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# Diagnostic Correlation Between Microscopic Hematuria and Radiological Findings in Urolithiasis: A Retrospective Study from a Tertiary Emergency Department in South Kerala

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## Abstract

**Background:**

Urolithiasis is one of the most frequent causes of acute flank pain presenting to the emergency department. Microscopic hematuria has traditionally been regarded as an important diagnostic indicator; however, its reliability varies widely among different populations. Although non- contrast computed tomography (NCCT) is considered the diagnostic gold standard, its routine use is limited by radiation exposure and cost.

**Objectives:**

To evaluate the correlation between microscopic hematuria and radiologically confirmed urolithiasis and to determine the diagnostic accuracy of microscopic hematuria in patients presenting with suspected renal colic.

**Materials and Methods:**

A retrospective observational study was conducted in the emergency department of a tertiary care hospital in South Kerala over a two-year period (January 2023 to January 2025). Adult patients presenting with suspected urolithiasis who underwent urine microscopy and radiological evaluation using ultrasonography and/or NCCT were included. Microscopic hematuria was correlated with NCCT findings. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), overall diagnostic accuracy, and receiver operating characteristic (ROC) curve analysis were calculated.

**Results:**

A total of 160 patients were analyzed. Microscopic hematuria was detected in 65% of patients, while NCCT confirmed urolithiasis in 70%. A statistically significant association was observed between microscopic hematuria and NCCT-confirmed stones ($\chi^2 = 18.42$, $p < 0.001$).

Microscopic hematuria demonstrated a sensitivity of 78.6%, specificity of 77.8%, PPV of 86.2%, NPV of 66.7%, and an overall diagnostic accuracy of 78.1%. The presence of hematuria was significantly associated with larger stone size (>10 mm) and ureteric location.

**Conclusion:**

Microscopic hematuria is a useful screening marker in patients with suspected urolithiasis but cannot reliably exclude stone disease when absent. NCCT remains essential for definitive diagnosis. A combined clinical, laboratory, and selective imaging approach may improve diagnostic efficiency in emergency settings.

**Keywords**: Microscopic hematuria; Urolithiasis; Renal colic; NCCT KUB; Emergency medicine

## Introduction

Urolithiasis is a common cause of emergency department visits and constitutes a significant global healthcare burden. The incidence of urinary stone disease has increased steadily over recent decades, largely attributable to changes in dietary habits, sedentary lifestyles, and climatic factors, particularly in tropical regions such as South India. Patients typically present with acute onset flank pain, often accompanied by nausea, vomiting, and hematuria.

Microscopic hematuria results from urothelial injury caused by stone migration and is frequently used as an initial screening investigation in patients with suspected urolithiasis. However, previous studies have demonstrated considerable variability in its diagnostic performance, and the absence of hematuria does not reliably exclude stone disease. Non-contrast computed tomography has emerged as the most accurate imaging modality for the detection of urinary calculi due to its high sensitivity and specificity. Nevertheless, concerns related to radiation exposure, cost, and resource utilization limit its indiscriminate use.

The present study was undertaken to evaluate the diagnostic correlation between microscopic hematuria and radiological findings in patients with suspected urolithiasis presenting to a tertiary care emergency department in South Kerala.

## Materials and Methods

### Study Design and Setting

This was a single-center, retrospective observational study conducted in the emergency department of St. Thomas Hospital, Changanassery, Kerala, India.

### Study Population

Adult patients aged 18 years and above presenting with clinical features suggestive of urolithiasis and who underwent urine microscopy and radiological evaluation were included in the study.

### Inclusion Criteria

1. Clinical suspicion of urolithiasis
2. Availability of urine microscopy results
3. Radiological evaluation using ultrasonography and/or NCCT
4. Complete medical records

### Exclusion Criteria

1. Hematuria secondary to trauma
2. Known alternative causes of hematuria such as urinary tract infection or malignancy
3. Incomplete or missing medical records

### Data Collection

Relevant data were extracted from electronic medical records using a structured data collection proforma. Variables included demographic characteristics, clinical presentation, urine microscopy findings, radiological results, stone size, and stone location.

### Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 25. Categorical variables were summarized as frequencies and percentages. The association between microscopic hematuria and NCCT findings was assessed using the Chi-square test. Diagnostic performance indices were calculated using NCCT as the reference standard. Receiver operating characteristic curve analysis was performed to evaluate the predictive accuracy of microscopic hematuria. A p-value of less than 0.05 was considered statistically significant.

## Results

A total of 160 patients met the inclusion criteria. The mean age of the study population was 52.8 ± 14.6 years, with a male predominance of 65%. Urolithiasis was confirmed on NCCT in 112 patients (70%).

Microscopic hematuria was present in 104 patients (65%). Among patients with microscopic hematuria, 86.2% were found to have stones on NCCT, compared with only 22.2% of patients without hematuria. This association was statistically significant ($p < 0.001$).

The diagnostic performance of microscopic hematuria was as follows: sensitivity 78.6%, specificity 77.8%, positive predictive value 86.2%, negative predictive value 66.7%, and overall diagnostic accuracy 78.1%.



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The presence of microscopic hematuria showed a statistically significant association with larger stone size (>10 mm) and ureteric location ($p < 0.05$). Ultrasonography demonstrated comparatively lower sensitivity for stone detection when compared with NCCT.

## Discussion

This study demonstrates a significant correlation between microscopic hematuria and radiologically confirmed urolithiasis in patients presenting with suspected renal colic. The diagnostic performance of microscopic hematuria observed in this study is consistent with previously published literature, supporting its role as a useful screening investigation rather than a definitive diagnostic test.

Although the presence of hematuria markedly increased the likelihood of stone disease, a substantial proportion of patients without hematuria were found to have urolithiasis on NCCT. This finding highlights the limitations of relying solely on urine microscopy to exclude stone disease, particularly in patients with persistent symptoms or high clinical suspicion.

NCCT remains the most reliable imaging modality for diagnosing urolithiasis, especially for ureteric calculi and small stones that may be missed on ultrasonography. The findings of this study support a pragmatic diagnostic approach that integrates clinical assessment, laboratory findings, and selective imaging to optimize patient management and resource utilization in emergency care settings.

## Limitations

The present study has certain limitations. Its retrospective design and single-center setting may limit generalizability. Ultrasonography findings were operator-dependent, and detailed metabolic evaluation and long-term follow-up data were not available.

## Conclusion

Microscopic hematuria is a valuable screening indicator in patients with suspected urolithiasis but should not be used as a standalone diagnostic criterion. While its presence strongly predicts stone disease, the absence of hematuria does not reliably exclude urolithiasis. NCCT remains essential for definitive diagnosis. An integrated clinical, laboratory, and imaging-based approach can enhance diagnostic accuracy and improve patient outcomes in emergency settings.

**Ethical Approval:** Approved by the Institutional Human Ethics Committee, St. Thomas Hospital, Changanassery

**Informed Consent:** Waived due to the retrospective nature of the study

## Author Contributions

1. Dr. Deepu Daniel: Conceptualization, study design, data collection, data analysis, manuscript drafting
2. Dr. Shiju Stanley: Supervision, critical revision of the manuscript, and final approval
3. Dr. Abraham Purackel: Radiological data interpretation and imaging correlation
4. Dr. Rubin Varughese Mathew: Data acquisition and literature review
5. Dr. Adarsh Krishnankutty: Statistical analysis support and data validation
6. Dr. Luanne Mathew: Manuscript editing and formatting
7. Dr. Athulya Vilayil Jayadevan: Data collection and clinical correlation
8. Dr. Joby Thomas: Literature review and manuscript review

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