

Hematuria



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(ESPNT)





**Hematuria is the presence of
RBCs in urine.**



If the amount of blood in urine is big enough, the urine will, then, look red.



Something which is, undoubtedly,
terrifying.

however





In many instances, the situation is benign.

Hematuria

```
graph TD; A["Hematuria"] --> B["Transient phenomenon of little significance"]; A --> C["Sign of serious renal disease"];
```

*Transient phenomenon
of little significance*

*Sign of serious
renal disease*



In the next few minutes, we will try to define this from that, and suggest the proper management.

If you see a red urine,



- ▶ Is this a hematuria or just a red color of urine ?
- ▶ If it proves hematuria, what type of hematuria is it, and where does it come from ?
- ▶ Is it only hematuria, or there are other bleeds elsewhere ?
- ▶ What is the possible cause ?
- ▶ How should I proceed to settle the diagnosis ?
- ▶ What are the lines of management to be taken ?



► **Is this hematuria or just a red color of urine ?**



**Red urine is
not
necessarily
hematuria**

**If urine is red, tea or cola-colored, but
with <3 RBCs/HPF, consider :**

hemoglobinuria

Intravascular Hemolysis: Differential Diagnosis

- Infectious:
 - Protozoa
 - Malaria (blackwater fever)
 - Bartonellosis
 - Babesiosis
 - Bacterial sepsis
 - Clostridium spp.
 - β -hemolytic streptococci
 - Meningococcus
- Immune:
 - ABO-incompatible transfusion treatment
 - Cold agglutinin disease
 - Rhesus blood factor immunoglobulin therapy
 - PNH
- Physical:
 - Artificial valve hemolysis
 - Microangiopathic hemolytic anemia
 - March hemoglobinuria
- Metals:
 - Cadmium, copper (Wilson's disease)
- Venom:
 - Animal bites
 - Snakes, spiders, wasps

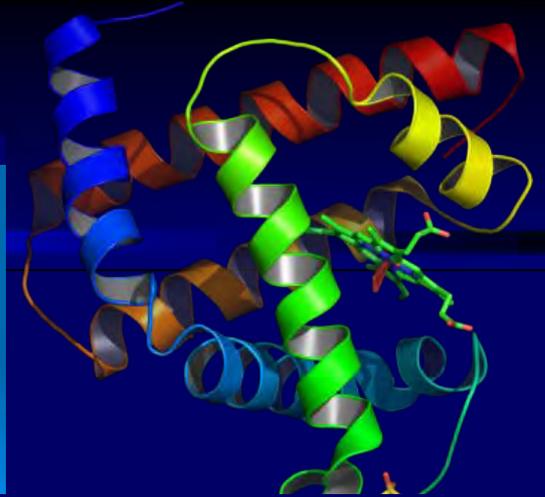
Myoglobinuria

Crush Syndrome

Myoglobinuria

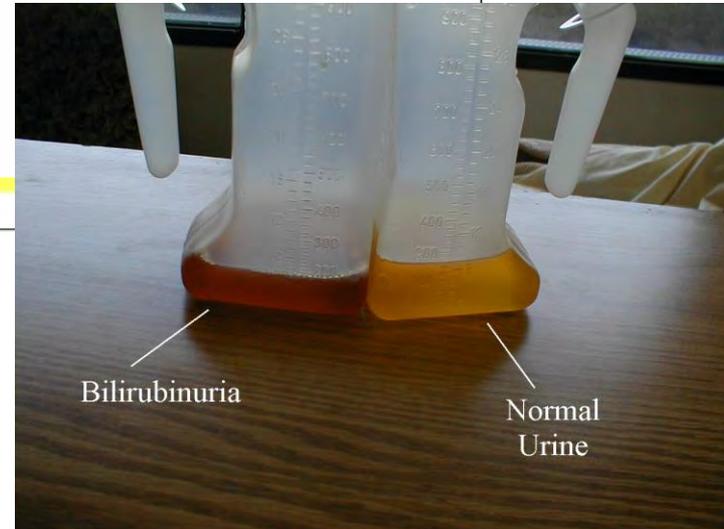


Compression of muscles, with subsequent rhabdomyolysis, can then result in myoglobinuria with red urine.



OBSTRUCTIVE JAUNDICE

Bilirubinuria



Several foods can cause a person's urine to
turn red or pink in color.
(e.g. beets, rhubarb, and blackberries)





Artificial cereals, drinks and other foods containing red-colored dyes can also be the cause of discoloration of urine .





Medications; phenazopyridine, methyl-dopa,
senna,

And, Rifampicin therapy

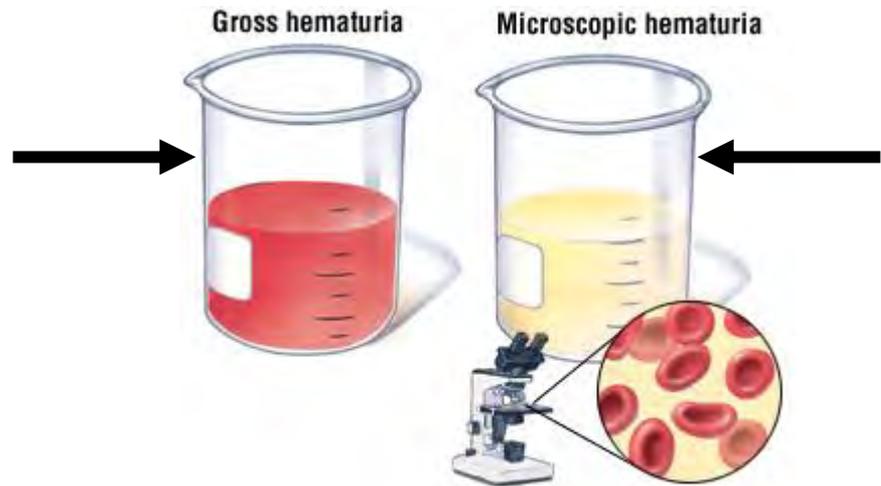




**Hematuria is the presence of
RBCs in urine.**

Hematuria can be differentiated into 2 categories:

- **Macroscopic** (gross) Hematuria
(visible red urine)
- **Microscopic** Hematuria
>3RBCs/HPF from 2 of 3 urinary sediments
without a UTI, or menstruation on microscopic
evaluation



SiMPLY



Blood that you can see with the naked eye is called *gross or macroscopic hematuria*.

