

Prevalence of Urinary Tract Infections and Epidemiological Characteristics at Tay Nguyen University Hospital

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Abstract: A cross-sectional study was conducted on 255 patients suspected of having urinary tract infections (UTIs) at Tay Nguyen University Hospital from March 2025 to May 2025. The results showed that the prevalence of culture-confirmed UTIs was 54.5%. Females had a significantly higher prevalence compared to males (82.0% vs. 18.0%, $p < 0.01$). The highest prevalence was observed in patients aged over 60 years (33.8%). The infection rate among the Ê Đê ethnic group (56.7%) was higher than that of the Kinh ethnic group (54.5%, $p < 0.05$). The predominant bacterial isolates included *Escherichia coli* (45.3%), *Staphylococcus aureus* (33.1%), and *Pseudomonas aeruginosa* (9.4%). UTIs remain a common infectious disease, particularly among females and the elderly. Strengthening preventive measures and continuous surveillance of etiological agents in the community is essential.

Keywords: Urinary tract infection, epidemiology, *E. coli*, *S. aureus*, *P. aeruginosa*.

INTRODUCTION

Urinary tract infection (UTI) is one of the most common infectious diseases, affecting approximately 150 million people worldwide each year. It occurs across all age groups, in both community and hospital settings, with diverse clinical manifestations and potentially severe complications if not treated promptly. In Vietnam, UTI ranks as the second most prevalent urinary system disease, following urolithiasis (University of Medicine and Pharmacy, 2009). According to the Ministry of Health, urinary system diseases account for the fifth leading cause in the national morbidity–mortality pattern, with a prevalence of 8.42% and a mortality rate of 1.21% (Ministry of Health, 2010).

Previous studies, both domestic and international, have demonstrated that enteric bacteria—particularly *Escherichia coli*, along with *Staphylococcus aureus* and *Pseudomonas aeruginosa*—are the most frequent etiological agents (Pham HA, Pham MH. 2022), (Flores-Mireles, A. L. *et al.*, 2015). Notably, the increasing trend of antimicrobial resistance poses challenges for treatment, especially in nosocomial infections. In the Central Highlands of Vietnam, epidemiological data on UTI and its bacterial etiology remain limited. Therefore, this study was conducted to provide scientific evidence on the prevalence and epidemiological characteristics of UTIs at Tay Nguyen University Hospital, aiming to support diagnosis, treatment, and prevention strategies.

MATERIALS AND METHODS

Study population

The study included patients who visited or were admitted to Tay Nguyen University Hospital and were clinically diagnosed with urinary tract infection, presenting with typical symptoms such as dysuria and urinary urgency.

Study setting and period

The research was carried out in the Internal Medicine and Surgery Departments of Tay Nguyen University Hospital, from March 1, 2025, to May 1, 2025.

Study design A descriptive cross-sectional design was applied.

Sampling method A convenient sampling method was used.

Sample size

The required sample size n was estimated using the single-proportion formula:

$$n = Z_{(1-\alpha/2)}^2 \frac{p(1-p)}{d^2}$$

where $Z_{(1-\alpha/2)} = 1.96$ for a 95% confidence level, the allowable margin of error $d = 0.05$, and the expected prevalence $p = 0.179$ based on Le Dinh Khanh (2018) (Le, D. K. *et al.*, 2018). The calculated minimum sample size was $n = 225$ participants.

Specimen collection

For each patient, 3–4 mL of midstream urine was collected into a sterile tube and immediately transported to the Microbiology Laboratory, Faculty of Medicine and Pharmacy, Tay Nguyen University. The entire urine sample was centrifuged at 3,000 rpm for 10 minutes. The sediment was used to prepare two smears for Gram

staining. The remaining sediment was inoculated onto/into appropriate media (broth, blood agar, chocolate agar, and MacConkey agar) following standard procedures (Le VP. 2000).

Culture and bacterial identification

Urine specimens were cultured on Brain Heart Infusion (BHI) broth, blood agar, chocolate agar, and MacConkey agar. Bacterial isolates were identified using conventional biochemical tests and, where indicated, specific antisera (serological) reactions, in accordance with standard microbiological protocols.

Data management and statistical analysis

Data were entered in Microsoft Excel and analyzed using SPSS 22. The chi-square (χ^2) test was applied to assess associations between categorical

variables. Statistical significance was set at $p < 0.05$.

