

URINARY TRACT INFECTIONS

- ✓ **Epidemiology**
- ✓ **Etiology**
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- ✓ **Risk factors of UTI**
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- ✓ **investigations**
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- ✓ **Treatment**
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URINALYSIS

Name: _____ Date: _____

Appearance: _____ Blood: _____

Color: _____ Bilirubin: _____

Protein: _____ Ketones: _____

Spec Grav: _____ Glucose: _____

Sediment: _____ Urobilinogen: _____

Bacteria: _____ RBC: _____

WBC: _____ Crystals: _____

Casts: _____ Epithelium: _____

pH: _____ Notes: _____

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- UTI are the most common genitourinary disease of childhood.
- The prevalence of UTI at all ages is 1-3% of girls and 1% of boys.
- Below 1 yr. male: female ratio is \approx 4:1 especially among uncircumcised males, but after 1 yr. there is striking female preponderance with ratio 1:10.

Etiology:

UTI is mainly caused by colonic bacteria e.g. **E coli**, followed by **Klebsiella and Proteus**. Infrequently it caused by Staphylococcus saprophyticus and enterococcus as well as to viral infection e.g. adenovirus

Pathology:

Virtually all UTIs are **ascending infections**. The bacteria arise from the fecal flora and enter the bladder via urethra.

- Rarely, in some neonates, renal infection may occur by hematogenous spread.

Risk factors of UTI include:

- Female gender
- Uncircumcised male
- Vesicoureteral reflux
- Obstructive uropathy
- Voiding dysfunction
- Neuropathic bladder
- Pinworm infestation
- Constipation
- Bubble bath
- Toilet training
- Urethral instrumentation
- Bacteria with P fimbriae
- Anatomic abnormality (labial adhesion)
- Tight clothing
- Wiping from back to front in females
- Sexual activity & Pregnancy

Clinical manifestations:

The symptoms and signs of UTI vary with age:

- **NEONATE :**

commonly presents with FTT, feeding problem, diarrhea, vomiting, fever, hyperbilirubinemia

- **1MONTH-2 YEAR INFANT :**

usually has non urinary tract manifestations such as feeding problems, FTT, diarrhea, unexplained fever. This age group also presents with gastrointestinal illness such as colic, irritability, screaming periods.

- **2-6 YEARS OLD CHILD :**

may have GIT symptoms and classic signs of UTI such as urgency, dysuria, frequency and abdominal pain.

- **6-18 YEARS :**

most commonly will have urgency, frequency, abdominal or flank pain.

There are 3 main types of UTI:

1. ***Asymptomatic Bacteriuria*** :refers to a condition that results in a positive urine culture without any manifestations of infection. It is most common in girls.

2. ***Cystitis (infection of bladder-lower UTI)*** : dysuria, urgency, frequency, suprapubic pain, incontinence, and malodorous urine. It **does not** cause fever or renal injury.

3. ***Pyelonephritis (upper UTI)***: is clinically manifested as abdominal or flank pain, fever, malaise, nausea, vomiting, and occasionally diarrhea.

Complications:

Chronic recurrent UTI → renal scarring →
chronic hypertension & renal insufficiency.

Investigations:

- UTI may be suspected based on symptoms, urinalysis, and urine culture;
- *A-There are several ways to obtain a urine sample:-*
- In toilet-trained children, a midstream urine sample usually is satisfactory; the area should be cleaned before obtaining the specimen.

- Children who are not toilet trained, a catheterized or suprapubic urine sample should be obtained.

Prompt plating of the urine sample for culture is important, because if the urine sits at room temperature for more than 60 min, overgrowth of a minor contaminant can suggest a UTI when the urine might not be infected. Refrigeration is a reliable method of storing the urine until it can be cultured. However, skin contamination is a concern.

- *Pyuria (leukocytes on urine microscopy)* suggests infection, but infection can occur in the absence of pyuria; this finding is more confirmatory than diagnostic.
- *Nitrites and leukocyte esterase* usually are positive in infected urine.
- *Microscopic hematuria* is common in acute cystitis, but microhematuria alone does not suggest UTI

Table 1. Urinalysis Results

Test	Usual Range	Indicators of Infection	Accuracy
Bacteria	Absent	Any amount	Low sensitivity, ^a high specificity ^b
Leukocyte esterase	Absent	Positive = pyuria, presence of WBCs in urine	High sensitivity, low specificity
WBC	<5	Pyuria: WBC >10	High sensitivity, low specificity
Nitrite	Absent	Positive = presence of bacteria that reduce nitrate	Low sensitivity, high specificity
RBC	<5	Hematuria common in infection	Low sensitivity, high specificity
Epithelial cells	<5	<5 = good urine sample	High epithelial cells indicate contamination with skin flora
pH	4.5-8	pH ↑ if urea-splitting organism (e.g., <i>Proteus mirabilis</i>) is present	Low specificity (there are many other causes of alkaline urine)

^a Sensitivity = likelihood of positive test when disease is present.

