

ORIGINAL ARTICLE

Urine Cultures Prior to Prostate Biopsy: A Cross-Sectional Analysis

Prostat Biyopsisi Öncesi İdrar Kültürleri: Kesitsel Bir Analiz

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Abstract

Introduction: Prostate cancer is a common male malignancy, and transrectal ultrasound-guided biopsy (TRUSBx) is the standard diagnostic method despite infection risks. The value of routine urine culture in asymptomatic patients remains unclear. This study aimed to evaluate pre-biopsy urine cultures in asymptomatic TRUSBx patients at a tertiary hospital, analyzing bacterial growth, isolated microorganisms, and antibiotic resistance.

Methods: This retrospective study included asymptomatic male patients aged 40–80 years who underwent TRUSBx between June 2019 and December 2024 and had a pre-biopsy urine culture. Patients with urinary catheters, recent urogenital or rectal surgery, or recent antibiotic use or hospitalization in the three months were excluded. A positive urine culture was defined as bacterial growth $\geq 10^5$ CFU/ml. Data were retrieved from hospital records.

Results: A total of 1548 male patients with pre-biopsy urine cultures were included in the study. The mean age was 65.2 years, and the mean PSA level was 10.2 ng/mL. Bacterial growth was detected in 66 patients (4.3%). Of these, 44 isolates (67%) were gram-negative and 22 (33%) were gram-positive. *Escherichia coli* was the most common gram-negative organism, while *Enterococcus faecalis* was the most frequently isolated gram-positive species. Among *E. coli* isolates, the highest resistance rate was observed against amoxicillin-clavulanate (65%), whereas resistance to fluoroquinolones was 17.4%.

Discussion and Conclusion: Bacterial growth was observed in <5% of asymptomatic males undergoing TRUSBx, with *E. coli* as the most common pathogen. Fluoroquinolone resistance was near the threshold, highlighting the need for local antimicrobial resistance data in prophylactic antibiotic planning.

Keywords: Antibiotic resistance; Prophylactic antibiotics; Transrectal ultrasound-guided prostate biopsy; Urine culture

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Prostate cancer is one of the most common malignancies among men worldwide and accounts for a significant proportion of cancer-related deaths. Prostate biopsy is performed for diagnostic purposes, with both transperineal and transrectal ultrasound-guided approaches available. Although the European Association of Urology (EAU) Guidelines report lower infection rates with the transperineal approach, transrectal ultrasound-guided prostate biopsy (TRUSBx) remains the most commonly preferred method due to its ease of application and the fact that it does not require anesthesia in an office setting. However, this procedure carries a risk of infectious complications.^[1–3]

While pre-biopsy rectal swab cultures are recommended in many studies, urine culture is not routinely advised in asymptomatic patients. However, the potential contribution of pre-biopsy urine culture to post-procedural complications remains unclear. Therefore, some clinicians prefer to perform urine culture screening before TRUSBx even in asymptomatic patients, considering the possible risk of post-biopsy infection. This approach is based on the hypothesis that asymptomatic bacteriuria may predispose patients to infectious complications.^[4–6]

Although routine antibiotic prophylaxis is administered before TRUSBx, the increasing prevalence of antibiotic resistance has led to a rise in infection rates. Therefore, the selection of an appropriate prophylactic antibiotic is of critical importance, and regional antibiotic susceptibility patterns should be taken into account during the decision-making process.^[7]

This study aims to retrospectively assess the prevalence of bacterial growth, isolated microorganisms, and their antibiotic resistance profiles in pre-biopsy urine cultures from asymptomatic patients, in order to contribute to regional data on uropathogen distribution and antimicrobial susceptibility.

Materials and Methods

Study Place, Design and Study Type

This retrospective original study was conducted at a tertiary care hospital and included data from asymptomatic male patients who underwent TRUSBx between June 2019 and December 2024.