Ethical considerations

All participants were adequately informed about the study's objectives, procedures, potential benefits, and their rights prior to enrollment. Participation was entirely voluntary, with the right to decline or withdraw at any time without consequences. Participant confidentiality was strictly maintained. Individuals with positive culture results were notified and received guidance and treatment according to antibiotic susceptibility testing.

RESULTS

Overall prevalence of urinary tract infection

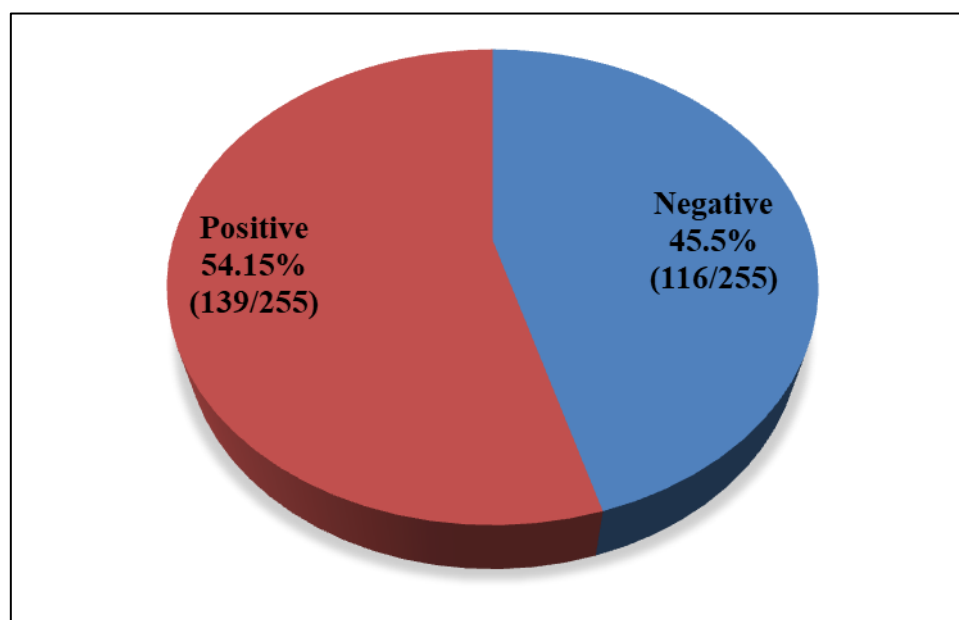


Figure 1. Prevalence of urinary tract infection among patients

Out of 255 patients with suspected urinary tract infection, 139 cases (54.5%) were culture-positive, while 116 cases (45.5%) were culture-negative.

Identification of bacterial isolates from urine sample

Table 1. Distribution of bacterial isolates from urine specimens

Microorganism	Number of isolates	Percentage (%)
<i>Escherichia coli</i>	63	45.3
<i>Staphylococcus aureus</i>	46	33.1
<i>Pseudomonas aeruginosa</i>	13	9.4
Yeast (<i>Candida</i> spp.)	17	12.2
Total	139	100

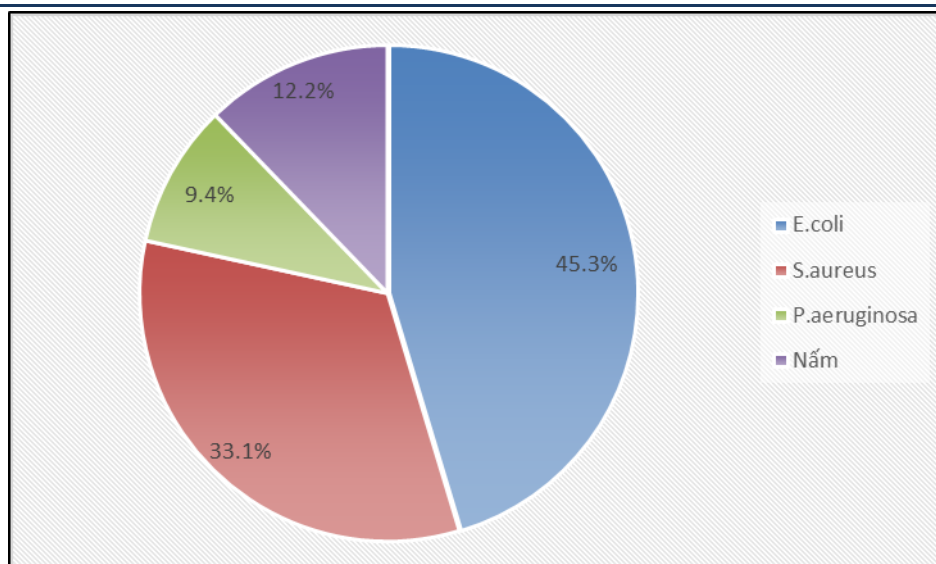


Figure 2. Distribution of bacterial isolates in urine specimens

Based on the results in Table 1, among 139 culture-positive urine samples: Escherichia coli accounted for 45.3%; Staphylococcus aureus accounted for 33.1%; Pseudomonas aeruginosa accounted for 9.4% and yeasts (mainly Candida spp.) were isolated in 12.2% of samples.

