## Hematuria

### Definition
- Normally the number of RBCs in urine should not be more than 5 RBCs/ high power field on microscopic examination of fresh centrifuged urine sample.
- So, haematuria is defined as a secretion of more than 5 RBCs/ HPF in urine.
- Transient microscopic haematuria is relatively common. Up to 39% of adults between ages of 18 and 33 may have microscopic haematuria at least once, and up to 16% may have it in two or more occasions.
- Therefore, an extensive workup is not indicated except in high-risk patients, > 50 years of age and those patients with other clinical or urinary abnormalities.

### Patterns of hematuria
1. Initial is usually urethral.
2. Terminal hematuria is usually prostatic or bladder origin.
3. Total hematuria is either bladder, ureteral or renal origin.
4. Gross or Microscopic. → In gross hematuria, urine looks red if alkaline, but brown or coca-cola like if urine is acidic due to denaturation of the HB.
5. Painful or painless.
6. Symptomatic or Asymptomatic.

### Urine dip stick test
- Haemoglobinuria.
- Myoglobinuria.
- Ascorbic acid

### False positive test for haematuria
- Highly diluted urine.

### False negative test for hematuria

<table>
<thead>
<tr>
<th>Primary glomerular disease</th>
<th>Secondary glomerulonephritis</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) IgA nephropathy</td>
<td>a) Post-streptococcal glomerulonephritis</td>
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<tr>
<td>b) Mesangial proliferative glomerulonephritis</td>
<td>b) Henoch-Schönlein purpura</td>
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<tr>
<td>c) Crescentic glomerulonephritis</td>
<td>c) SLE</td>
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<tr>
<td></td>
<td>d) Polyarteritis nodosa</td>
</tr>
</tbody>
</table>

### Causes of hematuria
- **Glomerular**
  1. Pyelonephritis
  2. Renal papillary necrosis
  3. Tuberculosis
  4. Toxic nephropathies.

- **Renal infection & tubulointerstitial diseases**
  1. Pyelonephritis
  2. Renal papillary necrosis
  3. Tuberculosis
  4. Toxic nephropathies.

- **Stone disease**
  1. Renal cell carcinoma
  2. Transitional cell carcinoma of the renal pelvis

- **Renal neoplastic disease**
  1. Medullary Sponge kidney
  2. Polycystic kidney disease
  3. Alport’s syndrome

- **Hereditary renal diseases**
  1. Use of anticoagulant, liver disease and thrombocytopenia

- **Renal vascular disease**
  1. Renal infarction, renal vein thrombosis or malignant hypertension

### Exertional haematuria

### Haematuria of ureteral origin
- 1. Malignancy.
- 3. Ureteral inflammatory condition secondary to nearby inflammation e.g. diverticulitis, appendicitis or salpingitis.
- 4. Ureteral trauma e.g. during ureteroscopy.
- 5. Ureteral varices, aneurysms, or arteriovenous malformation

### Haematuria of bladder origin
- 1. Infection: schistosoma, viral or bacterial cystitis.
- 3. Foreign body in the bladder e.g. stones.
- 4. Trauma: During instrumentation or accidental.
- 5. Drug: e.g. cyclophosphamide induced haemorrhagic cystitis.

### Hematuria of urethral (or associated structures) origin
- 1. Urethritis, foreign body or local trauma to the urethra.
- 2. Prostate: Acute prostatitis, benign prostatic hypertrophy
A- First, haematuria should be differentiated from other causes of red or brownish urine:
   a) Haemoglobinuria (haemolysis)
   b) Myoglobinuria (muscle damage)
   c) Porphyrins (in porphyria)
   d) Bile (in jaundice)
   e) Melanin (in melanoma)
   f) Alkaptururia,
   g) Food dyes.
   h) Drugs as PAS or phenylphthalein.

- Dipsticks (Hemastix) will be positive with haematuria, haemoglobinuria and with myoglobinuria but negative with other causes e.g. porphyrins bile melanin, alkaptururia, food dyes and drugs as PAS or phenylphthalein.
- Microscopy will show RBC’s only with haematuria.

B- Haematuria could be glomerular (because of glomerular disease, sometimes called medical); or non glomerular (sometimes called surgical). Glomerular haematuria could be differentiated from non glomerular haematuria by:

<table>
<thead>
<tr>
<th>Glomerular hematuria</th>
<th>Non glomerular hematuria</th>
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<tbody>
<tr>
<td>Small and dysmorphic</td>
<td>The shape of RBCs in urine</td>
</tr>
<tr>
<td>Proteinuria is present in most cases</td>
<td>Proteinuria</td>
</tr>
<tr>
<td>Red cell casts are seen</td>
<td>Casts</td>
</tr>
<tr>
<td>Absent</td>
<td>Blood clots</td>
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</tbody>
</table>

1. First exclude haemoglobinuria and myoglobinuria since both of them can also cause positive dipstick test for haematuria.
   - This is done by microscopic examination of fresh urine sample.
   - In case of haematuria, RBCs could be seen while in the other two conditions no RBC’s could be seen.
   - In case of myoglobinuria, clinical examination may show manifestations of muscle disease and the examination of urine by immunoelectrophoresis may show myoglobin.
   - In case of haemoglobinuria, manifestations of haemolysis may be evident

2. Examination of urine for:
   a. Proteinuria.
   b. Casts.
   c. Pus.
   d. Bacteria (specific and non specific)
   e. Culture (Ordinary and special)
   f. PCR (TB-DNA)

3. Ultrasound, plain X-ray, I.V.P. (if serum creatinine is normal), and possibly angiography, for the diagnosis of surgical diseases e.g. stone, malignancy, infection, or malformations.

4. RBCs in urine could be examined for its shape to differentiate glomerular (small, distorted) from non glomerular causes (by phase contrast microscopy).

5. Kidney function tests.
6. Specific investigations for diagnosis of systemic disease causing haematuria e.g. SLE.

Treatment of hematuria
1. Treatment of the cause.
2. Haemostatic e.g.:
   a. Cyclokapron.
   b. Vitamin K
   c. DDAVP
   d. Fresh frozen plasma.
3. Haematonics and blood transfusion