Patient Selection and Data Collection

The indication for biopsy was based on abnormal digital rectal examination findings, elevated PSA levels, and/or suspicious multiparametric prostate magnetic resonance

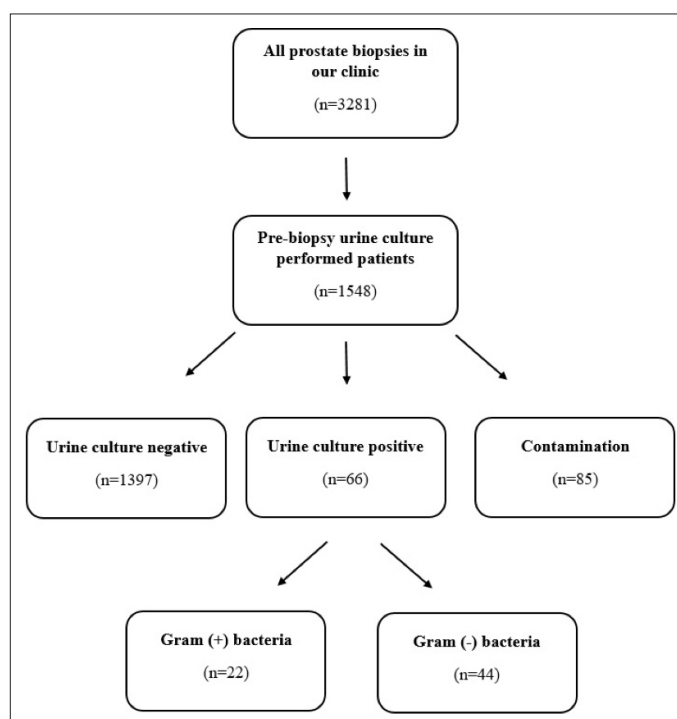


Figure 1. Flow diagram of patient selection and study inclusion process.

imaging findings. Data for the study were retrospectively obtained by reviewing the hospital registry system and patient medical records.

Exclusion criteria were the presence of a urinary catheter, a history of urogenital or rectal surgery, and antibiotic use or hospitalization within the last three months for any reason. A positive urine culture was defined as the growth of $\geq 10^5$ CFU/ml of bacteria in 1 ml of urine. Contamination was defined as the growth of two or more different microorganisms, particularly when these microorganisms were of low density and part of the normal flora. The flowchart of patient selection and study process is shown in Figure 1.

Ethical approval: Local Ethics Committee granted approval for this study (date: 29.04/2025, number: 423). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the study data. Since all variables were categorical, they were reported as frequencies and percentages (n, %). No inferential statistical tests were conducted, as no group comparisons were planned.

Table 1. Antibiotic resistance rates of isolated bacteria

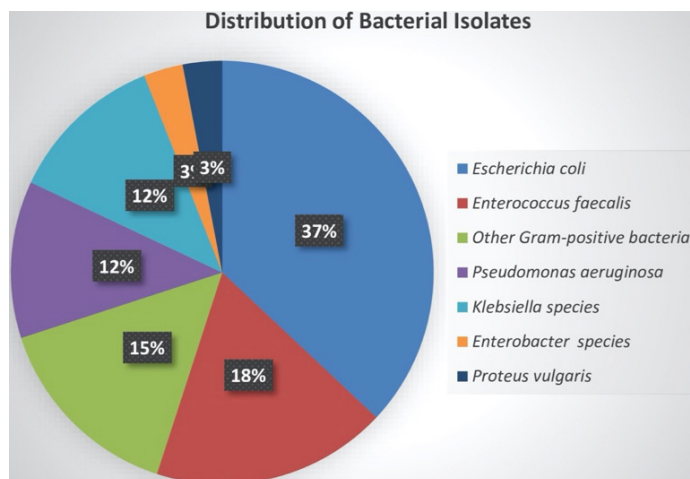
Antibiotic	<i>Escherichia coli</i> n/N (%)	<i>Enterococcus faecalis</i> n/N (%)	Other gram-positive bacteria n/N (%)	<i>Pseudomonas aeruginosa</i> n/N (%)	<i>Klebsiella species</i> n/N (%)	<i>Enterobacter species</i> n/N (%)	<i>Proteus vulgaris</i> n/N (%)
AMC	15/24 (62.5)	–	–	–	7/8 (87.5)	2/2 (100.0)	–
CIP/LEV	4/24 (16.6)	0/12 (0)	4/10 (40)	0/8 (0)	4/8 (50.0)	0/2 (0)	2/2 (100)
CRO	2/24 (8.3)	–	–	–	3/8 (37.5)	2/2 (100.0)	–
CFX	4/24 (16.6)	–	–	–	5/8 (62.5)	–	0/2 (0)
TZP	1/24 (4.1)	–	–	0/8 (0)	5/8 (62.5)	1/2 (50.0)	–
AM	5/24 (20.8)	2/12 (16.6)	–	–	5/8 (62.5)	–	0/2 (0)
VAN	–	1/12 (8.3)	0/10 (0)	–	–	–	–
MEM	0/24 (0)	–	–	–	4/8 (50.0)	0/2 (0)	–
SXT	3/24 (12.5)	–	0/10 (0)	0/8 (0)	6/8 (75.0)	0/2 (0)	2/2 (100)
CAZ	1/24 (4.1)	–	–	0/8 (0)	4/8 (50.0)	1/2 (50.0)	–
F	0/24 (0)	0/12 (0)	0/10 (0)	–	5/8 (62.5)	1/2 (50.0)	2/2 (100)
GN	2/24 (8.3)	–	–	–	3/8 (37.5)	0/2 (0)	0/2 (0)
ETP	0/24 (0)	–	–	–	3/8 (37.5)	0/2 (0)	–
FEP	1/24 (4.1)	–	–	2/8 (25%)	4/8 (50.0)	–	0/2 (0)
AK	0/24 (0)	–	–	0/8 (0)	3/8 (37.5)	–	0/2 (0)