^b Specificity = likelihood of negative test when disease is not present.

Source: Reference 1.

Sterile pyuria (positive leukocytes, negative culture) may occur in:

- partially treated bacterial UTIs
- viral infections
- renal tuberculosis
- renal abscess
- urinary obstruction
- inflammation near the ureter or bladder
eg.appendicitis

Urine culture

If the culture (**suprapubic or catheter sample**) shows **>50,000** colonies of a single pathogen regardless of symptoms, or if there are **10,000** colonies with symptoms, the child is considered to have a UTI.

In (**bag sample**), if the urinalysis result is positive, the patient is symptomatic, and there is a single organism cultured with a colony count **>100.000** there is a presumed UTI

B- **CBP** in upper UTI, there is leukocytosis (neutrophilia), ↑ ESR & CRP

C- **blood cultures** should be drawn before starting antibiotics if possible as sepsis is common in pyelonephritis, particularly in infants and any child with obstructive uropathy

D- **Imaging studies** are used to identify the anatomical abnormalities, these include:-

1. Ultrasound of kidney

is indicated **initially for all infants** with UTI to exclude obstruction and determine the size of the kidney, rule out hydronephrosis, renal abscess esp. when the child is very ill or toxic or there is poor response to AB or when s. creatinine is elevated.

2. VCUG

is indicated if the U/S study is abnormal or after a recurrent febrile UTI. The timing of VCUG 2-6 wk. after treatment (to allow inflammation in bladder to resolve to reduce the incidence of VUR).

3.IV pyelography to evaluate kidney size ;calyceal blunting ,urethral dilatation.

4.Renal scanning using DMSA (di-mercapto-succenic acid) is used to detect renal scars that usually develop after severe or recurrent upper UTI.

5.CT scan can also detect renal scars.

Treatment:

- Acute **cystitis** should be treated promptly to prevent progression to pyelonephritis

A course of **trimethoprim-sulfamethoxazole (TMP-SMX)** or **trimethoprim** 8 mg/kg /day. (3-5 day) is effective against many strains of E. coli.

Nitrofurantoin (5-7 mg/ kg/24 hr. in 3-4 divided doses) has the advantage of being active against *Klebsiella* and *Enterobacter* organisms.

Amoxicillin (50 mg/kg/24 hr.) also is effective as initial treatment but has a high rate of bacterial resistance.

- In acute febrile infections suggesting clinical **pyelonephritis, a 7-14 day** course of broad-spectrum antibiotics is preferable.
- ❖ **Children should be admitted to the hospital for IV rehydration and IV antibiotic therapy are:**
 1. Dehydrated
 2. Vomiting and unable to drink fluids
 3. 1 mo. Of age or younger
 4. Have complicated infection whom urosepsis is a possibility

Parenteral treatment with

- ceftriaxone (50-75 mg/kg/24 hr. not to exceed 2 g) or
- cefotaxime (100 mg/kg/24 hr.)or
- ampicillin (100 mg/ kg/24 hr.) with an aminoglycoside such as gentamicin (3-5 mg/kg/24 hr. in 1-3 divided doses) is preferable.

Treatment with aminoglycosides is particularly effective against *Pseudomonas* spp .

- Oral third-generation cephalosporins such as **cefixime** are as effective as parenteral ceftriaxone against a variety of Gram-ve organisms other than Pseudomonas, and these medications are considered to be the treatment of choice for oral outpatient therapy.

- The **oral fluoroquinolone ciprofloxacin** is an alternative agent for resistant microorganisms, particularly *Pseudomonas*, in patients older than age 17 yr.
- In some children with a febrile UTI, **intramuscular injection of a loading dose of ceftriaxone followed by oral therapy with a third-generation cephalosporin is effective**
- A urine culture 1 wk. after the termination of treatment of a UTI ensures that the urine is sterile

- Urologic conditions for recurrent UTIs that might benefit from long-term prophylaxis include

- ✓ Neuropathic bladder

- ✓ Urinary tract anomalies

- ✓ Cat

- ✓ Cranberry juice

- ✓ Probiotic therapy

- Antibiotics

There is interest in probiotic therapy, which replaces pathologic urogenital flora, and cranberry juice, which prevents bacterial adhesion and biofilm formation, but these agents have not proved beneficial in preventing UTI in children

