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# Association Between Microscopic Urinalysis Findings and Urine Culture Results Among Female Patients with Suspected Urinary Tract Infection.

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**Keywords:**
Urinary tract infection
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**ABSTRACT**

Microscopic urinalysis is widely used as a rapid preliminary test in patients with suspected urinary tract infection (UTI), although its findings do not always correspond with urine culture results. This retrospective cross-sectional study assessed the association between microscopic urinalysis findings and laboratory-reported urine culture outcomes among female patients investigated for suspected UTI at Duhok Obstetrics and Gynecology Teaching Hospital, Duhok, Iraq. Laboratory records generated between February and June 2023 were reviewed, and 47 records with corresponding microscopic urinalysis and urine culture results were included. The evaluated findings were pyuria, microscopic hematuria, increased epithelial-cell counts, and microscopic bacteriuria. Associations with culture growth were assessed using Fisher's exact test, with odds ratios (ORs) and 95% confidence intervals (CIs). Culture growth was detected in 11 specimens (23.4%), including eight monomicrobial cultures (17.0%) and three polymicrobial cultures (6.4%), whereas 36 specimens (76.6%) showed no growth. Fourteen bacterial isolates were recovered; *Escherichia coli* was the most frequent (35.7%), followed by *Klebsiella* spp. (28.6%). Pyuria (OR = 7.07; 95% CI: 1.33–37.65; P = 0.017) and microscopic bacteriuria (OR = 20.00; 95% CI: 2.29–175.05; P = 0.001) were significantly associated with culture growth. The combined presence of pyuria and microscopic bacteriuria showed 81.8% sensitivity, 77.8% specificity, 52.9% positive predictive value, and 93.3% negative predictive value. These findings suggest that pyuria and microscopic bacteriuria may support preliminary laboratory assessment of suspected UTI, but microscopic urinalysis should not be interpreted as confirmation of clinically diagnosed UTI or as a substitute for urine culture.

# العلاقة بين نتائج فحص البول المجهري ونتائج زراعة البول لدى المريضات المشتبه بإصابتهن بالتهاب المسالك البولية.

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**الكلمات المفتاحية:**
التهاب المسالك البولية
بيلة جرثوميةبيلة قيحية
زراعة البول عدوى بكتيرية
فحص البول المجهري

**الملخص**

يُستخدم الفحص المجهري للبول على نطاق واسع كاختبار أولي سريع لدى المريضات المشتبه بإصابتهن بالتهاب المسالك البولية، إلا أن نتائجه لا تتوافق دائمًا مع نتائج زراعة البول. هدفت هذه الدراسة المقطعية الاستعادية إلى تقييم العلاقة بين نتائج الفحص المجهري للبول ونتائج زراعة البول لدى مريضات خضعن للفحص للاشتباه بإصابتهن بالتهاب المسالك البولية في مستشفى دهوك التعليمي لأمراض النساء والتوليد، دهوك، العراق. تمت مراجعة السجلات المختبرية للفترة من فبراير إلى يونيو 2023، وشملت الدراسة 47 سجلًا توفرت فيها نتائج الفحص المجهري للبول وزراعة البول. شملت المتغيرات البيلة القيحية، و البيلة الدموية المجهرية، و زيادة عدد الخلايا الطلائية، ووجود البكتيريا مجهريًا في البول. تم تقييم الارتباط بين هذه المتغيرات و النمو البكتيري في زراعة البول باستخدام اختبار فيشر الدقيق مع حساب نسب الأرجحية وفواصل الثقة بنسبة 95%. ظهر نمو بكتيري في 11 عينة (23.4%)، بينما لم يظهر أي نمو في 36 عينة (76.6%). وتم الحصول على 14 عزلة بكتيرية. وكانت

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الإشريكية القولونية الأكثر شيوعًا (35.7%)، تلتها أنواع الكليبسيلا (28.6%).أظهرت كل من البيلة القيحية ووجود البكتيريا مجهريًا في البول ارتباطًا ذا دلالة إحصائية بالنمو البكتيري في زراعة البول. كما أظهر الجمع بينهما حساسية بلغت 81.8%، ونوعية 77.8%، وقيمة تنبؤية إيجابية 52.9%، وقيمة تنبؤية سلبية 93.3%. وتشير النتائج إلى أن البيلة القيحية ووجود البكتيريا مجهريًا في البول قد يدعمان التقييم المختبري الأولي للمريضات المشتبه بإصابتهن بالتهاب المسالك البولية، إلا أن الفحص المجهري للبول لا يُعد بديلًا عن زراعة البول، ولا ينبغي تفسير نتائجه بمفردها على أنها تأكيد للتشخيص السريري لالتهاب المسالك البولية.