N: Total number of isolates tested; n: Number of resistant bacterial isolates; AK: Amikacin; AMC: Amoxicillin-clavulanate; AM: Ampicillin; FEP: Cefepime; CAZ: Ceftazidime; CFX: Cefixime; CRO: Ceftriaxone; CIP: Ciprofloxacin; LEV: Levofloxacin; ETP: Ertapenem; FF: Fosfomycin; GN: Gentamicin; IMP: Imipenem; MEM: Meropenem; F: Nitrofurantoin; TZP: Piperacillin-tazobactam; SXT: Trimethoprim-sulfamethoxazole; VAN: Vancomycin.

Results

A total of 1548 male patients aged 40 to 80 years, for whom a pre-procedural urine culture had been requested, were included in this retrospective study out of 3281 patients who underwent TRUSBx at our clinic.

The mean age of the patients was 65.2 years, and the mean PSA level was 10.2 ng/mL. Bacterial growth was detected in the urine cultures of 66 patients (4.3%). Among these 66 patients with growth, 44 (67%) had gram-negative bacteria, and 22 (33%) had gram-positive bacteria isolated. The most common gram-negative pathogen was *Escherichia coli* (*E. coli*), while the most frequently isolated gram-positive microorganism was *Enterococcus faecalis*. *E. coli* isolates showed the highest resistance to amoxicillin-clavulanate (62.5%), while fluoroquinolone resistance was 16.6%. Annual fluoroquinolone resistance rates from 2019/20 to 2023/24 were 21.4%, 27.3%, 25%, 18.8%, and 15.4%, respectively. Extended spectrum beta lactamases (ESBL) were detected in four *E. coli* strains (16.6%). No resistance was detected to meropenem, ertapenem, or nitrofurantoin. *Klebsiella pneumoniae* strains exhibited high resistance to multiple antibiotics, including 87.5% to amoxicillin-clavulanate and 75% to trimethoprim-sulfamethoxazole and 62% of strains

**Figure 2.** Distribution of bacterial isolates (n=66).

had ESBL. *Enterococcus faecalis* showed low resistance overall, with 8.3% resistant to vancomycin. The types of uropathogenic microorganisms, their antibiotic susceptibility profiles, and fluoroquinolone resistance by year are summarized in Table 1 and Figures 2 and 3.