Prevalence of urinary tract infection by gender

Table 2. Prevalence of urinary tract infection by gender

Results Gender	Negative		Positive		p-value
	n	(%)	n	(%)	
Male	42	36.2	25	18.0	< 0.01
Female	74	63.8	114	82.0	
Total	116	100	139	100	

As shown in Table 2, the prevalence of culture-confirmed urinary tract infection was significantly higher in females (82.0%) compared with males (18.0%), with a statistically significant difference ($p < 0.01$).

Prevalence of urinary tract infection by age group

Table 3. Prevalence of urinary tract infection by age group

Results Age group	Negative		Positive		p-value
	n	(%)	n	(%)	
≤ 18	3	2.6	2	1.4	$p > 0.05$
19 – 30	14	12.1	29	20.9	
31 – 45	14	12.1	24	17.3	
46 – 60	41	35.3	37	26.6	
> 60	44	37.9	47	33.8	
Total	116	100	139	100	

The distribution of UTI across different age groups is presented in Table 3. The highest prevalence was observed among patients aged >60 years (33.8%), followed by the 46–60 years group (26.6%), the 19–30 years group (20.9%), and the 31–45 years group (17.3%). The lowest prevalence was

recorded in patients aged ≤18 years (1.4%). The difference across age groups was not statistically significant ($p > 0.05$).

Prevalence of urinary tract infection by ethnicity

Table 4. Prevalence of urinary tract infection by ethnicity

Results	Total samples	Negative		Positive		p-value
		n	(%)	n	(%)	

Ethnicity						
Kinh	224	102	45.5	122	54.5	< 0.05
Ê Đê	30	13	43.3	17	56.7	
M'ngong	1	1	100	0	0	

The prevalence of UTI according to ethnicity is shown in Table 4. Among Kinh patients, the prevalence of positive cultures was 54.5%. In the Ê Đê group, the prevalence was slightly higher at 56.7%, and this difference was statistically significant ($p < 0.05$). Only one patient of M'ngong ethnicity was included, who was culture-negative.

DISCUSSION

Prevalence of bacterial isolates in urinary tract infection

The findings of this study conducted at Tay Nguyen University Hospital revealed that the prevalence of culture-confirmed urinary tract infection (UTI) was 54.5%. Compared with previous studies, our prevalence was higher than that reported by Pham Hien Anh (2022) (27.33%) (Pham HA, Pham MH. 2022) and Le Dinh Khanh (2018) (45.5%) (Le, D. K. *et al.*, 2018). However, it was lower than the prevalence documented by Tran Quoc Huy (2022), who recorded 75.5% (Pham, T. Y. H. *et al.*, 2022). These discrepancies may reflect variations in epidemiological characteristics, population demographics, and risk factors for UTI across different geographical settings.

From a clinical perspective, UTI remains a condition with complex presentations and potential complications. Although diagnostic techniques and etiological identification have advanced considerably, bacterial culture and isolation continue to pose certain challenges in routine practice. At present, diagnosis and treatment are primarily based on clinical manifestations combined with biochemical and microbiological tests. Of particular concern is the increasing trend of antimicrobial resistance among uropathogens, which poses a significant challenge in selecting appropriate therapeutic regimens and highlights the urgent need for continuous surveillance and prudent antibiotic use in clinical settings.

Distribution of bacterial isolates from urine specimens

In this study, a total of 139 bacterial isolates were obtained from urine samples. Among them, *Escherichia coli* was the most frequently isolated pathogen with 63 strains (45.3%), followed by *Staphylococcus aureus* with 46 strains (33.1%) and *Pseudomonas aeruginosa* with 13 strains (9.4%).

In addition, 17 yeast isolates were recovered; however, fungal pathogens were not the primary focus of this study.

