



Original Research

Clinical Profile, Etiological Spectrum, and Treatment Outcomes of Patients Presenting with Hematuria in a Tertiary Care Hospital: An Observational Study

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Received: 12 Jun 2024 / Accepted: 10 July 2024

Abstract

Background: Hematuria is a clinically important symptom that ranges from benign self-limited disorders to significant urological malignancy and therefore requires systematic evaluation. **Objectives:** To assess the clinical profile, etiological spectrum, diagnostic findings, treatment modalities, and short-term outcomes of patients presenting with hematuria in a tertiary care hospital. **Methods:** This hospital-based observational study was conducted at RVM Institute of Medical Sciences and Research Centre, Laxmakkapally, Telangana, India, over eight months from September 2023 to April 2024. One hundred consecutive adult patients presenting with gross or microscopic hematuria were evaluated using clinical history, physical examination, urine investigations, ultrasonography, and selected advanced investigations such as computed tomography urography and cystoscopy. Data were summarized using descriptive statistics. **Results:** The mean age of participants was 46.8 ± 15.4 years, and 68% were male. Gross hematuria was more common than microscopic hematuria (62% vs 38%). Dysuria (48%) and flank pain (41%) were the leading associated symptoms. Urinary tract infection was the most frequent etiology (28%), followed by urolithiasis (24%) and benign prostatic hyperplasia (15%). Bladder carcinoma and renal tumors together accounted for 18% of cases. Ultrasonography showed abnormalities in 71% of patients. Conservative or medical management was used in 46%, antibiotic therapy in 28%, endoscopic stone procedures in 12%, transurethral procedures in 9%, and open or laparoscopic surgery in 5%. Complete resolution of hematuria was observed in 82% of patients, while 12% had persistent hematuria and 6% experienced recurrence. **Conclusion:** Hematuria in tertiary care practice demonstrates a broad etiological range, with infection and stone disease predominating but a clinically meaningful malignant burden remaining present. A structured diagnostic approach combined with etiology-based treatment yields favorable short-term outcomes and facilitates timely identification of serious underlying pathology.

Keywords: hematuria; gross hematuria; microscopic hematuria; urinary tract infection; urolithiasis; bladder carcinoma

Introduction

Hematuria is one of the most frequent warning symptoms encountered in urological practice and often prompts both patient anxiety and urgent clinical evaluation. It can present as gross hematuria, which is visible to the naked eye, or as microscopic hematuria detected on urine examination. Although many episodes arise from benign conditions, hematuria can also be the earliest manifestation of significant renal or urological disease, including malignancy. Contemporary guidelines emphasize that the presence of blood in urine should be confirmed carefully and interpreted within the clinical context rather than dismissed as an isolated laboratory abnormality [4-6].

The etiological spectrum of hematuria is broad and includes urinary tract infection, urolithiasis, benign prostatic enlargement, glomerular disease, trauma, drug-related bleeding, and tumors of the bladder or kidney. Reviews of adult hematuria consistently identify infection, stones, benign prostatic hyperplasia, and urological malignancy as major contributors, while the likelihood of clinically important pathology increases with advancing age, male sex, smoking, and a history of gross hematuria [8-10,13]. Earlier large hematuria series also established that serious lesions can be identified across a wide range of presentations, supporting the need for a structured work-up [1-3].

Evaluation of hematuria requires a stepwise approach that integrates detailed clinical history, physical examination, urine microscopy, urine culture when infection is suspected, renal function assessment, and imaging of the upper urinary tract. Cystoscopy remains central to the assessment of the lower urinary tract, particularly when malignancy is a concern, while ultrasonography and computed tomography urography contribute substantially to lesion localization and etiological diagnosis [5-8,10,14]. Risk-stratified guidance further indicates that even self-limited hematuria or hematuria occurring during anticoagulant therapy should not automatically preclude formal assessment when no benign cause is evident [6,8].

The clinical importance of timely hematuria evaluation is underscored by data showing that inadequate or delayed assessment can postpone the diagnosis of bladder cancer and other serious pathology. This issue has particular relevance in women, in whom hematuria is sometimes initially attributed to infection, resulting in later urological referral and delayed cancer diagnosis [11,12]. At the same time, many patients presenting to tertiary hospitals in India have mixed symptom profiles, coexisting comorbidities, and overlapping infectious, obstructive, and neoplastic causes, which makes local observational data valuable for guiding practical decision-making.