Discussion

Our findings revealed that asymptomatic bacteriuria was present in 4.3% of patients, with *Escherichia coli* being

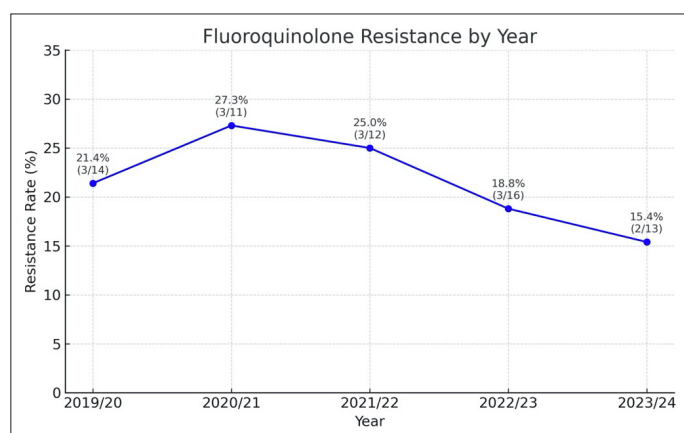


Figure 3. Fluoroquinolone resistance by year.

the most frequently (%36.4) isolated pathogen. Although this relatively low prevalence supports existing evidence suggesting that routine urine culture may have limited value in asymptomatic individuals, the detection of multidrug-resistant strains such as *E. coli* and *Klebsiella pneumoniae* emphasizes the importance of ongoing local resistance surveillance. These findings contribute to the ongoing debate on pre-biopsy evaluation protocols and may inform tailored prophylactic strategies to minimize post-procedural infectious complications.

TRUSBx is the most commonly used biopsy method in the diagnosis of prostate cancer. Although infectious complications related to biopsy typically occur in 0.8–3% of cases, life-threatening infectious conditions can develop in 0.1–1.3% of cases. Infectious agents can reach the prostate through several routes, including ascending urethral spread, reflux of infected urine into the prostatic ducts, hematogenous dissemination, or direct inoculation by the biopsy needle. These mechanisms underline the potential risk of infectious complications, particularly in patients with pre-existing bacteriuria or unrecognized urinary tract colonization.^[8,9]

Many studies recommend performing rectal cleaning with povidone-iodine and obtaining a rectal swab culture before TRUSBx to minimize complications associated with the procedure.^[10,11] Urine culture is not routinely recommended in asymptomatic patients before TRUSBx as it is considered ineffective in preventing infectious complications.^[6,12,13] However, despite this consensus, Utrera et al.^[14] reported a significant association between the presence of a positive urine culture and infectious complications. Therefore, some clinicians may prefer to routinely obtain a urine culture before TRUSBx in their practical approach.

In the literature, Qi DZ et al.^[6] evaluated the role of urine culture before prostate biopsy and detected bacterial growth in 4% of asymptomatic patients. This rate is consistent with the findings of our study (4.3%).

In addition, similar to our study, *E. coli* has been reported as the most frequently isolated pathogen in various studies in the literature. However, *E. coli* isolation rates in these studies vary between 50% and 70%.^[15–18] The relatively low rate observed in our study (36.4%) may be attributed to various factors such as differences in microbial flora in different geographical regions, inclusion of only male patients, and emergence of other dominant microorganisms due to antibiotic resistance patterns shaped by community-level antibiotic use practices. In the study conducted by Baran et al.,^[16] *E. coli* was identified as a uropathogen in 55% of female patients and 10.9% of male patients.

In two studies conducted in Türkiye, ampicillin was reported as the antibiotic to which *E. coli* strains exhibited the highest resistance, with rates ranging between 50% and 60%.^[16–18] In our study, however, *E. coli* isolates showed the highest resistance to amoxicillin-clavulanic acid, at a rate of 65%. The resistance rate to ampicillin was found to be 21%. Similarly, a study conducted in Pakistan reported a 70% resistance rate of *E. coli* isolates to amoxicillin-clavulanic acid.^[17]

In our study, *Klebsiella pneumoniae* was identified as another bacterium with high levels of antibiotic resistance. Among the total isolates, *K. pneumoniae* accounted for 12% of the bacterial growth, with resistance rates of 87.5% to amoxicillin-clavulanic acid and 62.5% to ampicillin. Similarly, the literature also reports high resistance rates of *K. pneumoniae*, particularly to ampicillin, ranging from 90% to 100%.^[16,18]

ESBL was detected in 16.6% of *E. coli* strains and 62.5% of *K. pneumoniae* strains. The rate of ESBL in community-acquired *E. coli* strains is below the rates reported in publications from our country.^[19]

Although no *E. coli* strains were found to be carbapenem resistant, half of the eight *K. pneumoniae* strains were found to be carbapenem resistant. Considering that these patients had no history of hospitalization or antibiotic use, carbapenem resistance may be a concern. However, the presence of only 8 strains warrants a study with a larger number of patients.

