Urinary tract infection - From Wikipedia, the free encyclopedia - Jan 1, 2014

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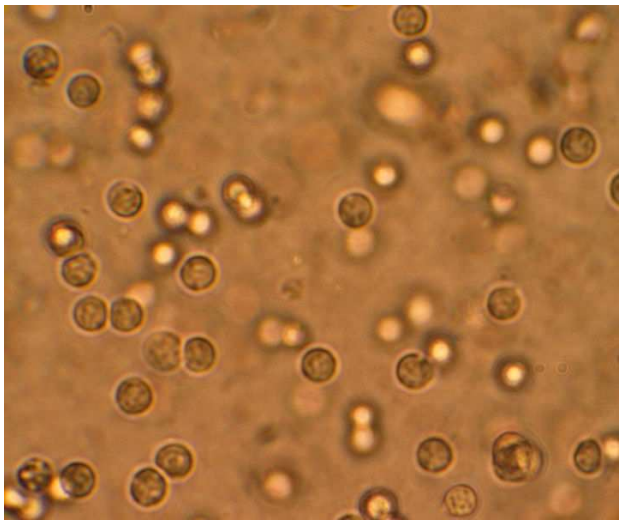
A urinary tract infection (UTI) (also known as acute cystitis or bladder infection) is an infection that affects part of the urinary tract. When it affects the lower urinary tract it is known as a simple cystitis (a bladder infection) and when it affects the upper urinary tract it is known as pyelonephritis (a kidney infection). Symptoms from a lower urinary tract include painful urination and either frequent urination or urge to urinate (or both), while those of pyelonephritis include fever and flank pain in addition to the symptoms of a lower UTI. In the elderly and the very young, symptoms may be vague or non specific. The main causal agent of both types is Escherichia coli, however other bacteria, viruses or fungi may rarely be the cause.



Multiple white cells seen in the urine of a person with a urinary tract infection via microscopy

Urinary tract infections occur more commonly in women than men, with half of women having at least one infection at some point in their lives. Recurrences are common. Risk factors include female anatomy, sexual intercourse and family history. Pyelonephritis, if it occurs, usually follows a bladder infection but may also result from a blood borne infection. Diagnosis in young healthy women can be based on symptoms alone. In those with vague symptoms, diagnosis can be difficult because bacteria may be present without there being an infection. In complicated cases or if treatment has failed, a urine culture may be useful. In those with frequent infections, low dose antibiotics may be taken as a preventative measure.

In uncomplicated cases, urinary tract infections are easily treated with a short course of antibiotics, although resistance to many of the antibiotics used to treat this condition is increasing. In complicated cases, longer course or intravenous antibiotics may be needed, and if symptoms have not improved in two or three days, further diagnostic testing is needed. In women, urinary tract infections are the most common form of bacterial infection with 10% developing urinary tract infections yearly.

Signs and symptoms

Lower urinary tract infection is also referred to as a bladder infection. The most common symptoms are burning with urination and having to urinate frequently (or an urge to urinate) in the absence of vaginal discharge and significant pain.[1] These symptoms may vary from mild to severe[2] and in healthy women last an average of six days.[3] Some pain above the pubic bone or in the lower back may be present. People experiencing an upper urinary tract infection, or pyelonephritis, may experience flank pain, fever, or nausea and vomiting in addition to the classic symptoms of a lower urinary tract infection.[2] Rarely the urine may appear bloody[4] or contain visible pyuria (pus in the urine).[5]

Children

In young children, the only symptom of a urinary tract infection (UTI) may be a fever. Because of the lack of more obvious symptoms, when females under the age of two or uncircumcised males less than a year exhibit a fever, a culture of the urine is recommended by many medical associations. Infants may feed poorly, vomit, sleep more, or show signs of jaundice. In older children, new onset urinary incontinence (loss of bladder control) may occur.[6]

Elderly

Urinary tract symptoms are frequently lacking in the elderly.[7] The presentations may be vague with incontinence, a change in mental status, or fatigue as the only symptoms,[2] while some present to a health care provider with sepsis, an infection of the blood, as the first symptoms.[4] Diagnosis can be complicated by the fact that many elderly people have preexisting incontinence or dementia.[7]