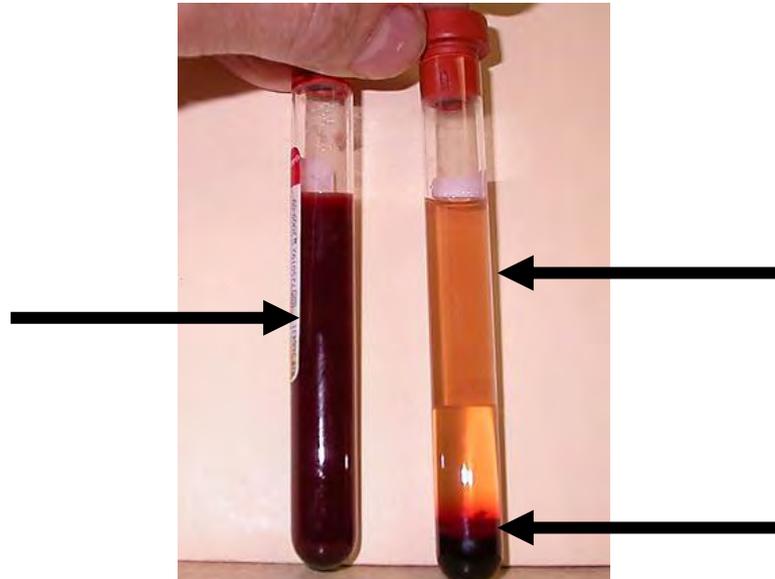
Blood visible only under a microscope is known as *microscopic hematuria*.

When I say that there are 5 RBCs/HPF,
do I mean the HPF of the examined:

whole urine, or

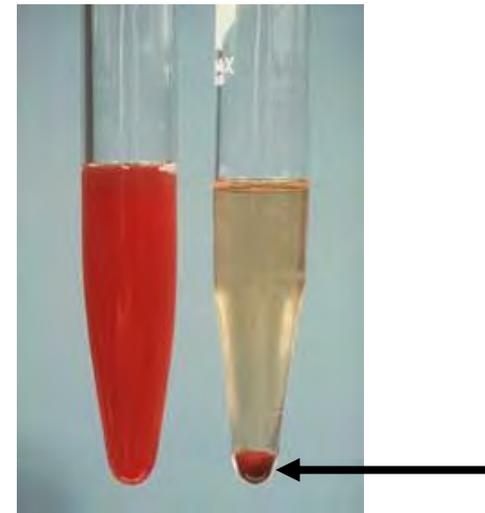
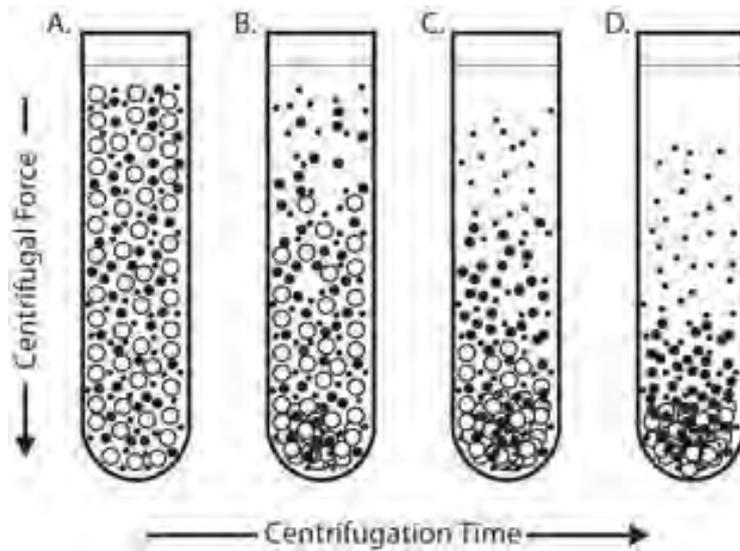
the supernate after centrifugation, or

The sediment after centrifugation ?



that's how
it's done

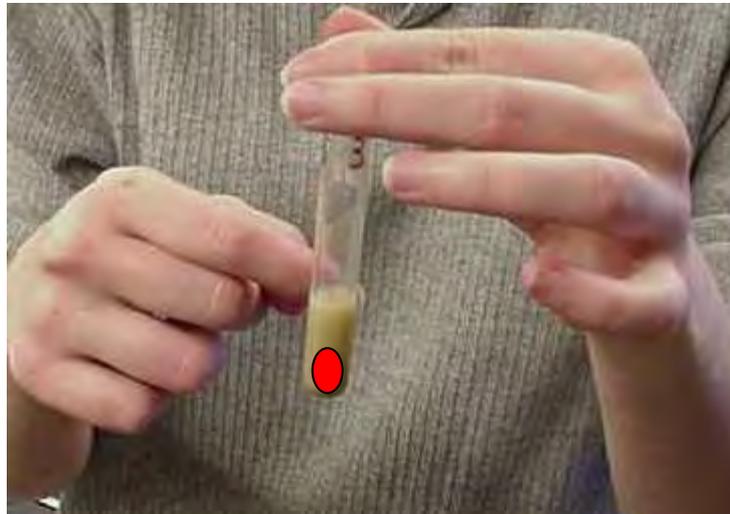
1. A sample of well mixed urine (10-15 ml) is centrifuged until a button is produced at the bottom.



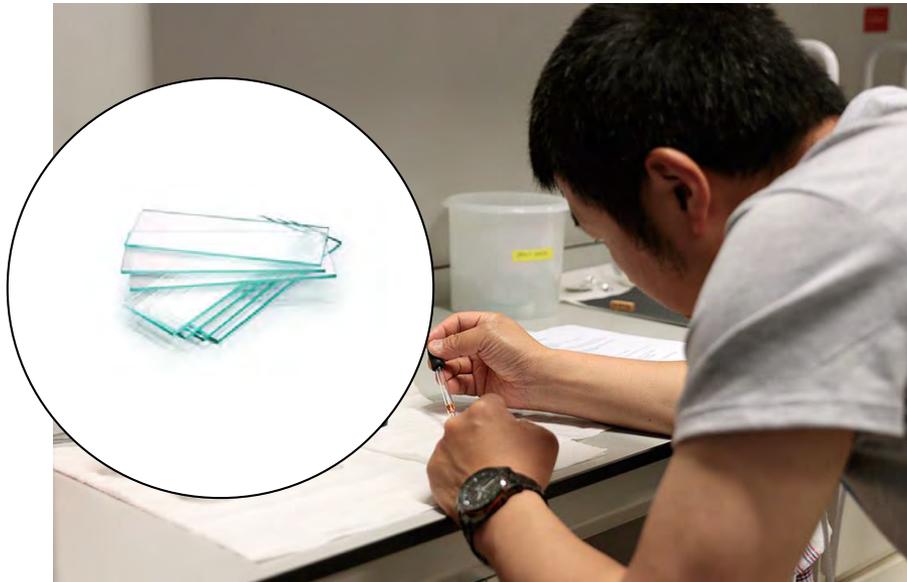
2. The supernate is decanted leaving from 0.5-1 ml in the tube.



