

Hematuria in the Newborn



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KEYWORDS

• Hematuria • Neonate • Renal function • Thrombosis

KEY POINTS

- Hematuria is uncommon in the healthy newborn, but is more common in premature infants, with incidence increasing as birth weight and gestation decrease.
- The causes of hematuria in the newborn differ from those seen in older children.
- Most causes of microscopic hematuria in the newborn are transient, require no intervention, and have no long-term sequelae.
- Newborn hematuria with concurrent hypertension, flank mass, changes in urine output, or decreased renal function often indicates more significant disease.

INTRODUCTION

Hematuria in the newborn is uncommon, and information about the true incidence of hematuria in infants is scarce. Microscopic and gross hematuria, while rare in healthy newborns, is more common in premature infants, particularly those cared for in the neonatal intensive care unit. Hematuria may be transient, but may require evaluation, investigation, and intervention in a timely manner.

Incidence

Recent studies of the incidence of newborn hematuria do not exist. A retrospective study of infants with gross hematuria over a 17-year period between 1950 and 1967 describes an incidence of 0.21 per 1000 admissions in infants younger than 1 month.¹ Studies of premature infants have shown microscopic hematuria to be more common. The incidence of microscopic hematuria increases with lower birth weight and gestation.^{2,3} Though often transient, microscopic hematuria of longer duration is a cause for concern.

Definition

Gross hematuria is visible blood. Microscopic hematuria is generally defined as greater than 5 red blood cells per high-power field on a spun urine sample. A fresh

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sample is recommended, as a delay increases the risk of red cell hemolysis and, thus, a false-negative result. Urine screening for hematuria is accomplished by dipstick evaluation, and a positive reading suggests the presence of red blood cells, free hemoglobin, or myoglobin. Positive urine dipstick readings for hematuria are based on a peroxidase-like activity of hemoglobin, which catalyzes a reaction resulting in a color change on the reagent strips. Urine dipsticks are exquisitely sensitive and can detect as little as 150 $\mu\text{g/L}$ of free hemoglobin.⁴ A positive dipstick necessitates a microscopic examination to evaluate for the presence of red blood cells.

The microscopic examination of urinary red blood cells can provide a clue to the origin of the hematuria. Red blood cells that maintain normal morphology suggest a lower tract origin. By contrast, red blood cells that transition through the glomerulus are more likely to be dysmorphic because of shearing stresses. Red blood cell casts are highly suggestive of glomerulonephritis.

Gross hematuria in the newborn requires careful evaluation, but the initial assessment focuses on whether the patient truly has hematuria. Urate crystals are common in newborns and give the urine a pink tinge. Such crystals are more common in dehydrated infants and thus are often seen in breast-fed infants. Less commonly in newborns, urine may appear pink, red, or brown as a result of porphyrins or medications (rifampin, chloroquine, and nitrofurantoin). The dipstick will be negative for blood. Vaginal bleeding in newborn females can also be confused for hematuria. Skin breakdown from diaper dermatitis can cause urine to appear red in the diaper, as can rectal bleeding and blood from a recent circumcision.

Etiology

There are a variety of different causes of hematuria in children (**Box 1**). True gross hematuria in a newborn should be evaluated promptly because several causes are associated with renal injury, including thrombotic events, infections, acute tubular or cortical necrosis, and glomerulonephritis.

History

The history in the newborn with hematuria should include prenatal history, family and maternal health history, birth events, and postnatal medical events and interventions. **Box 2** summarizes important inquiries. Hematuria is more common in premature, small for gestational age, and hospitalized infants.^{2,3} In the hospitalized infant it is important to review the medical record for risk factors such as procedures (umbilical lines or bladder catheterization), acute events (sepsis, necrotizing enterocolitis, or hypotensive episodes), recent medications, and nutrition.

Physical Examination

The physical examination should investigate other possible sources of bleeding, including the perineum, rectum, vagina, and circumcision. Elevated temperature suggests infection such as urinary tract infection (UTI). Elevated blood pressure suggests kidney involvement and is particularly worrisome, as it can be due to thrombosis, cortical necrosis, and mass effect, all of which require urgent intervention. Infants with autosomal recessive polycystic kidney disease (ARPKD) are particularly prone to hypertension. Hypotension may indicate infection or cardiac dysfunction.

Edema and hematuria are seen in patients with glomerulonephritis. A murmur may indicate glomerulonephritis secondary to endocarditis. Flank masses or a distended abdomen may be secondary to enlarged kidneys from obstructive uropathy, ARPKD, or renal artery or vein thrombosis. Findings in a patient with a bleeding disorder may include petechiae, bruising, or bleeding from the umbilical stump.

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