## 1. Introduction

Urinary tract infections (UTIs) are among the most frequently encountered bacterial infections and constitute an important global health burden. A Global Burden of Disease analysis estimated that more than 404 million UTI cases occurred worldwide in 2019 [1]. UTIs may involve the lower urinary tract, presenting primarily as cystitis, or the upper urinary tract, where infection may cause pyelonephritis and systemic manifestations. Although several microorganisms can affect the urinary tract, most UTIs are bacterial, with uropathogenic *Escherichia coli* (*E. coli*) being the predominant causative organism. Other clinically important uropathogens include *Klebsiella* spp., *Proteus* spp., *Enterococcus* spp., and *Staphylococcus* spp. [2]

The diagnosis of UTI requires interpretation of clinical manifestations together with appropriate laboratory findings [3], [4]. Routine urinalysis, sometimes referred to as general urine examination, is a rapid and relatively inexpensive screening method that may provide useful preliminary information before urine culture results become available [3]. Microscopic examination may demonstrate pyuria, hematuria, epithelial cells, and bacteria, indicating urinary tract inflammation, bacterial infection, or possible specimen contamination [3]. However, individual urinalysis criteria have limited specificity and should not be interpreted as an independent confirmation of UTI. Pyuria may occur in infectious and non-infectious conditions and may also be present in asymptomatic individuals, while microscopic bacteriuria may result from true infection, asymptomatic bacteriuria or colonization, or contamination during specimen collection and processing [3], [4], [5].

Urine culture remains the reference laboratory method for detecting and identifying bacterial uropathogens and, when required, performing antimicrobial susceptibility testing. However, culture requires appropriate specimen collection and generally takes at least 18–24 hours to produce preliminary results. Culture outcomes may also be influenced by previous antimicrobial exposure, low bacterial concentrations, improper transportation, contamination, or the presence of organisms that are difficult to recover using routine culture methods [6]. Consequently, discrepancies may occur between microscopic urinalysis findings and urine culture results.

Understanding the relationship between rapid microscopic findings and culture outcomes may improve the interpretation of routine urinalysis and help laboratories identify findings that are more strongly associated with bacterial growth. However, information concerning this relationship remains limited in routine laboratory settings in Duhok. Therefore, the present study aimed to assess the associations of microscopic urinalysis findings including pyuria, microscopic hematuria, increased epithelial-cell counts, and microscopic bacteriuria with urine culture results among female patients investigated for suspected UTI. The study also aimed to describe the bacterial uropathogens isolated from culture-positive specimens.

## 2. Method

A retrospective cross-sectional laboratory-based study was conducted using laboratory records from Duhok Obstetrics and Gynecology Teaching Hospital, Duhok, Kurdistan Region, Iraq. Records of patients investigated for suspected UTI between February and June 2023 were retrospectively reviewed. Records were included when microscopic urinalysis and urine culture results were available for the same patient, while incomplete or duplicated records were excluded. All records meeting the eligibility criteria during the study period were included; no sampling of eligible records was performed. A total of 47 eligible records were therefore included in the analysis.

The variables evaluated included patient age, sex, microscopic urinalysis findings, urine culture results, and identified bacterial isolates. Pregnancy status and biochemical dipstick parameters including leukocyte esterase and nitrites were not available in the laboratory records used in this study, and therefore could not be included in the analysis.

