

COMPARATIVE EVALUATION OF URINE DIPSTICK TEST AND URINE MICROSCOPY ANALYSIS IN DETECTION OF HEMATURIA: A VALIDITY STUDY IN A TERTIARY HOSPITAL IN MANDYA

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Abstract

Background: Screening of hematuria is recommended in many situations, including screening high-risk patients, and tests are expected to be sensitive. Thus hematuria warrants a thorough diagnostic evaluation as it can be of underlying life-threatening cause. Hence there is a need for simple means of detecting unsuspected hematuria. **Materials and Methods:** We examined 50 urine samples from healthy volunteers in this study. The participants had fresh, clean catch mid-stream urine samples tested at two physiological states - basal and hyperhydration. Venous blood was taken from one of the volunteers, and diluted in urine to serial controlled dilutions (1:10 to 1:10⁶). A urine dipstick and urine microscopy to detect hematuria were performed. **Result:** We found that urine dipstick was more sensitive and detected blood in 10⁶ dilution which is 100%, whereas urine microscopy detected at 10⁵, which is 83%. **Conclusion:** Urinary dipstick can be used as a screening test for hematuria, as it is sensitive and performs better in unstandardized conditions, it can be performed immediately at any setup, is universally available, and is also faster and cheaper than other techniques.

INTRODUCTION

Hematuria is defined as the occurrence of blood or red blood cells in the urine.^[1] It can be visible to the naked eye (termed "gross hematuria") or it can be microscopic (i.e. not visible to the eye but detected with a microscope or laboratory test).^[2] The origin of blood that enters and mixes with the urine can arise from any anatomical site within the urinary system, including the kidney, ureter, urinary bladder, and urethra, and in men, the prostate.^[3] Common causes of hematuria include urinary tract infection (UTI), kidney stones, viral illness, trauma, bladder cancer, and exercise.^[4] The literature agrees that gross hematuria warrants a thorough diagnostic evaluation. By contrast, microscopic hematuria is an incidental finding, and whether physicians should test for hematuria in asymptomatic patients remains an issue. Microscopic hematuria is defined as three or more red blood cells per high-power microscopic field in urinary sediment from two to three properly collected urinalysis specimens.^[5]

Screening of hematuria is recommended in many situations, including screening high-risk patients, and tests are expected to be sensitive. The two most common types of urine testing performed in inpatient and outpatient settings are chemical examination by reagent strip (dipstick) and sediment examination by microscopy. But there has been a debate as to whether urine dipstick or urine microscopy analysis (UMA) is the preferred testing method, but there is no consensus among practitioners.^[6]

The urine dipstick test remains a simple means of detecting unsuspected hematuria, proteinuria, or both. It can be performed immediately at any setup and is also cost-effective.^[7] Urine microscopy is the preferred test used for urine analysis, however, the sample has to be sent to the laboratory and delay also reduces the sensitivity of urine microscopy.^[8] Thus in this study, our objective is to compare urine dipstick and UMA as diagnostic tests for hematuria, using urine samples with known concentrations of RBC.

Objectives

1. To compare urine microscopy analysis and urinary dipstick as diagnostic tests for detecting hematuria.
2. To evaluate urinary dipstick as a reliable screening method in detecting hematuria.

MATERIALS AND METHODS

Study Design: Validity Study

Inclusion Criteria: Males aged 18-60 years and above giving informed consent to participate in this study.

Exclusion Criteria

1. Those with predisposing kidney disease.
2. Females.

Sample Size: 50 urine samples from persons without hematuria (volunteers).

Method of data Collection: Control urine was collected from 50 healthy male volunteers after informed oral consent. 50 ml of freshly voided clean catch midstream urine was collected in the basal state and hyper-hydration state. Venous blood sample was taken from one of the volunteers and added to the urine sample in known serial dilutions. These samples were tested for blood first by Urine dipstick within 10 minutes and later by urine microscopic examination, done to evaluate components of sediment with the standard protocol after centrifugation (1500 rpm for 3 minutes) and examined under 400x magnification, a minimum of 10 high power fields were used.

RESULTS

When we assessed 50 samples of the participants by two methods in baseline and hypotonic urine, using the same known serial dilutions (1:10 to 1:10⁶), all samples were examined in the same laboratory within 10 minutes of sample collection.