Cause
E. coli is the cause of 80–85% of urinary tract infections, with Staphylococcus saprophyticus being the cause in 5–10%.[1] Rarely they may be due to viral or fungal infections.[8] Other bacterial causes include: Klebsiella, Proteus, Pseudomonas, and Enterobacter. These are uncommon and typically related to abnormalities of the urinary system or urinary catheterization.[4] Urinary tract infections due to Staphylococcus aureus typically occur secondary to blood-borne infections.[2]

Sex
In young sexually active women, sexual activity is the cause of 75–90% of bladder infections, with the risk of infection related to the frequency of sex.[1] The term "honeymoon cystitis" has been applied to this phenomenon of frequent UTIs during early marriage. In post-menopausal women, sexual activity does not affect the risk of developing a UTI. Spermicide use, independent of sexual frequency, increases the risk of UTIs.[1]

Women are more prone to UTIs than men because, in females, the urethra is much shorter and closer to the anus.[9] As a woman's estrogen levels decrease with menopause, her risk of urinary tract infections increases due to the loss of protective vaginal flora.[9]

Urinary catheters
Urinary catheterization increases the risk for urinary tract infections. The risk of bacteriuria (bacteria in the urine) is between three to six percent per day and prophylactic antibiotics are not effective in decreasing symptomatic infections.[9] The risk of an associated infection can be decreased by catheterizing only when necessary, using aseptic technique for insertion, and maintaining unobstructed closed drainage of the catheter.[10][11][12]

Male scuba divers utilizing condom catheters or the female divers utilizing She-p external catching device for their dry suits are also susceptible to urinary tract infections.[13][14]

Others
A predisposition for bladder infections may run in families. Other risk factors include diabetes,[1] being uncircumcised, and having a large prostate.[2] Complicating factors are rather vague and include predisposing anatomic, functional, or metabolic abnormalities.[15] In children UTIs are associated with vesicoureteral reflux (an abnormal movement of urine from the bladder into ureters or kidneys) and constipation.[6]

Persons with spinal cord injury are at increased risk for urinary tract infection in part because of chronic use of catheter, and in part because of voiding dysfunction.[16] It is the most common cause of infection in this population, as well as the most common cause of hospitalization.[16] Additionally, use of cranberry juice or cranberry supplement appears to be ineffective in prevention and treatment in this population.[17]

Pathogenesis
The bacteria that cause urinary tract infections typically enter the bladder via the urethra. However, infection may also occur via the blood or lymph. It is believed that the bacteria are usually transmitted to the urethra from the bowel, with females at greater risk due to their anatomy. After gaining entry to the bladder, E. Coli are able to attach to the bladder wall and form a biofilm that resists the body's immune response.[4]

Diagnosis
In straightforward cases, a diagnosis may be made and treatment given based on symptoms alone without further laboratory confirmation. In complicated or questionable cases, it may be useful to confirm the diagnosis via urinalysis, looking for the presence of urinary nitrites, white blood cells (leukocytes), or leukocyte esterase. Another test, urine microscopy, looks for the presence of red blood cells, white blood cells, or bacteria. Urine culture is deemed positive if it shows a bacterial colony count of greater than or equal to 103 colony-forming units per mL of a typical urinary tract organism. Antibiotic sensitivity can also be tested with these cultures, making them useful in the selection of antibiotic treatment. However, women with negative cultures may still improve with antibiotic treatment.[1] As symptoms can be vague and without reliable tests for urinary tract infections, diagnosis can be difficult in the elderly.[7]

Classification
A urinary tract infection may involve only the lower urinary tract, in which case it is known as a bladder infection. Alternatively, it may involve the upper urinary tract, in which case it is known as pyelonephritis. If the urine contains significant bacteria but there are no symptoms, the condition is known as asymptomatic bacteriuria.[2] If a urinary tract infection involves the upper tract, and the person has diabetes mellitus, is pregnant, is male, or immunocompromised, it is considered complicated.[3][4] Otherwise if a woman is healthy and premenopausal it is considered uncomplicated.[3] In children when a urinary tract infection is associated with a fever, it is deemed to be an upper urinary tract infection.[6]