3. The sediment is resuspended in the remaining amount of the supernate by flicking the bottom of the tube several times.



4. A drop of resuspended sediment is poured onto a glass slide and cover slipped.





The sediment is first examined under **low power** to identify most crystals, casts, squamous cells, and other large objects.

Next, examination is carried out at **high power** to identify crystals, cells, and bacteria.

The various types of cells are usually described as
the number of each cell type found
per average high power field (HPF).

Example: 1-5 WBC/HPF.

Theoretically, no red cells should be found in urine, however, some find their way into the urine even in very healthy individuals .

And up to
3 RBCs/HPF
is considered normal

And

TESTS AND READING TIME

LEU	LEUKOCYTES	NEGATIVE		TRACE	SMALL +	MODERATE ++	LARGE +++
	2 minutes						
NIT	NITRITE	NEGATIVE		← POSITIVE (any degree of uniform pink color) →			
	60 seconds						
URO	UROBILINOGEN	NORMAL		mg/dL URINE (1 mg = approx. 1 EU)			
	60 seconds	0.2	1	2	4	8	
PRO	PROTEIN	NEGATIVE	TRACE	mg/dL	30 +	100 ++	300 +++
	60 seconds						
pH	pH	5.0	6.0	6.5	7.0	7.5	8.0
	60 seconds						
BLO	BLOOD	NEGATIVE	NON-HEMOLYZED TRACE	MODERATE	HEMOLYZED TRACE	SMALL +	MODERATE ++
	60 seconds						
SG	SPECIFIC GRAVITY	1.000	1.005	1.010	1.015	1.020	1.025
	45 seconds						
KET	KETONE	NEGATIVE	mg/dL	TRACE 5	SMALL 15	MODERATE 40	← LARGE 80 →
	40 seconds						
BIL	BILIRUBIN	NEGATIVE			SMALL +	MODERATE ++	LARGE +++
	30 seconds						
GLU	GLUCOSE	NEGATIVE	g/dL (%)	1/10 (tr.)	1/4	1/2	1
	30 seconds		mg/dL	100	250	500	1000
				2000 or more			

The Strip Test





Does the strip differentiate between hematuria, hemoglobinuria, and myoglobinuria ?

No!



Dipstick positive + RBCs on microscopic UA = **hematuria**.
Dipstick positive + low or absent RBCs on microscopic UA =
hemoglobinuria/myoglobinuria

Hematuria



**Hemoglobinuria/
Myoglobinuria**

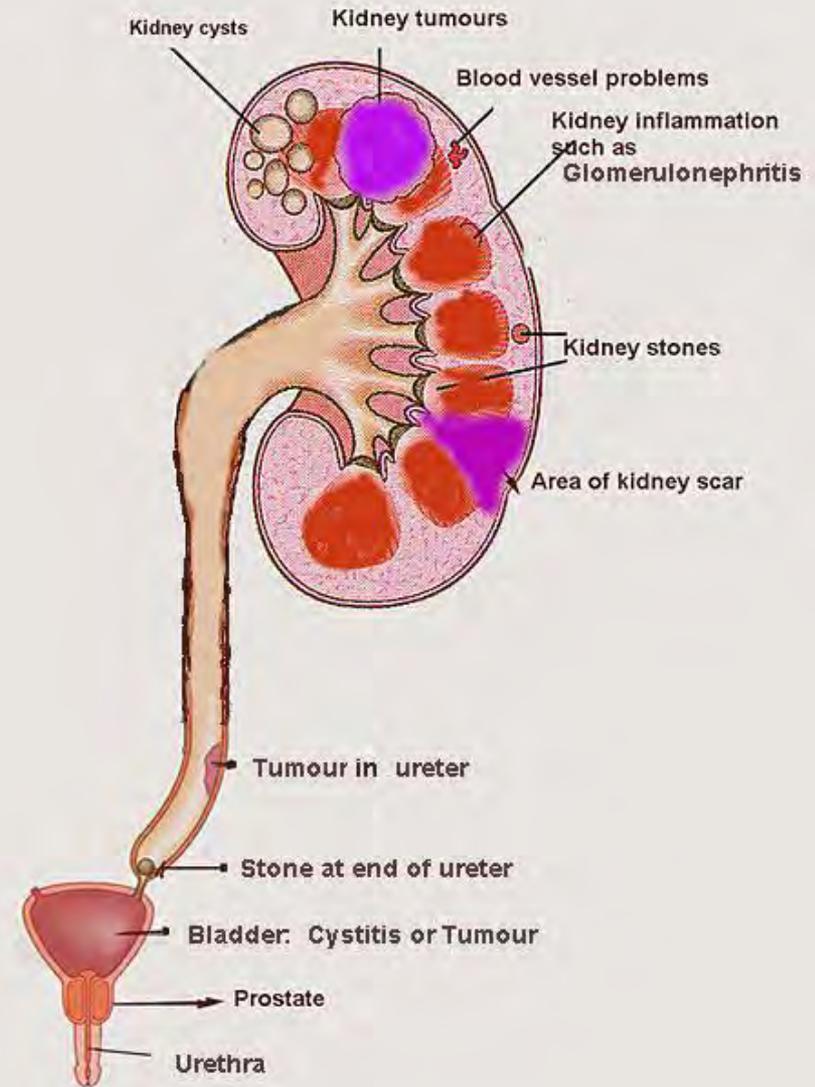




**▶ If it proves hematuria, what type of hematuria is it ?
And where does blood come from ?**

Hematuria may originate from different sites in the urinary tract.