The dipstick color changed from orange to green to dark blue. Any green spots or green color development on the reagent area within 60 seconds is considered significant.

When we compared the sensitivity of the two tests, it was found that the urine dipstick was more sensitive and detected blood in 10⁶ dilutions which is 100% sensitivity, whereas urine microscopy detected at 10⁵ dilutions which is 83% sensitivity.

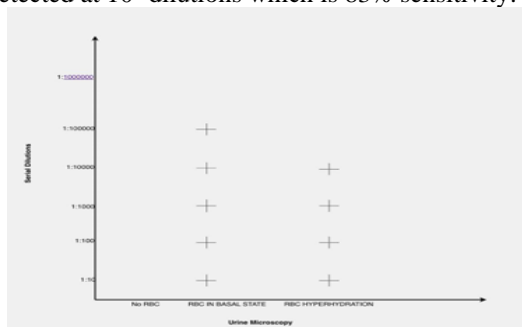


Figure 1: Detection of hematuria, results by urine microscopy in baseline and hypotonic urine.

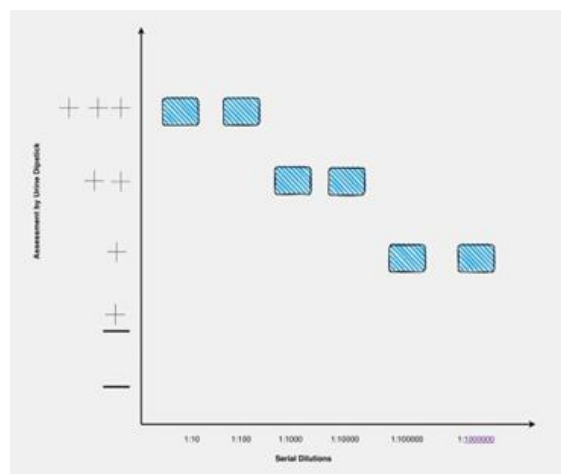


Figure 2: Detection of hematuria, results by urine dipstick in baseline urine.

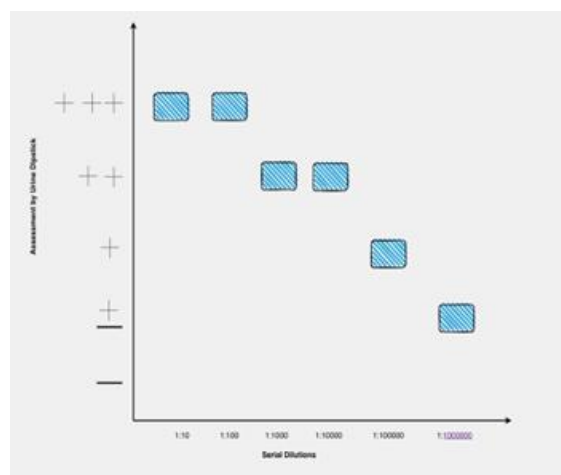


Figure 3: Detection of hematuria, results by urine dipstick hypotonic urine.

DISCUSSION

American Urological Association(AUA) convened the best practice policy panel on asymptomatic microscopic hematuria to formulate policy statements and recommendations for the evaluation of asymptomatic microhematuria in adults, AUA recommends that an appropriate renal or urologic evaluation be performed in all patients with asymptomatic microscopic hematuria who are at risk for urologic disease or primary renal disease.^[5] Urine dipstick screening in adolescents and adults, at least at all the initial examination has the role of urine dipstick in screening in the prevention of Chronic Kidney Disease.^[7]

Dipstick analysis of urine chemistry in combination with microscopic analysis for RBC count, a dipstick result for hematuria can provide insight and guidance to whether a patient's macroscopically discolored urine may be the result of hematuria, hemoglobinuria, myoglobinuria, pseudo-hematuria.^[8]

CONCLUSION

Urine microscopy is the preferred test used for urine analysis, however, it may not be reliable in unstandardized conditions as the sample has to be sent to the laboratory and delay also reduces the sensitivity of urine microscopy.

The urinary dipstick test performs better in unstandardized conditions, and can be used as a screening test for hematuria, as it is sensitive and, can be performed immediately at any setup, universally available, also faster, and cheaper than other techniques.

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