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DOI: 10.61336/im/24-1-16

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Against this background, the present study was undertaken to evaluate the clinical profile, etiological spectrum, diagnostic findings, treatment modalities, and short-term outcomes of patients presenting with hematuria at a tertiary care teaching hospital. The specific objective of the study was to describe the demographic and symptom pattern of hematuria, identify its major underlying causes, document the investigations employed in routine practice, and assess the immediate treatment outcomes in the study population.

Materials and Methods

Study design and setting

This hospital-based observational study was conducted at RVM Institute of Medical Sciences and Research Centre, Laxmakkapally, Telangana, India, a tertiary care teaching hospital. The study was carried out over a period of eight months, from September 2023 to April 2024. The work was planned to capture the routine spectrum of adult patients presenting with hematuria in a real-world tertiary care environment, where patients commonly undergo initial stabilization, etiological assessment, and definitive management within the same institution.

Study population

The study included 100 consecutive adult patients aged 18 years and above who presented with hematuria during the study period and satisfied the study criteria. Both patients with visible blood in urine and those in whom hematuria was detected on urine microscopy during evaluation were eligible for inclusion. Enrollment was based on clinical presentation to the outpatient department, emergency services, or inpatient units, thereby allowing representation of symptomatic as well as incidentally detected cases.

Eligibility criteria

Patients with gross hematuria, microscopic hematuria documented on urine microscopy, or hematuria associated with lower urinary tract symptoms, flank pain, fever, clot passage, or suspected urinary tract pathology were included. Patients with non-urinary sources of bleeding, obvious menstrual contamination, isolated discoloration of urine due to food or drugs, or incomplete essential clinical records were excluded from analysis. Patients whose diagnostic work-up remained insufficient to assign a reasonable etiological category were also excluded from the final dataset.

Clinical and diagnostic assessment

A detailed clinical history was recorded for all participants, including age, sex, residence, smoking history, hypertension, diabetes mellitus, associated symptoms, and prior urological complaints. Hematuria was categorized as gross when visible to the patient or clinician and as microscopic when identified on laboratory urine examination. For operational purposes in this study, urine microscopy showing more than 5 red blood cells per high-power field was taken as evidence of active hematuria in keeping with the laboratory reporting format used in the hospital, while standard hematuria evaluation principles were based on established guideline frameworks [5,6,8,10]. All patients underwent urine microscopy, and urine culture was performed when infection was suspected clinically or microscopically. Ultrasonography was used as the principal first-line imaging modality, while computed tomography urography and cystoscopy were undertaken selectively according to clinical suspicion, persistence of symptoms, suspicion of stone disease, upper tract pathology, bladder pathology, or malignancy.

Etiological classification and management

Based on the clinical profile, laboratory evaluation, imaging findings, cystoscopic impression, and specialist opinion, patients were grouped into major etiological categories such as urinary tract infection, urolithiasis, benign prostatic hyperplasia, bladder carcinoma, renal tumors, glomerulonephritis, trauma, and other causes including drug-induced bleeding or coagulopathy. Management was individualized according to the final working diagnosis. Conservative or medical therapy was provided for patients suitable for non-operative care. Antibiotics were administered for infective causes, endoscopic procedures such as ureteroscopy or percutaneous nephrolithotomy were used for selected stone disease, transurethral procedures were undertaken for benign prostatic or bladder lesions, and open or laparoscopic surgery was reserved for cases requiring definitive operative intervention.

Outcome assessment and statistical analysis

Patients were followed through the initial course of treatment and subsequent review as documented in the hospital record. Outcomes were categorized as complete resolution of hematuria, persistent hematuria requiring further evaluation, or recurrence during follow-up. Data were entered in tabular form and analyzed using descriptive statistics. Continuous variables were expressed as mean with standard deviation, while categorical variables were presented as frequency and percentage. Because the primary objective of the study was descriptive profiling, emphasis was placed on clinical pattern recognition and distribution of etiologies rather than hypothesis testing.

Ethical considerations

Ethics committee approval details and the final consent statement were not supplied with the dataset used for manuscript drafting. These particulars should be inserted by the authors from institutional records before journal submission.