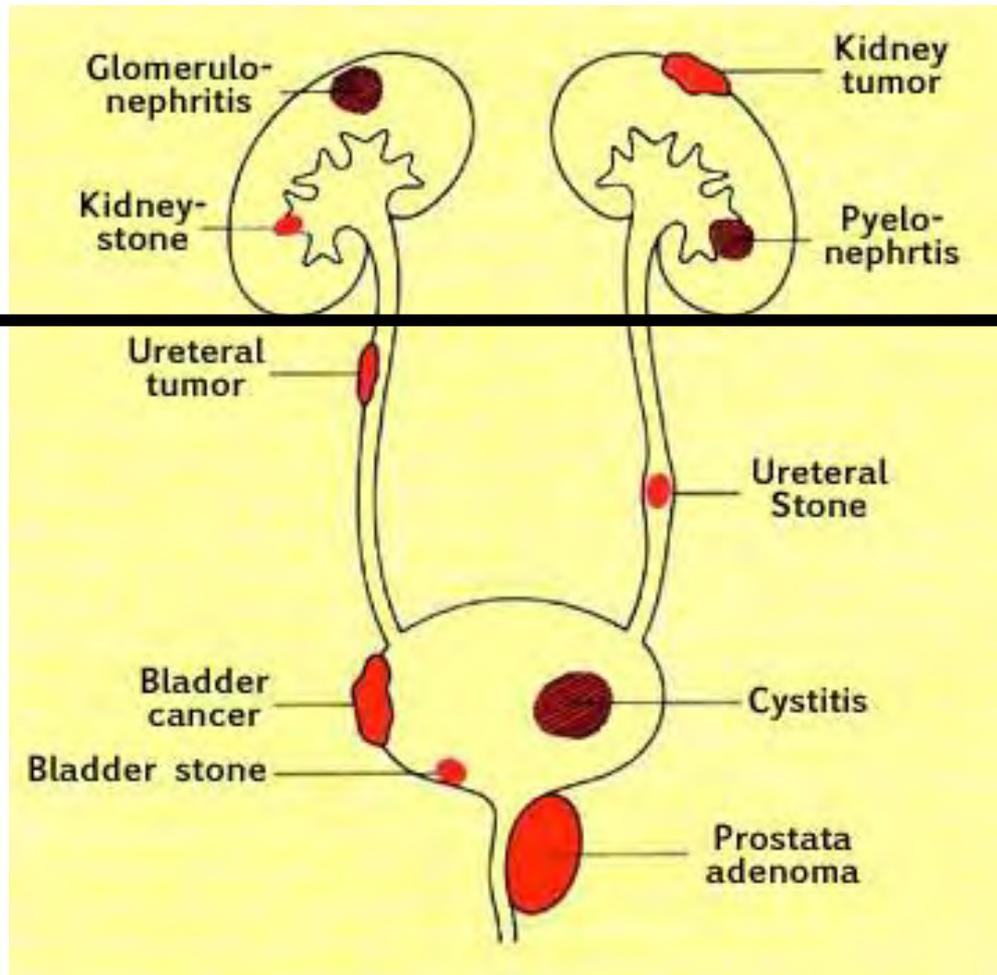
Systemic bleeding disorder should be taken into consideration.





▶ **Is it Renal or Extra-renal ?**

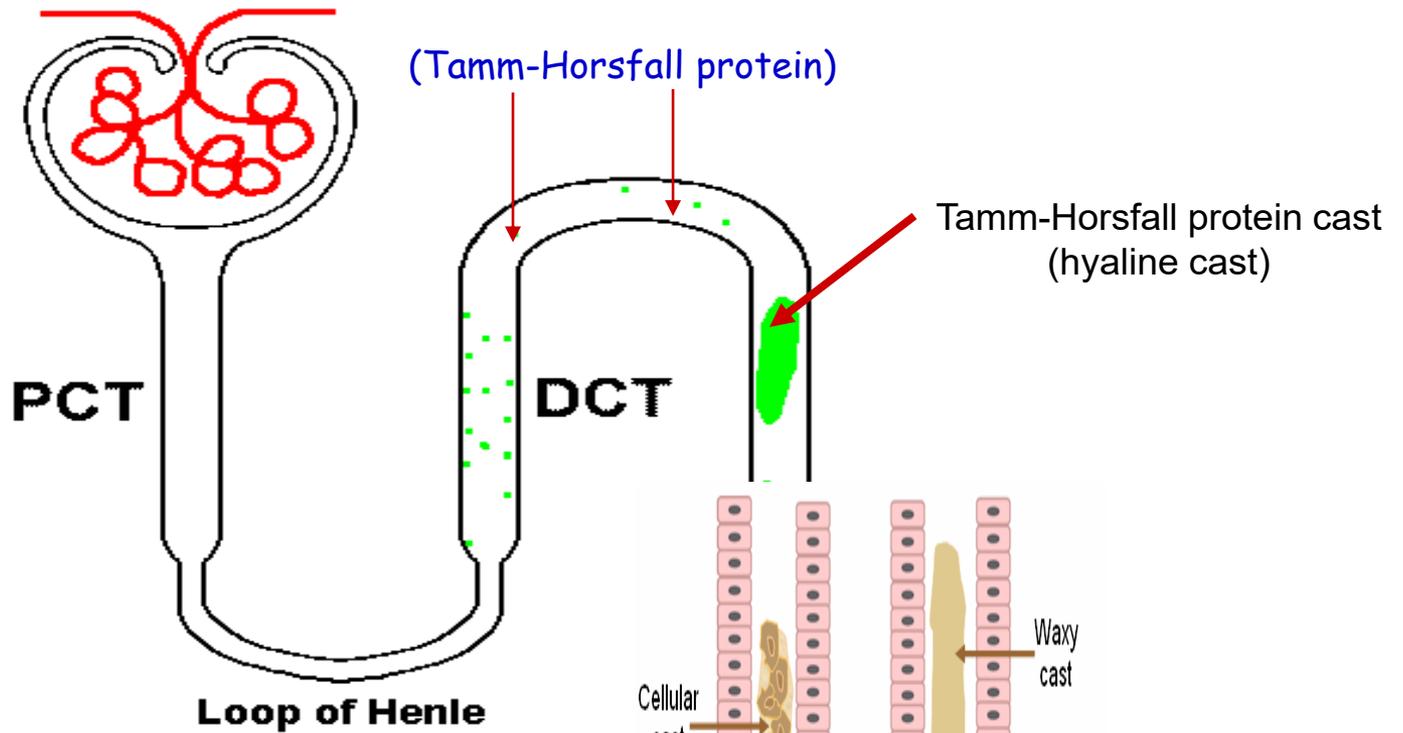
Is blood coming from the kidney,
or from elsewhere in the UT ?