Our findings are consistent with several previous reports. Pham Thuy Yen Ha (2022) reported *E. coli* in 43.4%, *P. aeruginosa* in 11.3%, and *S. aureus* in only 1.9% of UTI cases (Nguyen, T. T. N. *et al.*, 2024). Similarly, Le Dinh Khanh *et al.* (2018) documented prevalences of *E. coli* (45.88%), *S. aureus* (9.43%), and *P. aeruginosa* (8.24%) (Le, D. K. *et al.*, 2018). Thus, our results indicate that *E. coli* and *S. aureus* are the two major etiological agents of UTI at Tay Nguyen University Hospital, while *P. aeruginosa* also plays a noteworthy role, particularly in cases of hospital-acquired infections.

Prevalence of urinary tract infection by gender

Our study revealed a statistically significant difference in the prevalence of UTIs between males and females ($p < 0.01$). Females accounted for 82.0% of positive cases, whereas males represented only 18.0%. This finding is comparable to the study by Nguyen Thi Thanh Nhiem (2023), who reported prevalence rates of 53.4% in males and 65% in females (Que, A. T. *et al.*, 2021).

This gender difference can be explained by anatomical and physiological factors. In females, the urethra is shorter than in males and is located in close proximity to the anal region, which facilitates retrograde transmission of enteric bacteria into the urinary tract. Consequently, female patients are more susceptible to ascending infections, particularly those caused by *E. coli*, which was the predominant isolate in our study.

Our study revealed that urinary tract infections (UTIs) occurred across all age groups, with the youngest patient being 7 years old and the oldest 87 years old. The prevalence in the age group ≤ 18 years was 1.4%, indicating that UTIs are relatively uncommon in younger individuals. In the age group of 19–30 years, the prevalence was 20.9%. The increase in this group may be attributed to the onset of sexual activity, as sexual intercourse is one of the leading risk factors for UTI. Furthermore, pregnancy in women also increases the risk due to hormonal changes and the

mechanical pressure of the uterus on the urinary tract.

Meanwhile, the prevalence of UTI increased progressively with age: 17.3% in the 31–45 years group, 26.6% in the 46–60 years group, and the highest rate of 33.8% in patients > 60 years. This trend is consistent with the fact that advancing age is associated with reduced urinary clearance, impaired immune responses to infections, and higher prevalence of chronic comorbidities (such as diabetes mellitus and nephrolithiasis), all of which contribute to an increased risk of UTI. Our findings are in line with those reported by Que Anh Tram (2021), who documented a UTI prevalence of 77.21% in individuals over 50 years of age (Ha, T. V. 2013).

Prevalence of Urinary Tract Infections by Ethnicity

Dak Lak Province is home to 49 ethnic groups. The Kinh account for the majority of the population, while ethnic minorities such as the Ê Đê, M'ông, Thai, Tay, and Nung constitute nearly 30% of the total population. However, in our study, only a limited number of ethnic groups presented with urinary tract infections (UTIs) at Tay Nguyen University Hospital and were specifically analyzed.

The prevalence of UTIs among Kinh patients was 58.2%, while that among Ê Đê patients was 56.7%. The bacterial isolation rate in Kinh patients was slightly higher than in Ê Đê patients, though the difference was not significant. According to the study by Ha Thi Van (2013), the prevalence of UTIs was 68.5% among the Kinh, 70.2% among the Ê Đê, and 82.3% among the M'ông. Our findings indicate that the prevalence of UTIs among the Kinh, Ê Đê, and M'ông in our study was lower than that reported by Ha Thi Van (2013). This discrepancy may reflect improvements in community awareness, hygiene practices, lifestyle habits, and healthcare accessibility in the prevention of UTIs from 2013 to the present.

CONCLUSION

The study revealed that the prevalence of urinary tract infections (UTIs) at Tay Nguyen University Hospital was relatively high (54.5%). Among the isolated pathogens, *Escherichia coli* accounted for the highest proportion (45.3%), followed by *Staphylococcus aureus* (33.1%) and *Pseudomonas aeruginosa* (9.4%).

The incidence was significantly higher in females (82.0%) compared with males (18.0%), with a statistically significant difference. UTIs were observed across all age groups, but the highest prevalence was recorded in patients over 60 years of age (33.8%). Ethnic differences were also noted, with Kinh and Ê Đê patients representing the majority of cases.

These findings confirm that UTIs remain an important public health concern in the Central Highlands region. Strengthening epidemiological surveillance, promoting early diagnosis, and monitoring antimicrobial resistance patterns of major pathogens such as *E. coli*, *S. aureus*, and *P. aeruginosa* are essential to improving treatment outcomes and reducing the disease burden in the community.

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