Results

Table 1. Demographic characteristics of study participants (n = 100)

Parameter	Observation
Total cases	100
Age range	18-78 years
Mean age	46.8 ± 15.4 years
Gender distribution	Male: 68 (68%), Female: 32 (32%)
Residence	Rural: 59 (59%), Urban: 41 (41%)
Smoking history	37 (37%)
Known hypertension	29 (29%)
Known diabetes mellitus	24 (24%)

A total of 100 patients presenting with hematuria were included in the study and analyzed. The demographic characteristics, clinical presentation, etiological distribution, diagnostic findings, management profile, and treatment outcomes are summarized in Tables 1 to 6. The study population covered a broad adult age range and reflected the mixed benign and serious pathology typically encountered in tertiary care

urological practice.

As shown in Table 1, the age of the patients ranged from 18 to 78 years, with a mean age of 46.8 ± 15.4 years. The largest proportion of patients belonged to the 41-60-year age group (42%), followed by the 21-40-year group (31%). Hematuria was more common in men than women, with a male-to-female ratio of 2.1:1. A majority of participants were from rural areas, and notable background risk factors included smoking, hypertension, and diabetes mellitus.

Table 2. Clinical presentation of patients with hematuria

Clinical feature	Number (%)
Gross hematuria	62 (62%)
Microscopic hematuria	38 (38%)
Dysuria	48 (48%)
Flank pain	41 (41%)
Fever	26 (26%)
Passage of clots	18 (18%)
Lower urinary tract symptoms	35 (35%)
Weight loss	9 (9%)

Table 2 demonstrates that gross hematuria was the predominant mode of presentation, occurring in 62% of patients, whereas 38% were detected to have microscopic hematuria during evaluation. Dysuria and flank pain were the commonest associated complaints, indicating that infective and obstructive causes formed a substantial component of the case mix. Fever was present in about one-quarter of patients, while passage of clots and weight loss were less frequent but clinically important findings.

Table 3. Etiological spectrum of hematuria

Etiology	Number (%)
Urinary tract infection	28 (28%)
Urolithiasis	24 (24%)
Benign prostatic hyperplasia	15 (15%)
Bladder carcinoma	11 (11%)
Renal tumors	7 (7%)
Glomerulonephritis	6 (6%)
Trauma	5 (5%)
Others (drug-induced/coagulopathy)	4 (4%)
Total	100 (100%)

The etiological spectrum is presented in Table 3. Urinary tract infection was the leading cause of hematuria (28%), followed closely by urolithiasis (24%). Benign prostatic hyperplasia accounted for 15% of cases. Importantly, malignancy was identified in a substantial minority, with bladder carcinoma in 11% and renal tumors in 7%, giving an overall malignant burden of 18%. Glomerulonephritis, trauma, and other miscellaneous causes constituted the remainder of the study population.

Table 4. Diagnostic modalities and key findings

Investigation	Positive findings n (%)
Urine microscopy (RBC >5/HPF)	100 (100%)
Urine culture positive	26 (26%)
Ultrasonography abnormal findings	71 (71%)
CT urography performed	39 (39%)
Cystoscopy findings suggestive of bladder pathology	14 (14%)

As detailed in Table 4, urine microscopy confirmed hematuria in all patients. Urine culture was positive in 26%, reinforcing the high frequency of infective etiology. Ultrasonography revealed abnormal findings in 71% of patients and served as the most informative first-line imaging modality. Computed tomography urography was used selectively in 39% of patients, mainly when upper tract lesions, stone disease, or complex pathology were suspected. Cystoscopy identified bladder pathology in 14% of patients, especially among those with persistent, unexplained, or clinically suspicious hematuria.

Table 5. Treatment modalities

Treatment modality	Number (%)
Conservative/medical management	46 (46%)
Antibiotic therapy for infection	28 (28%)
Endoscopic stone removal (URS/PCNL)	12 (12%)
Transurethral resection of prostate/bladder tumor	9 (9%)
Open or laparoscopic surgery	5 (5%)
Total	100 (100%)

Management patterns are summarized in Table 5. Nearly half of the patients were treated conservatively or with medical therapy alone. Antibiotic therapy formed a major component of management because urinary tract infection was the single most frequent diagnosis. Interventional procedures were required in selected patients, particularly for stone disease and structural or neoplastic lesions. Endoscopic procedures and transurethral resections together accounted for 21% of treatment approaches, while 5% required open or laparoscopic surgery.