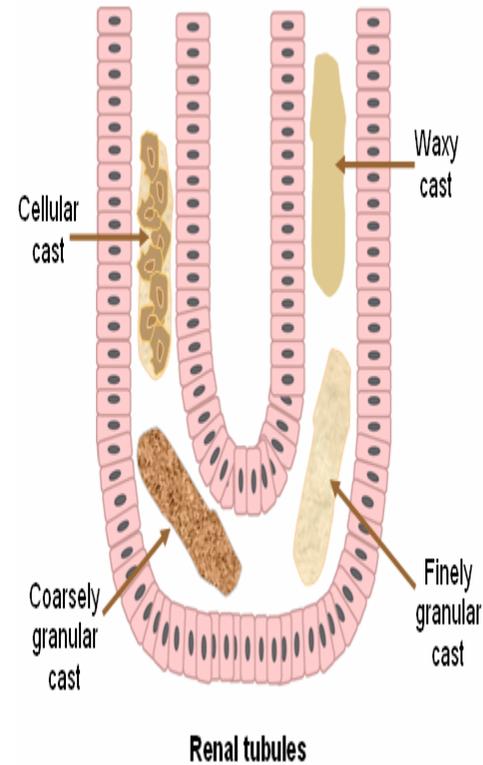
Pathognomonic



Red Blood Cell *casts* are pathognomonic of the *renal* origin of hematuria.



Urinary casts are formed only in the distal convoluted tubule (DCT) or the collecting duct



And as equal,

Pathognomonic



Proteinuria indicates the renal origin of the pathology



ON THE OTHER
HAND



Pathognomonic



Red Blood *clots* are pathognomonic of the extra-renal origin of hematuria.



► **ok, It is renal,**
Is it Glomerular or Non-glomerular ?

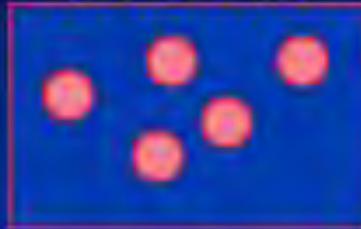
Normal RBC



Normal red blood cell

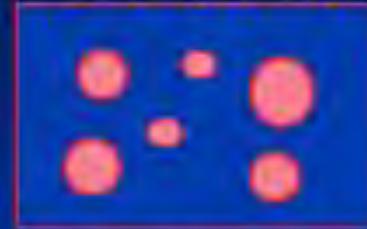
Urine red cell morphology

ISOMORPHIC



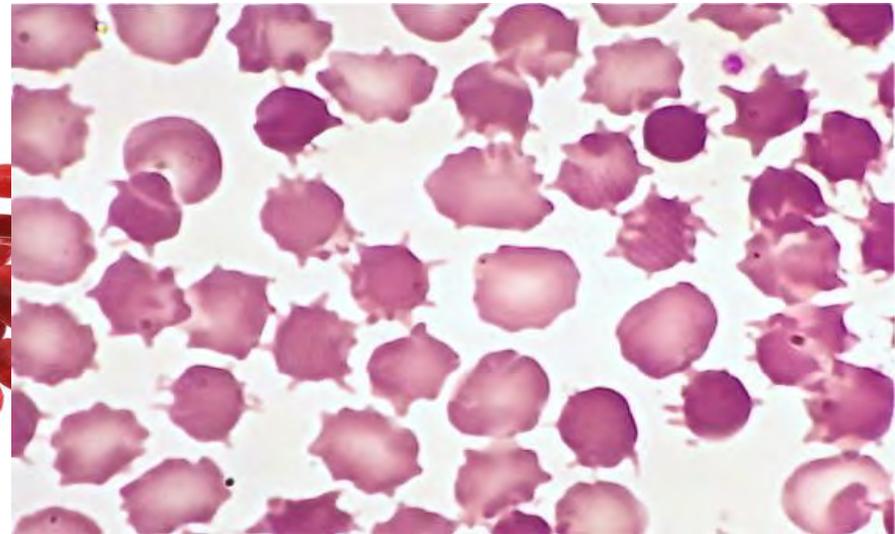
same shape
non-glomerular
(renal, ureters, bladder)

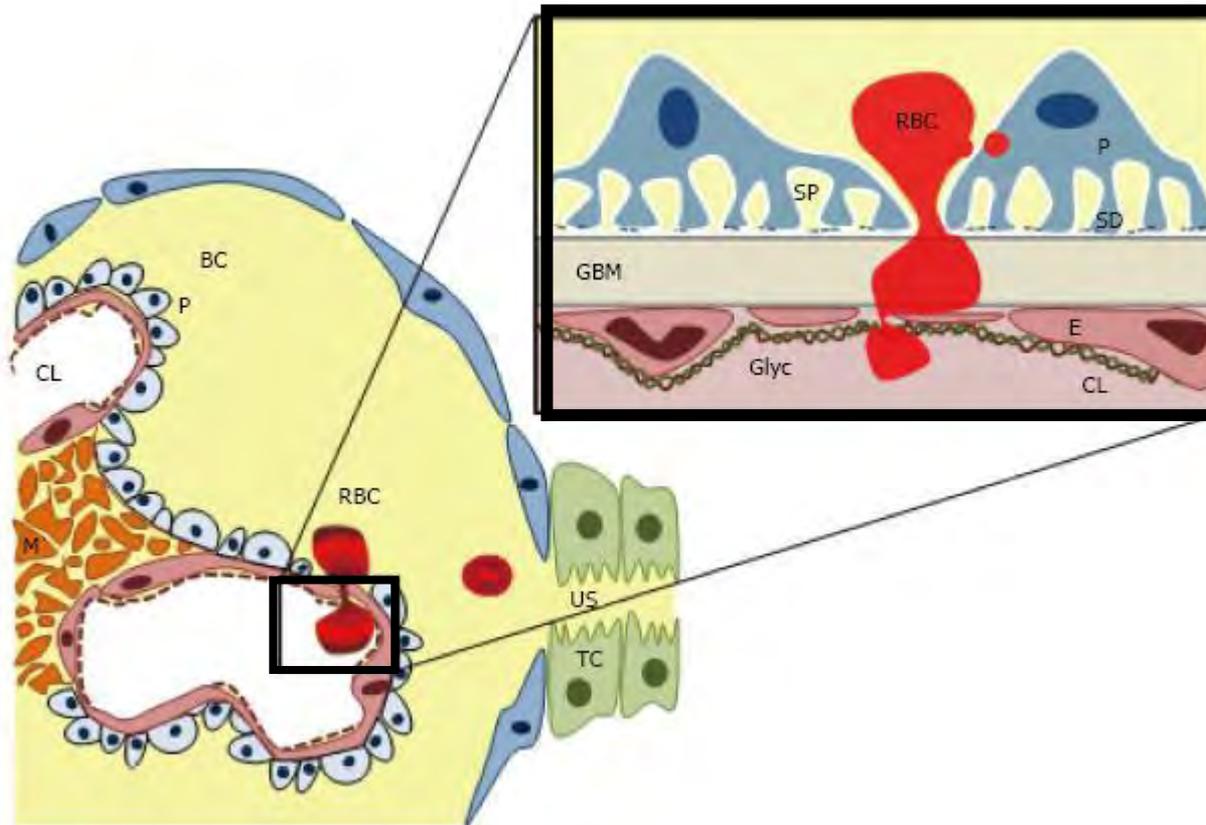
DYSMORPHIC



different size & shape
glomerular bleeding
(GN)

Acanthocytes





Dysmorphic RBCs have odd shapes as a consequence of being distorted via squeeze through the glomerular structure .