Clean-catch midstream urine specimens were collected in sterile containers and processed according to the routine procedures of the hospital microbiology laboratory. Midstream urine is an acceptable specimen for routine bacterial identification in patients with suspected UTI and helps to minimize contamination from periurethral and genital flora [4]. The specimens were inoculated onto blood agar and MacConkey agar and incubated aerobically at 35–37°C for 18–24 hours. After incubation, the cultures were examined for bacterial growth and colony characteristics. Bacterial isolates were identified using colony morphology, Gram staining characteristics, and conventional biochemical tests, including catalase, coagulase, oxidase, and triple sugar iron (TSI) tests, as appropriate for the organism under investigation.

The culture results were extracted from the final laboratory reports and classified as monomicrobial growth, polymicrobial growth, or no growth. The term “no growth” refers to a final laboratory report indicating the absence of detectable bacterial growth after a routine incubation period. Polymicrobial growth was defined as the recovery of more than one bacterial species from the same specimen, as documented in the final laboratory report. Because quantitative colony counts and clinical information were unavailable in retrospective records, it was not possible to determine reliably whether polymicrobial growth represented true polymicrobial infection or specimen contamination, and therefore it was not interpreted as a co-infection. For the association analysis, monomicrobial and polymicrobial cultures were combined as “culture growth detected” and compared with cultures showing no growth, because the primary outcome of the study was laboratory-reported bacterial growth rather than clinically confirmed UTI.

For microscopic examination, urine specimens were centrifuged and the resulting urine sediment was examined by light microscopy. Microscopic findings were recorded per high-power field (HPF), and the analyzed parameters included white blood cells (WBCs)/pus cells, red blood cells (RBCs), epithelial cells, and bacteria. Pyuria, microscopic hematuria, and increased epithelial-cell counts were categorized according to the predefined laboratory thresholds described below.

Microscopic urinalysis findings obtained from centrifuged urine sediment were classified according to the hospital laboratory reference ranges. For statistical analysis, pyuria was defined as >5 WBCs/HPF and absence of pyuria as ≤5 WBCs/HPF. Microscopic hematuria was defined as ≥3 RBCs/HPF and the absence of microscopic hematuria was defined as 0–2 RBCs/HPF. Increased epithelial cells were defined as >5 epithelial cells/HPF, whereas 0–5epithelial cells/HPF were considered within the reference range. Microscopic bacteriuria was categorized as present or absent according to the microscopic examination record [3], [4], [7]. These threshold-based categories were used consistently in the analysis, tables, and interpretations of results.

**Table 1: Reference ranges used by the hospital laboratory for microscopic urinalysis parameters (per high-power field, HPF)**

| Parameter | Reference range (per high-power field, HPF) |
|---|---|

| | |
|---|---|
| Pus Cells | 0–5 cells/HPF |
| Red Blood Cells (RBCs) | 0–2 cells/HPF |
| Epithelial Cells | 0–5 cells/HPF |
| Bacteria | None seen |

Because this retrospective study relied on previously generated laboratory records, the calibrated loop volume, quantitative colony counts, and exact colony-forming-unit threshold used to define significant growth were not consistently documented. Therefore, these criteria could not be accurately reconstructed. Consequently, the culture classification was based on the final laboratory interpretation recorded at the time of routine diagnostic testing, rather than on a retrospectively defined quantitative threshold.

Data were coded and analyzed using IBM SPSS Statistics software (IBM Corp., Armonk, NY, USA), version 27. Categorical variables were presented as frequencies and percentages. Associations between microscopic urinalysis findings and culture outcomes were assessed using Fisher's exact test because some expected cell frequencies were below five. A two-sided P value of less than 0.05 was considered statistically significant. Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) were calculated to estimate the strength and precision of the associations. An additional exploratory analysis evaluated the concurrent presence of pyuria and microscopic bacteriuria. Its association with culture growth was assessed using Fisher's exact test with odds ratios and 95% confidence intervals. Diagnostic-performance measures for identifying specimens with culture growth were calculated for pyuria, microscopic bacteriuria, and their concurrent presence, including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), with corresponding exact 95% confidence intervals. Monomicrobial and polymicrobial cultures were combined under the label "culture growth detected" for these analyses.