Clinical outcomes are shown in Table 6. Complete resolution of hematuria was achieved in 82% of patients, indicating a favorable short-term

response to etiology-based treatment. However, 12% continued to have persistent hematuria and required further diagnostic evaluation, while 6% experienced recurrence during follow-up. These findings emphasize that although most patients respond well to appropriate management, a smaller subset warrants continued surveillance and repeated etiological assessment.

Table 6. Clinical outcomes

Outcome	Number (%)
Complete resolution of hematuria	82 (82%)
Persistent hematuria requiring further evaluation	12 (12%)
Recurrence during follow-up	6 (6%)

Discussion

The present study provides a practical overview of hematuria as encountered in a tertiary care teaching hospital. The major findings were a clear male predominance, a concentration of cases in middle-aged and older adults, predominance of gross hematuria over microscopic hematuria, and a broad etiological distribution in which infection and stone disease formed the largest diagnostic groups. At the same time, malignancy constituted an important proportion of cases, underscoring the need to treat hematuria as a clinically meaningful sign rather than a trivial symptom.

The demographic pattern observed in this study is broadly consistent with earlier hematuria series and modern risk-based guidance. Classic large analyses showed that the probability of serious underlying disease increases with age and is higher in men [1-3]. More recent reviews and guidelines similarly note that older age, male sex, smoking, and prior gross hematuria increase the risk of urological malignancy [6,9,13]. The predominance of male patients and the substantial proportion of smokers in the current series therefore fit with the established clinical risk profile of patients requiring comprehensive hematuria evaluation.

With regard to etiology, urinary tract infection and urolithiasis together accounted for more than half of the cases in the present study. This pattern aligns with adult hematuria reviews that identify infection, urinary calculi, benign prostatic enlargement, and malignancy as the common major causes in routine practice [8-10]. The contribution of benign prostatic hyperplasia in our cohort is also expected in a population with a significant representation of middle-aged and elderly men. Nevertheless, the combined malignant burden of bladder carcinoma and renal tumors in 18% of patients is clinically important and supports the longstanding view that hematuria deserves structured investigation even when apparently benign explanations are present [1,5,8].

The diagnostic profile of the study also reflects contemporary practical care. Ultrasonography yielded abnormalities in 71% of patients and functioned effectively as the first-line imaging test in a resource-conscious setting. Selective use of computed tomography urography and cystoscopy helped refine diagnoses in patients with suspected upper tract disease, stone disease, persistent hematuria, or bladder pathology. This approach is consistent with guideline-supported risk stratification and with evidence showing that cystoscopy remains central to bladder cancer detection while imaging complements localization of upper urinary tract lesions [5-8]. The high rate of complete symptom resolution in our study further suggests that an organized etiological work-up can translate into timely and effective treatment.

An important clinical implication of the present findings is that hematuria should not be underestimated in any subgroup. Studies have shown that women are at risk of delayed bladder cancer diagnosis after initial presentation with hematuria, often because symptoms are first attributed to infection [11,12]. Although our study was not designed to analyze sex-based delay, the finding of both benign and malignant causes across the cohort reinforces the importance of uniform vigilance. Persistent hematuria and recurrent episodes in our series also highlight the need for continued reassessment, especially in high-risk individuals or those with initially inconclusive findings [6,13]. Overall, the study supports a balanced but systematic approach in which common reversible causes are treated promptly while serious underlying pathology is actively excluded.

Limitations

This study was conducted at a single tertiary care center with a modest sample size and predominantly descriptive analysis. Referral bias likely increased the proportion of complicated and malignant cases. Follow-up was limited and did not allow robust long-term assessment of recurrence, progression, or survival. Histopathological confirmation was unavailable for every benign-appearing lesion, and subgroup analysis according to severity or duration of hematuria was not performed.

Conclusion

Hematuria is a clinically significant presentation with a wide etiological spectrum in tertiary care practice. In the present study, urinary tract infection and urolithiasis were the most common causes, yet malignancy accounted for a substantial proportion of cases and therefore required careful exclusion. Gross hematuria, dysuria, and flank pain were frequent presenting features, and ultrasonography served as a valuable first-line diagnostic tool. Most patients responded well to etiology-specific management, with complete resolution in the majority. These findings support a structured evaluation pathway that integrates clinical assessment, urine testing, imaging, and selective endoscopic assessment to ensure prompt diagnosis, rational treatment, and continued surveillance in persistent or recurrent cases.

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