And you should

Ask the lab to report on the shape of the RBCs, the presence of clots, or the presence of casts and their type, etc...

JUST 
AS WELL

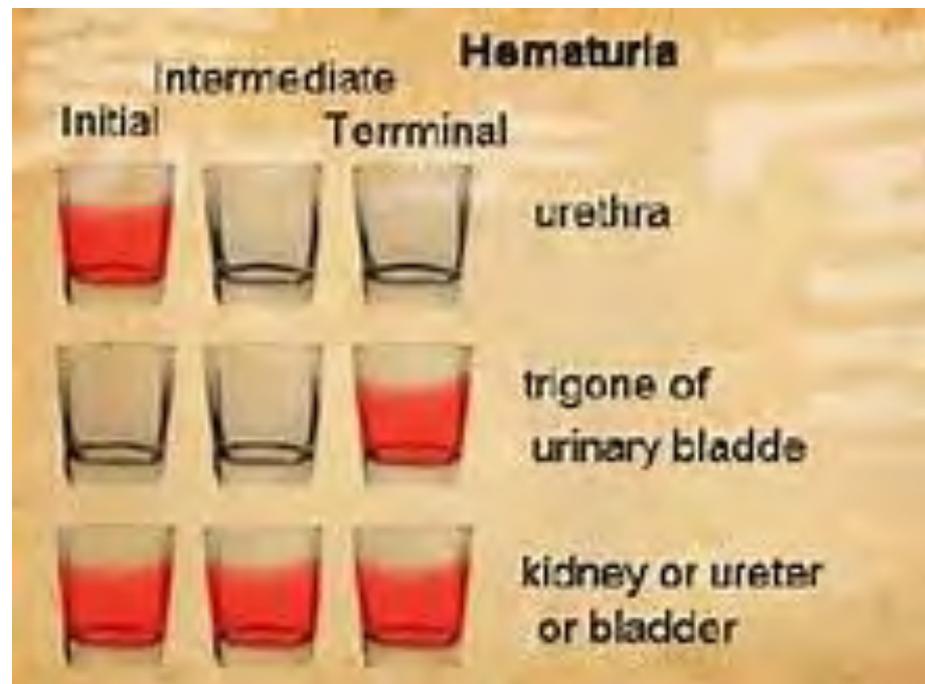


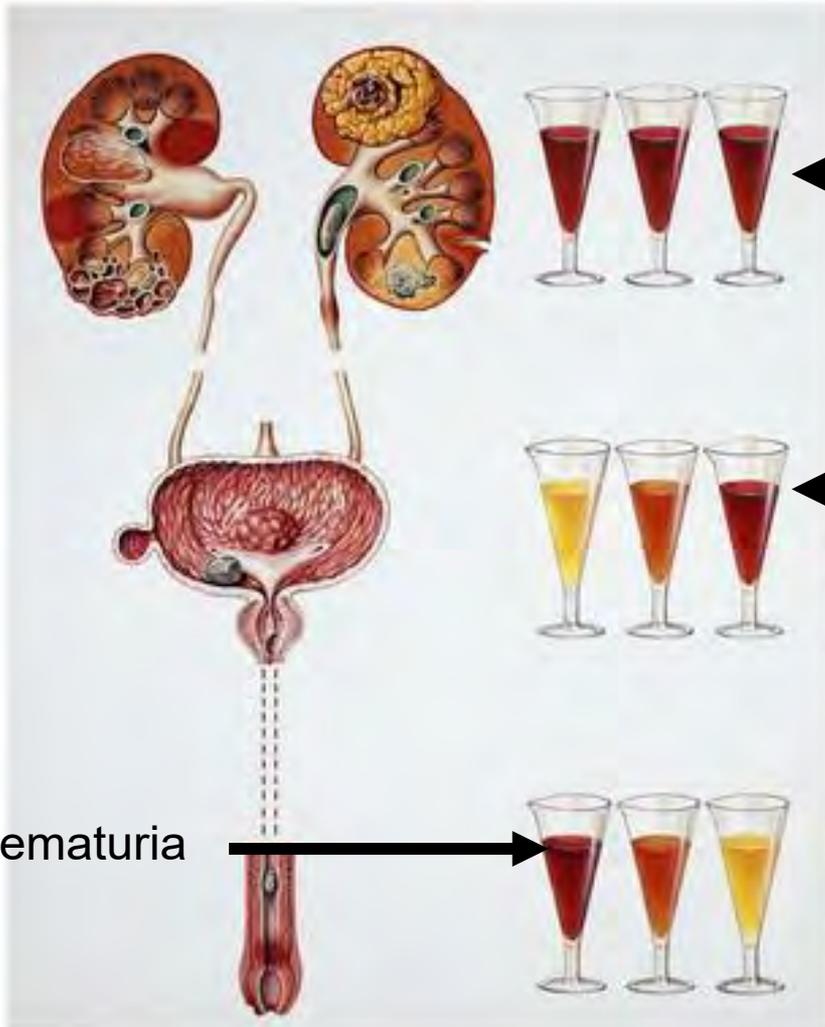
The Timing of hematuria i.e. when it occurs during urination, is very important; it may indicate the location of the problem.

Initial hematuria, at the onset of urination= urethra.

Terminal hematuria, at the end of urination = Bladder or Prostate (in men)

Total hematuria, throughout the whole flow = Bladder, Ureters, and/or Kidneys.





althrough hematuria

Terminal hematuria

Onset hematuria

The 3 flask test



▶ **What is the possible cause ?**





It is crucial to determine the reason for the bleeding.
Treatment depends on the underlying cause .



Causes of Hematuria

- *Kidney disease*
- *Lesions along the urinary tract*
- *Conditions unrelated to kidney and urinary tract*

25 = $5 \frac{20}{25}$ 3.7
% nouns 81% 9
LET'S SUM
IT UP
= e 21x
vowels — spelling 5.80 + 12'
1/2 →

Causes of Hematuria

Lesions along the UT

▶ Tumors, Vascular problems, Stones, Polyps, and Ulcers

Kidney disease

Extra-renal conditions

▶ Leukemia, Hemorrhagic diathesis

Glomerular

Immune

Antibody Mediated

Cell Mediated

Non-Immune

Non-Glomerular

- *PN
- *TIN
- *PKD
- *Trauma
- *Tumors
- *Metabolic

Glomerular Hematuria

Immune & Non-Immune mediated

Isolated Kidney Disease

- *Post-infectious GN
- *IgA nephropathy
- *Alport's syndrome
- *TBMD
- *MPGN
- *MN
- *FSGS
- *Anti-glomerular BM dis.

