THE CHILD WITH RED URINE

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The presence of ‘red’ urine or ‘blood’ on urine dipstick examination is a common problem in children, and signifies disorders ranging from benign conditions such as medications and food colouring to more serious conditions such as urinary tract infection, hereditary cystic renal diseases and glomerulonephritis. In the clinical approach and management of these children, it is important to firstly differentiate true haematuria from non-haematuria, and subsequently dissecting out the different causes of haematuria.

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POSSIBLE SCENARIOS IN CLINICAL PRACTICE

The possible clinical scenarios in which the child could present with ‘haematuria’ are as follows:

1. Child passing out red or dark-coloured urine without any voiding symptoms
2. Child with associated lower urinary tract symptoms such as dysuria, frequency and urgency.
3. Positive ‘blood’ on urine dipstick examination (most common cause of specialist referral).
4. Child with clinical features of acute glomerulonephritis, namely, haematuria, oedema and oliguria.

CAUSES OF RED URINE

Red urine can be due to 3 possible causes:

1. Haematuria
2. Myoglobinuria or haemoglobinuria
3. Coloured urine

Haematuria, myoglobinuria and haemoglobinuria will result in a positive test for ‘blood’ on urinary dipstick examination. Myoglobinuria and haemoglobinuria can be excluded from the history and physical examination. A history of trauma, excessive exercise or prolonged seizures associated with calf pain and tenderness suggests myoglobinuria. Red urine associated with pallor and jaundice is highly suggestive of haemoglobinuria, especially in the child with a history of glucose-6-phosphate dehydrogenase (G6PD) deficiency. Red urine due to colouring can be elicited from the history: foods such as beetroot and berries; medications such as rifampicin, desferrioxamine, and phenolphthalein. Moreover, the urine dipstick will be negative for ‘blood’ if colouring is the cause of the red urine. In infants, ‘pink-staining’ or ‘blood’ on the diapers is often due to deposition of urate crystals.

A child with red/dark-coloured urine

Urine labstick for rbc

positive

Haematuria

Haemoglobinuria

Myoglobinuria

Drugs

chemicals

negative

Exclude from history

Exclude from history/physical examination

Confirm on urine microscopy
DEFINITION OF HAEMATURIA

The definition of haematuria varies depending on the method of quantifying the amount of red blood cells in the urine.

1. > 3 red blood cells per mm$^3$ of fresh uncentrifuged midstream urine
2. > 5 red blood cells per mm$^3$ of fresh centrifuged midstream urine

Test must be positive ≥ 2 out of 3 occasions.

CAUSES OF HAEMATURIA

In the clinical approach to a child with haematuria, the aetiology can be divided into glomerular and non-glomerular causes.

CLINICAL APPROACH TO A CHILD WITH HAEMATURIA

a. Confirm the presence of haematuria.

b. Differentiate glomerular from non-glomerular causes.

c. Detailed history and physical examination to determine underlying cause and assess severity and associated complications of the haematuria.

A. Non-glomerular haematuria
   i. Fever, frequency, dysuria, urgency, loin pain, suprapubic pain (urinary tract infection). Exclude balanitis by inspecting the preputial region for redness and penile discharge in boys.
iii. Colicky loin to groin abdominal pain and passage of stone (renal calculi).
iv. History of trauma to loin or pelvic region (trauma-related haematuria).
v. Relationship with exercise (exercise-induced haematuria).
vi. Associated bleeding tendency such as easy bruising (coagulopathy).
Isolated gross haematuria in the absence of cutaneous manifestation is extremely rare.
vii. Look for perineal masses especially the base of penis (pelvic or bladder rhabdomyosarcoma). Although rare, it is important to rule this out.
viii. Detailed social and psychological history if history of recurrent gross haematuria with no apparent specific reasons (factitious).

B. Glomerular haematuria
i. Gross haematuria, oliguria, hypertension, cardiomegaly, pulmonary oedema (acute glomerulonephritis). Exclude secondary causes such as post-infectious glomerulonephritis, systemic lupus erythematosus, Henoch Schonlein purpura nephritis.

ii. Features of glomerulonephritis, haemolytic anaemia and petechial rash, particularly in the context of a gastrointestinal or respiratory infection (haemolytic uraemic syndrome).

iii. Positive family history of haematuria, renal failure and sensori-neural deafness (Alport’s syndrome).

iv. Hypertension, bilateral ballotable kidneys and positive family history of haematuria and renal failure (autosomal dominant polycystic kidney disease).

v. A positive family history of microscopic haematuria without proteinuria or renal failure would suggest familial benign haematuria in an asymptomatic child.

Note: Asymptomatic haematuria is considered to be significant, requiring further investigations, if it is
1) persistent
2) associated with proteinuria
3) associated with a positive family history of renal failure or sensori-neural deafness

d. Investigations

Basic investigations can be conducted in the general practice setting to confirm haematuria and delineate glomerular and non-glomerular causes. These include:

a) Urine dipstick and microscopy
proteinuria of >1+ on 3 occasions and presence of casts are indicative of glomerular disease
b) **Urine phase- contrast microscopy**

dysmorphic red blood cells of >20% of total red blood cells on a fresh specimen of urine is suggestive of glomerular haematuria.

c) **Urinary protein quantification**

Significant proteinuria

*spot urine protein/creatinine > 0.02 gm/mmol*

Urine total protein

- > 0.3 gm/day/1.73m² (mild)
- > 1.0 gm/day/1.73m² (moderate)
- > 3.5 gm/day/1.73m² (nephrotic range)

d) **Renal function tests**

raised serum urea and creatinine are indicative of significant glomerulonephritis or renal parenchymal disease

Further investigations are indicated upon specialist referral depending on the most likely cause.

### Investigations for haematuria

**Step 1**

- Confirm haematuria with labstick
- Urine microscopy
- Urine culture

**Step 2**

- Urine phase contrast microscopy
- Urine total protein/creatinine

**Step 3**

- **Non-glomerular**
  - Isomorphic rbc, no cast, no proteinuria
  - ➢ Urine calcium/creatinine
  - ➢ Coagulation screen if history is suggestive
  - ➢ AXR/ultrasound of kidneys and bladder
  - ➢ Cystoscopy

- **Glomerular**
  - Dysmorphic rbc, cast, proteinuria
  - ➢ Urea/electrolytes
  - ➢ 24Hr UTP/CCT
  - ➢ Complements
  - ➢ Screen relatives
  - ➢ Audiology
  - ➢ Renal biopsy

**Note:** Familial and non-familial benign haematuria can be effectively excluded from the other forms of glomerular haematuria by the absence of proteinuria and the presence of normal renal function.
MANAGEMENT

Subsequent management of haematuria is dependent on the primary cause and its severity.

What you can do?

A) Non-glomerular haematuria

1. Urinary tract infection
   Antibiotic therapy

B) Glomerular haematuria

1. Familial/non-familial
   Reassurance and regular follow-up for occurrence of benign haematuria proteinuria

2. Acute glomerulonephritis
   Low salt diet. Diuretic therapy and control of hypertension. Stabilise child prior to specialist referral.

SPECIFIC MANAGEMENT UPON SPECIALIST REFERRAL

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**CONCLUSION**

Haematuria is a common childhood renal problem. In the absence of associated symptoms or proteinuria, it generally is due benign conditions such as familial benign haematuria. However, more serious conditions such as urinary tract infection, hereditary cystic renal diseases and glomerulonephritis have to be excluded. Early diagnosis will help alleviate parental anxiety when the cause is benign, and allow specific treatment for the more serious conditions.