Children
To make the diagnosis of a urinary tract infection in children, a positive urinary culture is required. Contamination poses a frequent challenge depending on the method of collection used, thus a cutoff of 105 CFU/mL is used for a "clean-catch" mid stream sample, 104 CFU/mL is used for catheter-obtained specimens, and 102 CFU/mL is used for suprapubic aspirations (a sample drawn directly from the bladder with a needle). The use of "urine bags" to collect samples is discouraged by the World Health Organization due to the high rate of contamination when cultured, and catheterization is preferred in those not toilet trained. Some, such as the American Academy of Pediatrics recommends renal ultrasound and voiding cystourethrogram (watching a person's urethra and urinary bladder with real time x-rays while they urinate) in all children less than two year old who have had a urinary tract infection. However, because there is a lack of effective treatment if problems are found, others such as the National Institute for Clinical Excellence only recommends routine imaging in those less than six month old or who have unusual findings.[6]

Differential diagnosis
In women with cervicitis (inflammation of the cervix) or vaginitis (inflammation of the vagina) and in young men with UTI symptoms, a Chlamydia trachomatis or Neisseria gonorrheae infection may be the cause.[2][18] Vaginitis may also be due to a yeast infection.[19] Interstitial cystitis (chronic pain in the bladder) may be considered for people who experience multiple episodes of UTI symptoms but urine cultures remain negative and not improved with antibiotics.[20] Prostatitis (inflammation of the prostate) may also be considered in the differential diagnosis.[21]

Hemorrhagic cystitis, characterized by blood in the urine, can occur secondary to a number of causes including: infections, radiation therapy, underlying cancer, medications and toxins.[22] Medications that commonly cause this problem include the chemotherapeutic agent cyclophosphamide with rates of 2 to 40%.[22] Eosinophilic cystitis is a rare condition where eosinophiles are present in the bladder wall.[23] Signs and symptoms are similar to a bladder infection.[23] Its cause is not entirely clear; however, may be linked to food allergies, infections, and medications among others.[24]

Prevention
A number of measures have not been confirmed to affect UTI frequency including: urinating immediately after intercourse, the type of underwear used, personal hygiene methods used after urinating or defecating, or whether a person typically bathes or showers.[1] There is similarly a lack of evidence surrounding the effect of holding one's urine, tampon use, and douching.[9] In those with frequent urinary tract infections who use spermicide or a diaphragm as a method of contraception, they are advised to use alternative methods.[4] Condom use without spermicide or use of birth control pills does not increase the risk of uncomplicated urinated tract infection.[25][1]

Medications
For those with recurrent infections, a prolonged course of daily antibiotics is effective.[1] Medications frequently used include nitrofurantoin and trimethoprim/sulfamethoxazole.[4] Methenamine is another agent frequently used for this purpose as in the bladder where the acidity is low it produces formaldehyde to which resistance does not develop.[26] In cases where infections are related to intercourse, taking antibiotics afterwards may be useful.[4] In post-menopausal women, topical vaginal estrogen has been found to reduce recurrence. As opposed to topical creams, the use of vaginal estrogen from pessaries has not been as useful as low dose antibiotics.[27] Antibiotics following short term urinary catheterization decreases the subsequent risk of a bladder infection.[28] A number of vaccines are in development as of 2011.[4]

Children
The evidence that preventative antibiotics decrease urinary tract infections in children is poor.[29] However recurrent UTIs are a rare cause of further kidney problems if there are no underlying abnormalities of the kidneys, resulting in less

than a third of a percent (0.33%) of chronic kidney disease in adults.[30] Whether routine circumcisions prevents UTIs has not been well studied as of 2011.[31]

Alternative medicine
Some research suggests that cranberry (juice or capsules) may decrease the number of UTIs in those with frequent infections.[32][33] A Cochrane review concluded that the benefit, if it exists, is small.[34] Long-term tolerance is also an issue[35] with gastrointestinal upset occurring in more than 30%.[36] Cranberry juice is thus not currently recommended for this indication.[34] As of 2011, intravaginal probiotics require further study to determine if they are beneficial.[4]

Treatment
The mainstay of treatment is antibiotics. Phenazopyridine is occasionally prescribed during the first few days in addition to antibiotics to help with the burning and urgency sometimes felt during a bladder infection.[37] However, it is not routinely recommended due to safety concerns with its use, specifically an elevated risk of methemoglobinemia (higher than normal level of methemoglobin in the blood).[38] Acetaminophen (paracetamol) may be used for fevers.[39]

Women with recurrent simple UTIs may benefit from self-treatment upon occurrence of symptoms with medical follow-up only if the initial treatment fails. A prescription for antibiotics can be delivered to a pharmacist by phone.[1] A complicated UTI is more difficult to treat and usually requires more aggressive evaluation, treatment and follow-up.[40]