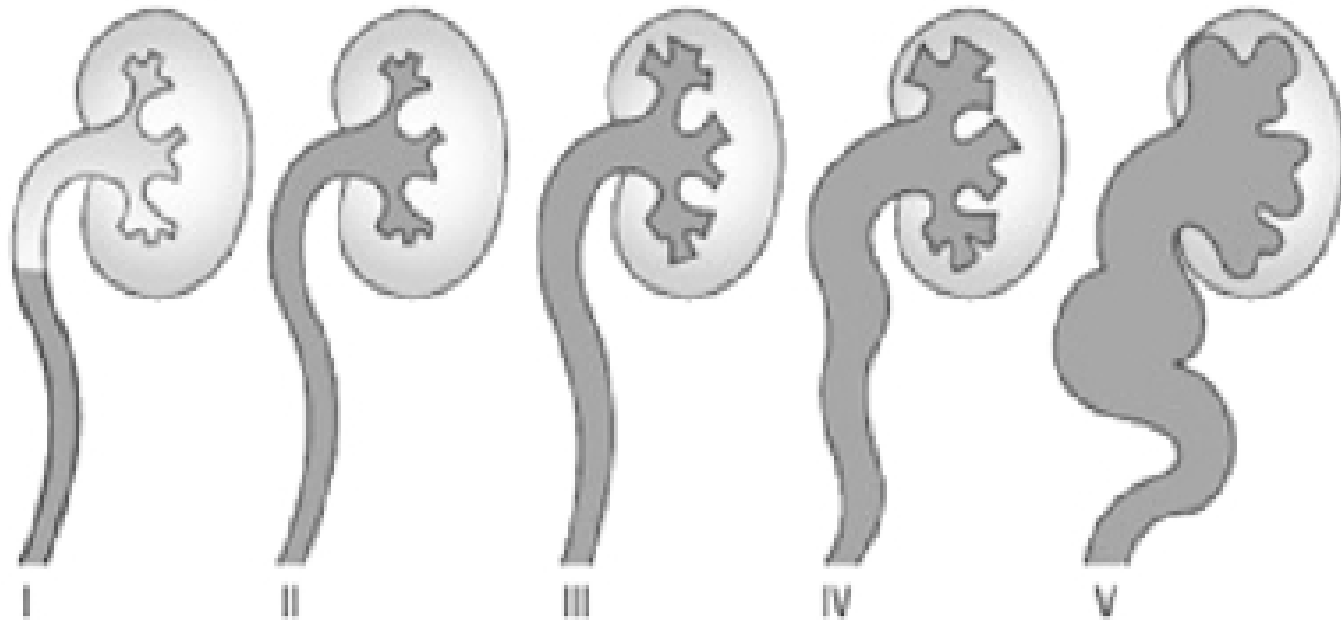
trimethoprim-sulfamethoxazole (TMP-SMZ), amoxicillin, or cephalexin can also be effective

Vesico ureteral reflux:

- VUR is a condition in which urine flows from the bladder into the ureters/kidneys.
- Most children with VUR are asymptomatic
- Reflux increases risk of urinary tract infection or acute pyelonephritis, so testing for reflux may be performed after a child has one or more infections.
- May be congenital or acquired like in Posterior urethral valves; urethral or meatal stenosis, bladder instability, neurogenic bladder . UTI may cause reflux due to the elevated pressures associated with inflammation.

International Classification of Vesicoureteral Reflex

a



b

Grade	Description
I	Into a nondilated ureter
II	Into the pelvis and calyces without dilatation
III	Mild to moderate dilatation of the ureter, renal pelvis, and calyces with minimal blunting of the fornices
IV	Moderate ureteral tortuosity and dilatation of the pelvis and calyces
V	Gross dilatation of the ureter, pelvis, and calyces; loss of papillary impressions; and ureteral tortuosity

Treatment:

85% of grade I & II cases of VUR will resolve spontaneously. 50% of grade III cases and a lower percentage of higher grades will also resolve spontaneously

- The goal of treatment is to minimize infections by prophylactic antibiotics, as it is infections that cause renal scarring and not the vesicoureteral reflux
- When medical management fails to prevent recurrent UTI, or if the kidneys show progressive renal scarring then surgical interventions may be necessary
- Medical management is recommended in children with Grade I-III VUR. A trial of medical treatment is indicated in patients with Grade IV VUR . Of the patients with Grade V VUR surgery is the only option .



THANK YOU