

# Clinical Significance and Differentiation of Hematuria and Hemoglobinuria

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**ABSTRACT.** *The purpose of this study is to help people better understand the index reaction, clinical significance and identification of hematuria and hemoglobinuria by analyzing the results of urine routine examination in laboratory test, guide people to read the report correctly, avoid confusing diseases and pay attention to the value of regular physical examination and self-health;*

**KEYWORDS:** *Urine routine examination, Hematuria, Hemoglobinuria, Differential diagnosis*

## 1. Introduction

With the progress of civilized society and the improvement of living standards, people are increasingly concerned about their physical and mental health. As an important means of early detection and screening of diseases, regular physical examination has been paid more and more attention. The hospital also provides comprehensive and thoughtful medical security for people through health lectures, health education, universal physical examination and other rich and diverse forms. As one of the commonly used physical examination items, urine routine examination can reflect the metabolic status of the body through the changes of various indicators in the urine, and as an auxiliary diagnosis of diseases, especially for kidney diseases<sup>[1]</sup>. Urine routine examination includes urine color, transparency, pH, red blood cells, white blood cells, epithelial cells, tube type, protein, specific gravity and urine sugar. In clinical practice doctors often meet patients with hematuria or hemoglobinuria. Although there are similarities in clinical manifestations between them, the underlying causes are often different in essence. The following study is combined with specific cases to analyze.

Medical Records:Case 1:A female, 18 years old, was a student. During the physical examination at school, she was found to have positive occult blood test, the red blood cell count was 3-5/HP by microscopic examination and white blood cell was negative in urine. She had no complaints of special discomfort and was referred to our hospital for review of urine routine examination. After being asked by medical history, she was advised to check the urine routine again and take urine for the first time in the morning, not to exercise violently before taking urine samples

and to stop all the oral drugs or health care products. Urine routine examination results: yellow, occult blood test (+), ketone body (+), microscopic red blood cell 1-3/HP, microscopic white blood cell 3-5/HP, urine microalbumin normal. The female patient denied gross hematuria, no urinary tract irritation sign such as frequent urination, acute urination and dysuria, no back pain and weakness, no fever, not in menstrual period, no previous history of kidney diseases such as glomerulonephritis, nephrotic syndrome, IgA nephropathy and no history of chronic urinary tract infection. At present, the positive occult blood test was considered hemoglobinuria, so she was advised to drink more water, pay attention to rest and do not need drug treatment for the time being. One week later, the urine routine examination showed that the occult blood test was negative and the red blood cell was negative too.

Case 2: One 45 years old male who is a taxi driver came to our hospital for treatment due to his dark urine color and abdominal distension. He had a history of hypertension and hyperlipidemia, usually sat in a sitting position for work reasons and had little water. Moreover, he drank a lot of beer two days before the onset of the disease in dinner with his friends. Physical examination: clear mind, general spirit, stable breathing, response to the point, heart rate of 80bpm, bilateral lung breathing sounds were thick and no obvious dry or wet rales were heard, the abdomen was flat and soft without no obvious tenderness and rebound pain, no muscle tension, no percussion pain in liver area, suspected percussion pain in left renal area and normal bowel sounds. The urine routine examination showed: brown, turbid, occult blood test (+ + +), protein (+), pH: 6.0, specific gravity: 1.010, urine leucocyte (+), microscopic white blood cell: 3-5/HP, microscopic red blood cell: 80-90/HP, urinary albumin: 80 mg/L. Through the above urine routine test, the diagnosis of hematuria can be confirmed, furthermore, the color doppler ultrasound examination of urinary system immediately showed left ureteral calculi and mild hydronephrosis, the blood routine was normal and CRP was 15mg/L, while renal function was not affected. After the etiology was identified, the male patient was transferred to urology for further treatment.