Multi-system disorder

- *HSP
- *SLE
- *HUS
- *PAN
- *Goodpasture's dis.
- *HIV
- *Sickle cell dis.
- *DM

The most common

The commonest causes of hematuria

- Infection of the urine.
- Kidney and bladder stones .
- Trauma to the urinary tract.
- Bladder tumors.
- Prostate tumors.
- kidney tumors and other kidney diseases.
- Blood disorders

This is how software tools are designed including

MS Word.

Don't worry, **commonest** is the word and many dictionaries define it .

Oxford Dictionary lists " **commoner** "and "**commonest** "as the comparative and superlative forms of "common ."

Sep 27, 2007

However, on [Ngram](#), *most common* is more popular than *commonest* especially in recent years .

Interesting point is that, many people prefer speaking **most common** over **commonest**

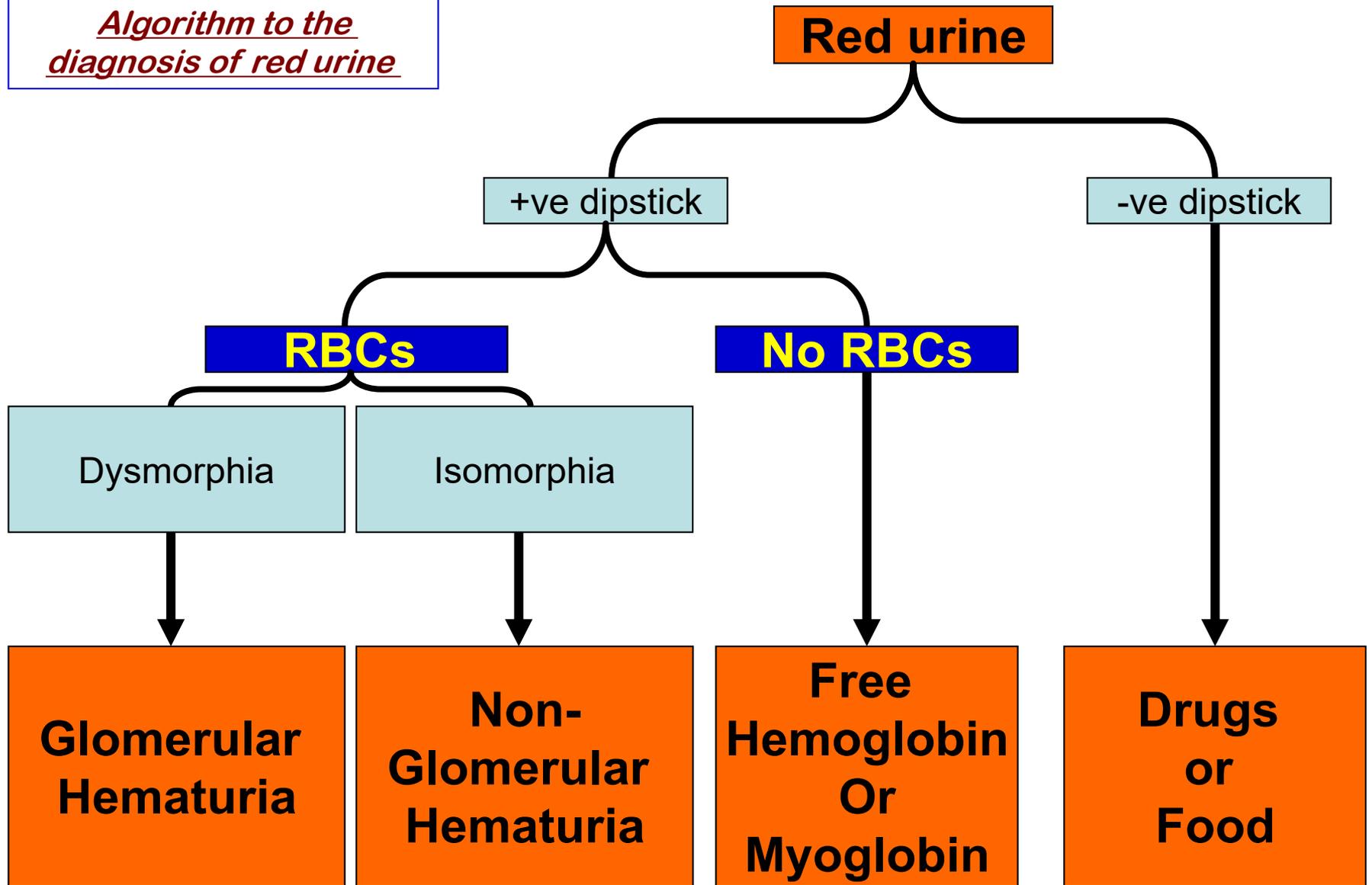
because if you say *commonest problem* it may sound *communist problem* !

To avoid such ambiguity with such noun, prefer using *most common* .



▶ **How should I proceed to settle the diagnosis ?**

*Algorithm to the
diagnosis of red urine*





▶ What are the lines of management to be taken ?

Asymptomatic (isolated) hematuria generally does not require treatment.



In conditions associated with abnormal clinical, laboratory, or imaging studies, treatment may be necessary, as appropriate, with the primary diagnosis .

ask about

the medical history of the patient and his family, especially any history of kidney disease, bladder problems or bleeding disorders.

Any recent trauma or strenuous exercise, recent infections, and any medications taken.

Any symptoms, such as frequent urination, pain with urination and flank pain should be verified.

Urine is analyzed to look for protein, white cells and red cells to identify a kidney or bladder infection, or kidney inflammation (glomerulonephritis).

Then, depending on the suspected cause of hematuria, additional testing may include:

Urine culture : to confirm a kidney or bladder infection.

CT scan of the kidneys, ureters and bladder.

Ultrasound : to help establish whether a kidney mass is a non-cancerous (benign), fluid-filled cyst or a solid mass, such as a cancerous tumor. Ultrasound also can identify kidney stones.

Cystoscopy: to inspect the bladder lining for tumors, ulcers, or other problems.