Ethical approval was obtained from the Ethical Research Committee, Cihan University–Duhok, under approval number CU-DUH/MICRO/2026/058, dated 5 July 2026. The study involved the retrospective analysis of previously generated laboratory records. Patient confidentiality was maintained by excluding names, hospital identification numbers, and other direct personal identifiers from the research dataset. The anonymized data were used exclusively for scientific research purposes.

## 3. Results

A total of 47 patient records were included in the study. As shown in Table 2, the largest proportion of patients belonged to the 20–30-year age group, comprising 22 cases (46.8%). This was followed by the 31-40-year age group with nine cases (19.1%), the 41–50-year group with 7 cases (14.9%), patients older than 50 years with five cases (10.6%), and patients younger than 20 years with four cases (8.5%). All 47 participants were female.

**Table 2: Age Distribution of Study Participants (n = 47).**

| Age Group (years) | Number | Percentage |
|---|---|---|
| Less than 20 | 4 | 8.5% |
| 20–30 | 22 | 46.8% |
| 31-40 | 9 | 19.1% |
| 41-50 | 7 | 14.9% |
| More than 50 | 5 | 10.6% |
| Total | 47 | 100% |

According to microscopic urinalysis, pyuria was identified in 23 cases (48.9%), while it was absent in 24 cases (51.1%). Microscopic hematuria was identified in 12 cases (25.5%), while 35 cases (74.5%) had RBC counts within the reference range. Increased epithelial cells were observed in 28 cases (59.6%), while 19 cases (40.4%) had epithelial-cell counts within the reference range. Microscopic bacteriuria was present in 22 cases (46.8%) and absent in 25 cases (53.2%).

Urine culture findings were summarized in Table 3. No bacterial growth was recorded in 36 specimens (76.6%), monomicrobial bacterial growth was reported in eight specimens (17.0%), and polymicrobial growth in three specimens (6.4%). Therefore, monomicrobial and polymicrobial culture growth was detected in 11 specimens (23.4%). A total of 14 bacterial isolates were reported from cultures showing bacterial growth. *E. coli* was the most frequently identified organism, accounting for five isolates (35.7%), followed by *Klebsiella* spp. with four isolates (28.6%). *Staphylococcus* spp. and *Proteus* spp. were each identified in two isolates (14.3%), while *Streptococcus* spp. was detected in only one isolate (7.1%).

**Table 3: Urine Culture Results among Study Participants (n = 47)**

| Culture Result | Frequency | Percentage |
|---|---|---|
| No Growth | 36 | 76.6% |
| Monomicrobial growth | 8 | 17.0% |
| Polymicrobial growth | 3 | 6.4% |
| Total | 47 | 100% |

As shown in Table 4, pyuria was detected in nine of the 11 specimens with culture growth and in 14 of the 36 specimens with no growth. Specimens with pyuria had higher odds of culture growth than those without pyuria (OR = 7.07; 95% CI: 1.33–37.65; P = 0.017).

Microscopic hematuria was detected in three specimens with culture growth and nine specimens with no growth and was not significantly associated with culture growth (OR = 1.13; 95% CI: 0.24–5.18; P = 1.000). Increased epithelial cells were observed in eight specimens with culture growth and 20 specimens with no growth; however, this association was not statistically significant (OR = 2.13; 95% CI: 0.49–9.38; P = 0.485).

Microscopic bacteriuria was present in ten of the 11 specimens with culture growth and in 12 of the 36 specimens with no growth. The presence of microscopic bacteriuria was significantly associated with culture growth (OR = 20.00; 95% CI: 2.29–175.05; P = 0.001). The wide confidence interval indicates substantial uncertainty around the magnitude of this association.

The diagnostic performance of pyuria and microscopic bacteriuria for identifying specimens with culture growth is presented in Table 5. Pyuria showed a sensitivity of 81.8% (95% CI: 48.2–97.7) and a specificity of 61.1% (95% CI: 43.5–76.9). Its PPV was 39.1% (95% CI: 19.7–61.5), while its NPV was 91.7% (95% CI: 73.0–99.0). Microscopic bacteriuria showed a sensitivity of 90.9% (95% CI: 58.7–99.8) and a specificity of 66.7% (95% CI: 49.0–81.4). Its PPV was 45.5% (95% CI: 24.4–67.8), whereas its NPV was 96.0% (95% CI: 79.6-99.9). The concurrent presence of pyuria and microscopic bacteriuria was also significantly associated with culture growth (OR = 15.75; 95% CI: 2.81-88.13; P < 0.001) and demonstrated 81.8% sensitivity, 77.8% specificity, 52.9% PPV, and 93.3% NPV. Overall, pyuria and microscopic bacteriuria were significantly associated with culture growth, whereas microscopic hematuria and increased epithelial-cell counts were not.