## 2. Discussion

Hematuria is one of the common symptoms of urinary system diseases. A small amount of red blood cells can be found in the urine of normal people. When there are more than 3 red blood cells per high power microscopic field in centrifuged precipitation urine, or more than 8000 red blood cells per milliliter of fresh urine are directly counted, it is called hematuria. Hematuria can be divided into microscopic hematuria and gross hematuria. The former has mild symptoms and only the increase of red blood cells can be seen under the microscope. When the amount of bleeding is large, the urine can be in the form of washing meat water, strong tea or even directly bright red, which is called gross hematuria. There are many causes of hematuria. Before determining the true hematuria, we must exclude the false hematuria caused by rectal bleeding or female menstrual contamination<sup>[2]</sup>. In addition, after strenuous exercise, red blood cells in urine can also show a transient

increase. There are three common causes of hematuria. The first is urinary system disease, which is undoubtedly the most popular, such as IgA nephropathy, acute glomerulonephritis, pyelonephritis, cystitis, prostatitis, urinary stone, urinary system tumor and even some rare diseases such as polycystic kidney, urethral malformation, renal dynamic and static venous embolism, etc. The second is the urinary system adjacent organ disease, such as female pelvic inflammatory disease, salpingitis or adjacent organ tumor invasion of bladder, ureter caused by hematuria. The third category is systemic diseases, including hematological diseases such as leukemia, thrombocytopenic purpura, aplastic anemia, infectious diseases such as sepsis, epidemic hemorrhagic fever, endocrine and metabolic diseases such as diabetic nephropathy, renal amyloid disease, etc.

Hemoglobinuria refers to urine containing a large number of free hemoglobin and no or only a small amount of red blood cells, mostly due to intravascular hemolysis<sup>[3]</sup>. The hemoglobin value in normal adult plasma is less than 50mg/L and forms macromolecular compound with hepatoglobin, which can not be filtered from glomerulus. When the occurrence of intravascular hemolysis, hemoglobin exceeds the binding capacity of hepatoglobin, and the free hemoglobin is filtered out from the glomerulus so to form different degrees of hemoglobinuria. Hemoglobinuria is different from hematuria, because the upper layer of hemoglobinuria is still red after centrifugation, while the upper layer of hematuria is transparent. According to the content of hemoglobin in urine, the color can be bright red, dark brown and in severe cases, the color is sauce oil. The most common cause of hemoglobinuria is intravascular hemolysis, such as hemolytic anemia, blood transfusion reaction, drugs or chemicals causing hemolysis. In addition, hemolysis in the urinary tract and renal infarction can also occur.

The two laboratory performances above point to two different kinds of diseases. Gross hematuria or microscopic hematuria mostly mean urinary system diseases represented by kidney, which need to be treated in nephrology or urology. Besides nephrology, hemoglobinuria of the diseases such as paroxysmal nocturnal hemoglobinuria and Favism<sup>[4]</sup> should be treated in hematology department. After understanding the essential difference between hematuria and hemoglobinuria, we can further judge the etiology by other accompanying symptoms of patients. For example, hematuria with abdominal pain is mostly urinary calculi, hematuria with bladder irritation sign may be cystitis, prostatitis, etc, hematuria with abdominal mass needs to consider the possibility of renal tumor, hematuria along with the systemic uncontrolled bleeding tendency is more common in hemophilia, leukemia, thrombocytopenic purpura and other blood system diseases, hematuria with fever can be seen in acute pyelonephritis. Finally, many patients with asymptomatic hematuria are IgA nephropathy and renal tumor. As to hemoglobinuria, etiology can also be judged according to clinical manifestations. For example, if hemoglobinuria appears in the morning for the first time, paroxysmal nocturnal hemoglobinuria should be considered; when hemoglobinuria appears after blood transfusion, clinical doctors should consider blood transfusion reaction caused by blood type incompatibility; if hemoglobinuria occurs after eating broad bean, it is highly suspected of Favism. In addition, clinicians also need to exclude the interference of

laboratory tests caused by vaginal or rectal blood contamination samples and whether to take anticoagulants, antiplatelet drugs, antipyretic and analgesic drugs, antibiotics and antineoplastic drugs for a long time before urine examination.

### 3. Conclusion

Hematuria and hemoglobinuria are often confused in clinical medicine. Many people mistake the positive occult blood test in the urine routine report for hematuria, in fact this is wrong. The more rigorous judgment standard is to observe the quantitative and qualitative red blood cells in urine at the same time, because the positive urine occult blood test only represents that the urine contains hemoglobin or myoglobin and red blood cells can exist or not. Once the wrong diagnosis is caused by wrong understanding, serious consequences may be brought. Only through the detailed collection of medical history, careful physical examination and accurate laboratory test, can we make a correct diagnosis of the etiology and provide the correct direction for treatment.

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