Blood tests : for signs of urinary tract infection, kidney failure, anemia of CKD, bleeding disorders, or abnormally high levels of blood chemicals that can encourage the formation of kidney stones .

Additional testing for conditions causing kidney inflammation (such as lupus) may be recommended, depending on the findings of the routine blood and urine tests .



Prevention



In general, you can help to prevent not only kidney disease, but also other forms of body sufferings by following a healthy lifestyle.



If hematuria is related to strenuous exercise, switch to a less-intense exercise program.



Stay well hydrated.



Drink





Wherever you are...



As much as you can...

Invite your friends
to a...



WATER
PARTY

Don't miss a chance for a clean glass of water....



don't wait until you're thirsty
before you reach for that glass of
water – it would be already
too late.



I'm thirsty

Try to get used to drink by the hour
rather than by the hypothalamus.



**Drink about eight glasses of fluid daily
(more during hot weather).**







Treatment

The treatment of hematuria depends on its cause.

In general, people with exercise-related hematuria do not need any treatment other than to modify their exercise programs.

People with drug-related hematuria will improve if they stop taking the medication that caused the problem.

Antibiotics typically will cure infection-related hematuria .

For other causes of hematuria, treatment may be more complex:

Kidney stones — Smaller stones sometimes can be flushed from the urinary tract by drinking lots of fluids. Larger stones may require surgery or lithotripsy.

Trauma — Treatment depends on the type and severity of injuries. In severe cases, surgery may be necessary.

Tumor in bladder or kidney— The primary types of treatment are surgery, chemotherapy, radiation therapy and immunotherapy, a type of treatment that stimulates the immune system to fight cancer.

Glomerulonephritis— Children who develop glomerulonephritis related to a streptococcal infection often recover after antibiotics without needing additional treatment. If it is caused by an autoimmune disorder, such as lupus, medications to suppress the immune system, are usually prescribed.

Bleeding disorders — Treatment depends on the specific type of bleeding disorder.



Points to Remember

www.webmd.com/children/hematuria-benign

Gross hematuria

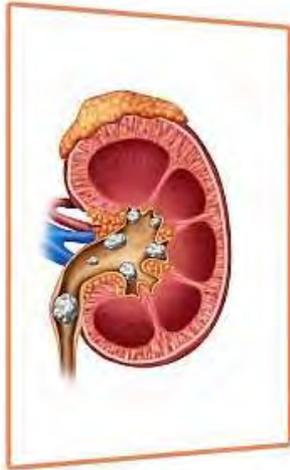


Microscopic hematuria



Hematuria is the presence of blood in urine.

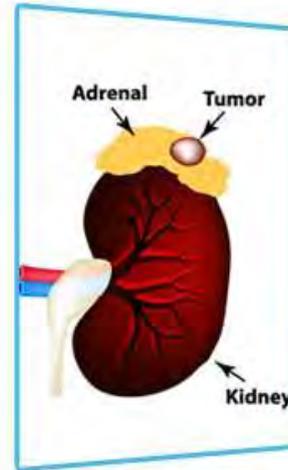
Causes of Hematuria



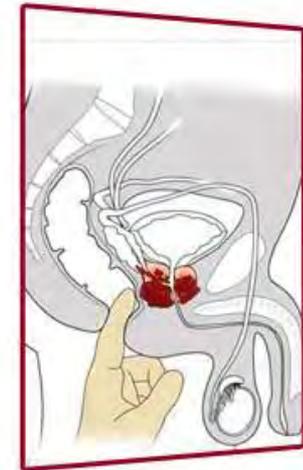
Kidney Stones



Urinary Tract
Infection



Kidney Tumors



Prostate Cancer

The causes of hematuria range from vigorous exercise, to the more serious causes such as kidney or bladder cancer, inflammation anywhere along the UT, stones, and PKD.

Family
History



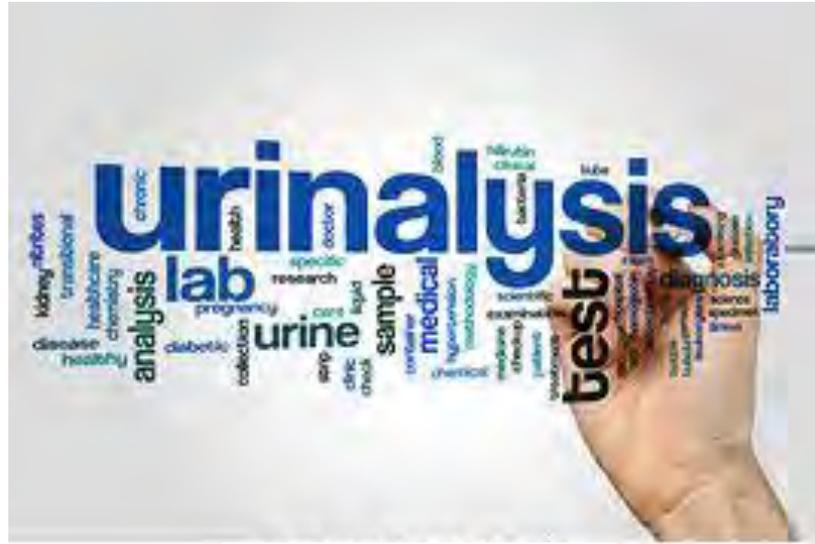
People with hematuria may have a family history of kidney disease..



Most people with microscopic hematuria do not have any symptoms.



Taking a medical history may help a health care professional diagnose the cause of hematuria.



Health care professionals diagnose hematuria with a urinalysis.



Clinical Pearl

Urine, carefully examined, and intelligently interpreted, is a fluid biopsy of the kidney.

**What's the
cause?**

A 3D white figure stands next to a large red question mark, symbolizing a question or inquiry.

Health care professionals treat hematuria by treating its underlying cause.

A decorative graphic consisting of a vertical line of seven circles of varying sizes. The top three circles are red, and the bottom four are yellow. The circles are arranged in a slightly curved path.

PROCEED





Thank
You

Ramzi el-Baroudy

QUIZ
TIME



Urinalysis shows proteinuria, many RBCs, red cell casts, and 1-2 WBCs/HPF. Which of the following diseases best fits with these findings ?

- A. Acute pyelonephritis
- B. Chronic pyelonephritis
- C. Acute PSGN
- D. Minimal change disease

Hematuria is least likely to occur in :

- A. Acute PSGN
- B. Renal tubular adenocarcinoma
- C. Urinary stones
- D. Minimal change disease

Hematuria, proteinuria, and hypertension, are common with the following diseases except :

- A. APSG
- B. IgA nephropathy
- C. Thin Basement Membrane Disease
- D. SLE