**Table 4: Association of microscopic urinalysis findings with urine culture growth.**

| Microscopic urinalysis finding | Culture growth n (%) (n=11) | No growth n (%) (n=36) | OR (95% CI) | P value |
|---|---|---|---|---|
| Pyuria (>5 WBCs/HPF) | 9 (81.8) | 14 (38.9) | 7.07 (1.33–37.65) | 0.017 |
| No Pyuria (≤5 WBCs/HPF) | 2 (18.2) | 22 (61.1) | | |
| Microscopic hematuria (≥3 RBCs/HPF) | 3 (27.3) | 9 (25.0) | 1.13 (0.24–5.18) | 1.000 |

| | | | | |
|---|---|---|---|---|
| No microscopic hematuria (0–2 RBCs/HPF) | 8 (72.7) | 27 (75.0) | | |
| Increased epithelial cells (>5 cells/HPF) | 8 (72.7) | 20 (55.6) | | |
| Epithelial cells within reference range (0-5 cells/HPF) | 3 (27.3) | 16 (44.4) | 2.13 (0.49–9.38) | 0.485 |
| Microscopic bacteriuria present | 10 (90.9) | 12 (33.3) | 20.00 (2.29–175.05) | 0.001 |
| Microscopic bacteriuria absent | 1 (9.1) | 24 (66.7) | | |
| Combined pyuria + microscopic bacteriuria | 9 (81.8) | 8 (22.2) | 15.75 (2.81–88.13) | <0.001 |
| Combined criterion negative | 2 (18.2) | 28 (77.8) | | |

Note: The combined criterion was positive when both pyuria (>5 WBCs/HPF) and microscopic bacteriuria were present in the same specimen. Monomicrobial and polymicrobial positive cultures were combined as "culture growth detected." OR, odds ratio; CI, confidence interval. *P value < 0.05 was considered statistically significant.

**Table 5: Performance characteristics of individual and combined microscopic urinalysis findings for identifying specimens with culture growth.**

| Urinalysis finding | Sensitivity, % (95% CI) | Specificity, % (95% CI) | PPV, % (95% CI) | NPV, % (95% CI) |
|---|---|---|---|---|
| Pyuria | 81.8 (48.2-97.7) | 61.1 (43.5-76.9) | 39.1 (19.7-61.5) | 91.7 (73.0-99.0) |
| Microscopic bacteriuria | 90.9 (58.7-99.8) | 66.7 (49.0-81.4) | 45.5 (24.4-67.8) | 96.0 (79.6-99.9) |
| Combined pyuria and microscopic bacteriuria | 81.8 (48.2–97.7) | 77.8 (60.8–89.9) | 52.9 (27.8–77.0) | 93.3 (77.9–99.2) |

Note: The combined criterion was considered positive when both pyuria and microscopic bacteriuria were present in the same specimen. Culture growth comprised monomicrobial and polymicrobial growth. PPV, positive predictive value; NPV, negative predictive value; CI, confidence interval.

## 4. Discussion

The present study evaluated the association between microscopic urinalysis findings and urine culture outcomes among 47 patients investigated for suspected UTI. Monomicrobial growth was detected in eight specimens (17.0%), polymicrobial growth in three specimens (6.4%), and no growth in 36 specimens (76.6%). Overall, bacterial growth was detected in 11 specimens (23.4%), yielding 14 bacterial isolates. Pyuria and microscopic bacteriuria were significantly associated with culture growth, whereas microscopic hematuria and increased epithelial-cell counts were not. However, because clinical symptoms, prior antimicrobial exposure, pregnancy status, and other relevant clinical variables were unavailable, culture growth in the current study should not be interpreted as equivalent to clinically confirmed UTI.

