequently entered into a spreadsheet. Data management and analysis were performed using Microsoft Excel.

## Ethical Approval

- Permission to collect sample will be obtained from Rama Medical College, Hospital & Research Centre, Kanpur, U.P.

## Results

Out of 50 cases 13 adolescent girls who fulfilled the study criteria and participated in the study, 4 were less than 14 years of age, 8 were between the age 15 and 18 and rest 1 were more than 18 years of age (Table 1).

Table 1: Age wise distribution

| Age group   | Number | Percentage (%) |
|-------------|--------|----------------|
| <14 years   | 4      | 30.78%         |
| 14-18 Years | 8      | 61.53%         |
| >18 years   | 1      | 7.69%          |

The most common urinary symptom was burning during micturition with 4 (30.76% girls) complaining it. This was followed by frequency, pain and blood in urine. Many girls had more than one symptom (Table 2).

Table 2: Symptoms of urinary tract infection

| Symptoms            | Number | Percentage (%) |
|---------------------|--------|----------------|
| Burning micturition | 4      | 30.76%         |
| Frequency           | 3      | 23.08%         |
| Pain                | 2      | 15.39%         |
| Blood in urine      | 1      | 7.69%          |
| Other               | 3      | 23.08%         |

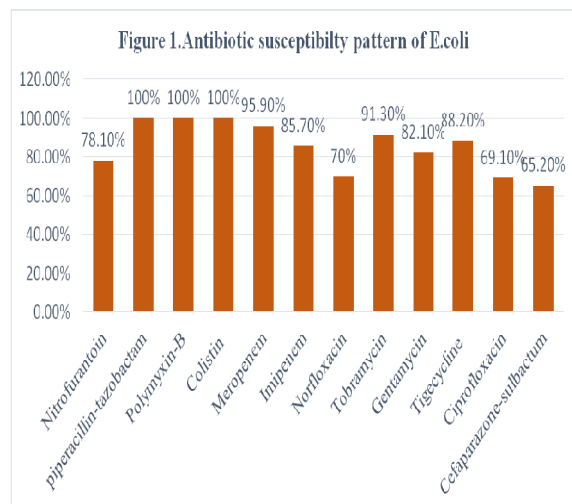
Low water intake (< 4 glasses) was present in 9 (69.2%) girls. Poor menstrual hygiene was present in 7 (53.8%) girls. Improper perineal washing and poor nutrition was also found in the girls. Vaginal discharge was present in 4 (30.7%) girls (Table 3).

Table 3: Risk factor of urinary tract infection in Adolescent girls

| Risk factors              | Number | Percentage |
|---------------------------|--------|------------|
| Inadequate water intake   | 9      | 69.20%     |
| Poor menstrual hygiene    | 7      | 53.80%     |
| Improper perineal washing | 6      | 46.10%     |
| Vaginal discharge         | 4      | 30.70%     |
| Poor nutrition            | 3      | 23.00%     |
| Pregnancy                 | 2      | 15.30%     |

*E. coli* (13) isolates were most sensitive to Piperacillin-Tazobactam (100%), Polymyxin -B (100%), and

Colistin (100%), followed by Meropenem (95.9%) Imipenem (85.7%), Tobramycin (91.3%), Tigecycline (88.2%).



**Figure 1: Antibiotic susceptibility pattern of E. coli.**

## Discussion

Urinary Tract Infection (UTI) most commonly occurs in adolescent age group [14]. Lower UTIs are considered as the most common adolescent girl's infection. At least one episode of UTI occurs in nearly 5-6% of girls during their entry from high schools to graduation. Compared to boys, the recurrence rate is 50% greater in girls [15]. The vagina and anus are positioned close to the urinary opening which makes females more prone for the development of UTI [16]. Due to UTI, every year nearly 6-7 million young women visit physicians and therefore it is a major concern for the parents and healthcare providers [14]. Any delay in the treatment leads to permanent kidney damage, bacterial endocarditis and infertility [14,17]. In our study the burning micturition was observed as the commonest symptom (30.76%) followed by frequency, pain, blood in urine and other. The finding is in accordance with Sarita Mohapatra et.al [18] (2022) burning micturition (37.6%) followed by frequency (30.4%).

In our study the Inadequate water intake and poor menstrual hygiene is most common risk factor followed by improper perineal washing, vaginal discharge, poor nutrition and pregnancy. The finding is similar to Shubha Srivastava et.al. [19] (2018).

In our study Antibiotic sensitivity pattern of E. coli revealed that maximum sensitivity was seen for to piperacillin-tazobactam (100%), polymyxin -B (100%), and colistin (100%), followed by Meropenem (95.9%) Imipenem (85.7%), Tobramycin (91.3%), tigecycline (88.2%). The finding is in accordance with Akter Tet al. [20](2016) found that 100% of E. coli isolates were sensitive to gentamycin, amikacin, imipenem, meropenem, piperacillin-tazobactam, and tobramycin.

Among adolescent girls, poor hygiene and dysfunctional voiding pattern increases the risk for UTI. Silent UTI may occur among adolescent girls due to inadequate intake of water and infrequent passage of urine. The possible link between the prevalence of UTI among students residing in the hostel includes the use of western toilets, unhygienic mass toilets; improper menstrual hygiene and toileting habits [17].

## Conclusion

There should be very useful information to initiate and develop health intervention measures for the prevention and control of UTI among young adolescent girls. Its prevention, appropriate training to maintain adequate hygienic practices, food and life style modification was the need highlighted from this study. Educational talks on UTIs and its risk factors should be held periodically amongst the girls to improve knowledge and improve their preventive practices towards UTI

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