Uncomplicated
Uncomplicated infections can be diagnosed and treated based on symptoms alone.[1] Oral antibiotics such as trimethoprim/sulfamethoxazole (TMP/SMX), cephalosporins, nitrofurantoin, or a fluoroquinolone substantially shorten the time to recovery with all being equally effective.[41] A three-day treatment with trimethoprim, TMP/SMX, or a fluoroquinolone is usually sufficient, whereas nitrofurantoin requires 5–7 days.[1][42] With treatment, symptoms should improve within 36 hours.[3] About 50% of people will recover without treatment within a few days or weeks.[1] The Infectious Diseases Society of America does not recommend fluoroquinolones as first treatment due to the concern of generating resistance to this class of medication.[42] Amoxicillin-clavulanate appears less effective than other options.[43] Despite this precaution, some resistance has developed to all of these medications related to their widespread use.[1] Trimethoprim alone is deemed to be equivalent to TMP/SMX in some countries.[42] For simple UTIs, children often respond to a three-day course of antibiotics.[44]

Pyelonephritis
Pyelonephritis is treated more aggressively than a simple bladder infection using either a longer course of oral antibiotics or intravenous antibiotics.[45] Seven days of the oral fluoroquinolone ciprofloxacin is typically used in areas where the resistance rate is less than 10%. If the local resistance rates are greater than 10%, a dose of intravenous ceftriaxone is often prescribed.[45] Trimethoprim/sulfamethoxazole or amoxicillin/clavulanate orally for 14 days is another reasonable option.[46] In those who exhibit more severe symptoms, admission to a hospital for ongoing antibiotics may be needed.[45] Complications such as urinary obstruction from a kidney stone may be considered if symptoms do not improve following two or three days of treatment.[2][45]

Epidemiology
Urinary tract infections are the most frequent bacterial infection in women.[3] They occur most frequently between the ages of 16 and 35 years, with 10% of women getting an infection yearly and 60% having an infection at some point in their lives.[1][4] Recurrences are common, with nearly half of people getting a second infection within a year. Urinary tract infections occur four times more frequently in females than males.[4] Pyelonephritis occurs between 20–30 times less frequently.[1] They are the most common cause of hospital acquired infections accounting for approximately 40%.[47] Rates of asymptomatic bacteria in the urine increase with age from two to seven percent in women of child bearing age to as high as 50% in elderly women in care homes.[9] Rates of asymptomatic bacteria in the urine among men over 75 are between 7-10%.[7]

Urinary tract infections may affect 10% of people during childhood.[4] Among children urinary tract infections are the most common in uncircumcised males less than three months of age, followed by females less than one year.[6] Estimates of frequency among children however vary widely. In a group of children with a fever, ranging in age between birth and two years, two to 20% were diagnosed with a UTI.[6]

Society and culture
In the United States, urinary tract infections account for nearly seven million office visits, a million emergency department visits, and one hundred thousand hospitalizations every year.[4] The cost of these infections is significant both in terms of lost time at work and costs of medical care. In the United States the direct cost of treatment is estimated at 1.6 billion USD yearly.[47]

History
Urinary tract infections have been described since ancient times with the first documented description in the Ebers Papyrus dated to c. 1550 BC.[48] It was described by the Egyptians as "sending forth heat from the bladder".[49] Effective treatment did not occur until the development and availability of antibiotics in the 1930s before which time herbs, bloodletting and rest were recommended.[48]

Pregnancy
Urinary tract infections are more concerning in pregnancy due to the increased risk of kidney infections. During pregnancy, high progesterone levels elevate the risk of decreased muscle tone of the ureters and bladder, which leads to a greater likelihood of reflux, where urine flows back up the ureters and towards the kidneys. While pregnant women do not have an increased risk of asymptomatic bacteriuria, if bacteriuria is present they do have a 25-40% risk of a kidney infection.[9] Thus if urine testing shows signs of an infection—even in the absence of symptoms—treatment is recommended. Cephalexin or nitrofurantoin are typically used because they are generally considered safe in pregnancy.[50] A kidney infection during pregnancy may result in premature birth or pre-eclampsia (a state of high blood pressure and kidney dysfunction during pregnancy that can lead to seizures).[9]

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