The predominance of cultures showing no bacterial growth highlights the limited ability of clinical suspicion or an isolated abnormal urinalysis result to predict culture positivity. This finding is consistent with a study conducted by Advani et al. [3], who observed that individual urinalysis parameters generally had limited PPV for clinically defined UTIs. Tien et al. [5] similarly reported that approximately 60-70% of urine cultures obtained in routine practice may show no significant growth. Disagreement between microscopic urinalysis and culture findings may be due to previous antimicrobial exposure, low bacterial concentrations, specimen-related factors, or other methodological factors.

Pyuria was significantly more frequent among specimens with culture growth, supporting its value as a laboratory finding associated with culture positivity. Nevertheless, pyuria was also detected in several specimens showing no bacterial growth, confirming that it is not specific for a positive urine culture. Pyuria may occur in non-bacterial inflammatory conditions, urinary calculi, systemic conditions, or previous antimicrobial treatment, which may suppress bacterial growth and contribute to sterile pyuria or culture-negative findings [8]. Advani et al. [3] found that no single urinalysis parameter demonstrated consistently high diagnostic performance, while Tien et al. [5] demonstrated that the probability of recovering a uropathogen increased with the degree of pyuria, although diagnostic performance varied according to the WBC threshold used. In the present study, pyuria showed relatively high sensitivity and NPV but more modest specificity and PPV for culture growth. Taken together, these findings support the use of pyuria as a preliminary laboratory indicator rather than as independent evidence of clinically confirmed UTI.

Microscopic bacteriuria was significantly associated with culture growth. Bacteria were observed microscopically in ten of the 11 specimens showing bacterial growth on urine culture, compared with 12 of the 36 specimens showing no growth. This finding suggests that microscopic bacteriuria may be a useful preliminary indicator of subsequent bacterial growth on urine culture. Nevertheless, its presence in culture-negative specimens demonstrates that it is not fully specific. Microscopically observed bacteria may reflect contamination, delayed specimen processing, non-viable organisms after antimicrobial exposure, or bacterial concentrations below the threshold for significant growth. Choi et al. [9] found that urinalysis predicted cultures containing Gram-negative bacteria, particularly *E. coli*, more effectively than cultures containing some Gram-positive bacteria. This may be relevant because *E. coli* was the most frequently identified isolate in this study. However, microscopic bacteriuria should be interpreted as a laboratory screening finding associated with culture positivity rather than a confirmation of clinical UTI.

When evaluated as preliminary laboratory indicators of culture growth, pyuria and microscopic bacteriuria showed relatively high sensitivity and NPV, whereas specificity and PPV were more modest. Microscopic bacteriuria demonstrated a sensitivity of 90.9% and an NPV of 96.0%, whereas pyuria showed a sensitivity of 81.8% and NPV of 91.7%. These results suggest that the absence of these microscopic abnormalities may be more useful for identifying specimens less likely to yield bacterial growth than their presence is for confirming culture positivity. A similar pattern has been reported in a study conducted by Advani et al. [3], who found that individual urinalysis parameters generally had limited PPV and were more informative for ruling out infection than for confirming it. Tien et al. [5] likewise demonstrated high sensitivity and NPV for pus-cell counts at several thresholds, whereas specificity and PPV were considerably lower. However, direct comparison should be made cautiously because the definitions of pyuria, study populations, and outcome criteria differed between studies. The concurrent presence of pyuria and microscopic bacteriuria demonstrated 81.8% sensitivity, 77.8% specificity, 52.9% PPV, and 93.3% NPV. Compared with microscopic bacteriuria alone, the combined criterion increased specificity from 66.7% to 77.8% and PPV from 45.5% to 52.9%, while sensitivity decreased from 90.9% to 81.8%. Thus, combining the two findings appeared to improve rule-in performance at the expense of some sensitivity; however, given the small number of specimens with culture growth, this finding should be regarded as exploratory.The performance pattern observed for the combined criterion was also consistent with findings reported by Yalçınkaya Kara et al. [10], who assessed combined leukocyte and bacterial parameters against urine-culture positivity and found that requiring both parameters to be positive increased specificity and PPV, although sensitivity decreased. In the present study, the relatively high sensitivity and NPV point estimates observed for pyuria and microscopic bacteriuria should also be interpreted cautiously. Only 11 specimens showed culture growth, resulting in wide confidence intervals around several diagnostic-performance estimates. Accordingly, these measures should be regarded as exploratory estimates requiring confirmation in larger

populations rather than as established diagnostic-performance characteristics.

