

## Urinary Tract Infection

Urinary tract infections (UTIs) are caused by bacteria that invade the urinary system and multiply, leading to an infection. UTIs are very common; approximately eight to ten million people seek professional medical assistance annually for this disease. Women are affected more than men, although men and children can get UTIs. Approximately one woman in five will have a urinary tract infection in her lifetime.

Most infections are not serious and can be easily treated with antibiotics. However, if left untreated, some infections can result in kidney damage and even death. This is why it is so important to seek appropriate medical treatment if a UTI is suspected.

## Anatomy and Function

The urinary tract is made up of the kidneys, two ureters, the bladder, and urethra. The major components are the kidneys, a pair of bean-shaped organs located below the ribs near the middle of one's back. The kidneys comprise a complex filtration system made up of individual nephrons that work together to remove waste products from the blood, which are eliminated from the body in the form of urine. The kidneys also function to maintain a stable balance of salts and other substances in the blood, as well as to produce a hormone erythropoietin, which triggers the production of red blood cells in the bone marrow.

The ureters are tube-like structures that transport the urine from the kidneys to the bladder where the urine is stored. Muscles called sphincters tighten around the urethra to prevent urine from leaking out. There are two sphincters: the internal is not controlled consciously, while the external sphincter is under voluntary control. The bladder is elastic and expands as it fills with urine. When the bladder reaches a certain capacity, which differs for each individual, the brain sends impulses to the internal sphincter to relax and other impulses to a muscle called the detrusor to contract and expel the urine out the urethra. This process is under the voluntary control of the individual, who can hold the urine until social circumstances allow for urination. (Loss of this control is urinary incontinence.)

Urine is normally "sterile," meaning that it usually contains no bacteria. The body accomplishes this through several methods. First, the two sphincter muscles that prevent urine leaking from the bladder to the urethra, also prevent the bacteria that normally colonize the skin from ascending through the meatus (the opening in the urethra) into the bladder. Second, the length of the urethra makes it difficult for bacteria to get to the bladder. The fact that women have a much shorter urethra than men accounts for the five-fold increase of UTIs among women compared to men. Finally, if bacteria do make it to the bladder, the body is equipped with valves where the ureters empty into the bladder, a region known as the trigone. These valves prevent the "reflux" of urine, and any bacteria present, back up into the kidneys. Further, the bladder almost completely empties when urination occurs, so that any bacteria present should be

excreted as well. Nevertheless, despite all these defense mechanisms, infections sometimes occur.

## Causes and Risks

There are three types of urinary tract infections:

- \* Urethritis — is infection of the urethra.
- \* Cystitis — is infection of the bladder.
- \* Pyelonephritis — is infection of the kidneys.

UTIs are often categorized as simple (uncomplicated) or complicated. Simple UTIs are infections that occur in normal urinary tracts. Complicated UTIs occur in abnormal urinary tracts or when the bacteria causing the infection is resistant to many antibiotic medications.

Large numbers of bacteria live on the skin and around the rectal area. Bacteria may get into the urine from the urethra and travel into the bladder. It may even travel up to the kidney. But no matter how far it goes, bacteria in the urinary tract can cause problems. The factors associated with an increased risk of UTI include:

- \* Females (Short urethra providing bacteria easier access to urinary tract)
- \* Postmenopausal Women (Loss of protective effects of estrogen on vaginal lining)
- \* Sexual Intercourse
- \* Diaphragm or Condom/Spermicidal Foam Use
- \* Urinary Tract Instrumentation (Urinary catheter, cystoscopy etc.)
- \* Urinary Tract Abnormality or Obstruction (Neurogenic bladder, prostate enlargement etc.)
- \* Anatomical Abnormalities (Ureteropelvic junction obstruction, bladder diverticuli etc.)
- \* Other Illnesses and Disorders (Diabetes, spinal cord injury etc.)

## Symptoms

Symptoms associated with lower urinary tract infection include abdominal pain, urinary frequency, urgency, burning, and sensation of incomplete bladder emptying. In addition, the urine may be cloudy and have an unpleasant odor.

Kidney infections often cause fevers and back pain. These infections need to be treated promptly because a kidney infection can quickly spread into the bloodstream and cause a life-threatening condition.

## Diagnosis

The evaluation of a suspected UTI involves a detailed history and physical exam. The urine will be examined for the presence of white blood cells (pyuria), red blood cells (hematuria) and bacteria (bacteriuria). If a UTI is suspected, the urine is cultured to

determine what type of bacteria is growing and which antibiotics will be effective in killing it (sensitivity test).

If infection recurs, diagnostic studies of the urinary tract should be considered to rule out defects that may cause the infection e.g. kidney stones; diverticula, small pockets that bulge out of the bladder or urethra and contain urine; a narrowing of one of the tubes of the urinary tract; or a cystocele, a condition in women where the structures that support the bladder weaken and allow the bladder to protrude into the vagina.

## Treatment

UTIs are treated with antibacterial drugs. The type of drug used and the duration of treatment depend on the type of bacteria and severity of infection.

Infections complicated by urinary obstruction (e.g., kidney stone, BPH) and other risk factors (e.g., spinal cord injury) may require surgery to correct the cause of UTI. Kidney infections may require hospitalization and as many as 6 weeks of antibiotic treatment to prevent serious kidney damage.

Follow up urinalysis and urine culture is performed after treatment to make sure that the urinary tract is bacteria free.