Antibiotic prophylaxis is recommended before TRUSBx.^[20,21] Fluoroquinolones are among the most commonly preferred antibiotics for this purpose. However, due to

the increasing resistance to fluoroquinolones, the use of this antibiotic class for prophylaxis has recently been restricted by the European Medicines Agency (EMA).^[22,23] According to the literature, in regions where *E. coli* strains exhibit fluoroquinolone resistance rates exceeding 20%, alternative antibiotics should be considered for prophylactic use.^[24,25] In our study, the fluoroquinolone resistance rate among *E. coli* isolates was found to be 16.6%. When examining fluoroquinolone resistance rates among all microorganisms tested for fluoroquinolone susceptibility, the annual rates were 21.4%, 27.3%, 25%, 18.8%, and 15.4%, indicating a decreasing trend over time. Although the number of patients tested each year was relatively limited, these findings suggest that the prophylactic use of fluoroquinolones should be carefully re-evaluated. In this context, considering alternative antibiotics for prophylactic purposes may be appropriate.

In our institution, cefixime 400 mg has been used as prophylactic antibiotic for TRUSBx over the past three years, in accordance with the EAU recommendations for regions with high fluoroquinolone resistance.^[3] The regimen is initiated 24 hours before the procedure and continued for a total duration of three days. However, we believe that the selection of prophylactic antibiotics should be guided by regional antimicrobial resistance patterns. Supporting this, a study conducted in Türkiye in 2022 reported a fluoroquinolone susceptibility rate of 89.7% in rectal swab samples obtained before TRUSBx.^[26] This finding once again highlights the importance of incorporating local resistance data into empirical antibiotic selection.

TRUSBx was not performed in any patient with a positive urine culture at the time of detection. In these cases, antibiotic therapy was administered in accordance with the antibiogram results, and the procedure was deferred until a negative urine culture was obtained. Following culture sterilization, the biopsy was carried out. With this approach, no post-biopsy infections were observed in patients who initially had bacterial growth. The rate of bacterial growth in the urine cultures of asymptomatic patients before TRUSBx was found to be 4.3% in our study. Since we did not perform biopsies on any patient with a positive urine culture, a direct comparison of post-biopsy infectious complications between patients with and without bacterial growth could not be performed.

However, considering the low prevalence of bacteriuria in asymptomatic patients, and supported by the findings of Qi DZ et al.,^[6] who reported no significant difference

in post-biopsy infectious complication rates between culture-positive and culture-negative patients, we believe that routine urine culture screening for all asymptomatic individuals may not be necessary. Instead, a selective approach, such as performing urine cultures only in patients with suspicious findings on automated urinalysis or those presenting with urinary symptoms, may be both sufficient and more practical in clinical practice.

The most significant limitation of our study is its single-center design. This may have contributed to a limited sample size and the inclusion of a population with regional characteristics. As a result, the distribution of isolated bacteria and antibiotic resistance profiles may also be region-specific. Therefore, to enhance the generalizability of the findings, multicenter and prospective studies with larger sample sizes are needed.

Conclusion

Bacterial growth was detected in less than 5% of asymptomatic male patients before TRUSBx, with *E. coli* being the most commonly isolated pathogen. Additionally, resistance rates to fluoroquinolones, which are frequently used for prophylactic purposes, were observed to be at threshold levels. Considering the low prevalence of asymptomatic bacteriuria and existing evidence suggesting no significant difference in post-biopsy infection rates between culture-positive and culture-negative patients, routine urine culture screening for all asymptomatic individuals may not be necessary. Instead, a selective screening approach based on urinary symptoms or suspicious urinalysis findings can be recommended to optimize clinical practice.

Ethics Committee Approval: The Kayseri City Hospital Non-Interventional Clinical Research Ethics Committee granted approval for this study (date: 29.04.2025, number: 423).

Informed Consent: Written informed consent was obtained from participants.

Conflict of Interest: None declared.

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