Microscopic hematuria and increased epithelial-cell counts were not significantly associated with culture growth in this study. Microscopic hematuria is nonspecific and may accompany inflammation, menstruation, urinary calculi, trauma, or other urinary tract disorders. Epithelial cells, particularly squamous epithelial cells, commonly originate from the distal urethra or genital tract and may be influenced by specimen-collection quality rather than infection. The study records also did not distinguish between squamous, transitional, and renal tubular epithelial cells, which may have reduced the ability to identify a meaningful association. Walber et al. [11] and Müller et al. [12] likewise reported that epithelial-cell counts and other urinalysis parameters alone could not reliably distinguish contamination or mixed cultures from clinically meaningful growth.

Among the 14 bacterial isolates, *E. coli* was the most frequent, followed by *Klebsiella* spp., *Staphylococcus* spp., *Proteus* spp., and *Streptococcus* spp. The predominance of *E. coli* is consistent with its established role as the principal bacterial uropathogen and its ability to adhere to uroepithelial cells, evade host defenses, and establish ascending infection [2], [13]. The findings are also broadly consistent with a study conducted in Iraq by Abdalla et al. [14], who identified *E. coli* as the most frequent organism in 1,185 urine culture reports. However, comparisons should be interpreted cautiously because the present study had a substantially smaller sample size and was conducted in a specialized obstetrics and gynecology hospital. The relatively high proportion of *Klebsiella* spp. may reflect local epidemiology, patient characteristics, healthcare exposure, or random variation related to the small number of isolates. Three specimens showed polymicrobial growth, resulting in 14 isolates from 11 specimens with culture growth. Polymicrobial urine cultures may occur in patients with underlying clinical, anatomical, or healthcare-related risk factors [15].

These polymicrobial cultures could represent clinically meaningful growth or contamination; therefore, their inclusion among the 11 specimens with culture growth may have influenced the estimated associations. Pyuria and microscopic bacteriuria may help identify urine specimens with a greater probability of bacterial growth on culture. However, the occurrence of these findings in culture-negative specimens demonstrates that urinalysis should not be used as a stand-alone confirmation of UTI. Diagnosis of UTI requires appropriate clinical assessment together with laboratory findings, while urine culture provides evidence of bacterial growth and enables identification of the causative organism.

This study has several limitations. The retrospective, single-center design and modest sample size, particularly the small number of specimens with culture growth (n = 11), limit the precision and generalizability of the findings. All participants were female, and pregnancy status, urinary symptoms, previous antimicrobial treatment, and other clinical variables were not available in the laboratory records. Consequently, culture positivity could not be equated with clinically confirmed UTI, and the findings should be interpreted primarily as associations between microscopic urinalysis parameters and laboratory-reported culture outcomes. In addition, quantitative colony counts and the exact culture significance threshold were unavailable, and the clinical significance of polymicrobial growth could not be independently established. Despite these limitations, the study provides useful local evidence regarding the relationship between routine microscopic urinalysis findings and urine culture outcomes and provides a basis for larger prospective multicenter studies incorporating detailed clinical and microbiological data.

## 5. Conclusion

Pyuria and microscopic bacteriuria were significantly associated with culture growth, whereas microscopic hematuria and increased epithelial-cell counts were not. *E. coli* was the most frequently identified bacterial isolate. These findings support the practical use of microscopic urinalysis as a rapid preliminary aid for estimating the likelihood of culture growth while awaiting definitive culture results. The study is limited by its retrospective, single-center design, modest sample size, and absence of detailed clinical and quantitative culture data; therefore, the findings should not be used as stand-alone diagnostic criteria. Larger prospective multicenter studies incorporating clinical information, quantitative culture data, and antimicrobial susceptibility profiles are recommended.

## 6. References


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