

Bacterial cystitis in women

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Bacterial cystitis is a highly prevalent and distressing condition in women but is usually uncomplicated in those who are healthy and not pregnant. Based on symptom assessment and urinalysis, treatment of this condition can generally be managed in primary care.

Bacterial cystitis refers to infection of the bladder (lower urinary tract) and is the most common infection in women. It is estimated that 50% of women will develop cystitis in their life,¹ and it is a frequent cause of presentation to GPs.² The incidence of bacterial cystitis increases with age and is related to sexual activity. It is also common in postmenopausal women.

Bacterial cystitis is usually uncomplicated in otherwise healthy, nonpregnant women. An uncomplicated urinary tract infection is defined as one in which there is no concern that the infection has extended beyond the bladder. Complicated urinary tract infection is defined as an infection associated with fever, suspected or documented pyelonephritis (upper urinary tract infection), sepsis or bacteraemia. Bacterial cystitis can occur alone or in association with pyelonephritis. This article will deal only with lower urinary tract infections in women.

MedicineToday 2018; 19(2): 49-51

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Epidemiology

Among sexually active women, the incidence of cystitis is 0.5 to 0.7 episodes/person/year.³ Cystitis in postmenopausal women occurs with an incidence of 0.07 episodes/person/year.⁴ This incidence is higher in women in residential aged care.

Recurrent cystitis occurs in 12 to 27% of women after their first episode and in 48% of women who have had more than one episode.⁵ Recurrence is more common in postmenopausal women.⁶ Recurrent cystitis may be caused by relapse of the original infection or reinfection with the same or a different strain of pathogen.

Pathogenesis

In bacterial cystitis, the vaginal introitus is first colonised by uropathogens, usually from the lower gastrointestinal tract, after which the pathogens move up the urethra into the bladder. Cystitis in healthy women is rarely explained by underlying functional or anatomical abnormalities of the urinary tract. It is not known why vaginal colonisation progresses to cystitis in some women, whereas in others it never does.

Microbiology

Most women (75 to 95%) develop cystitis as a result of *Escherichia coli* infection, with infections occasionally caused by other species of gut organisms, such as *Proteus mirabilis* and *Klebsiella pneumoniae*, or other bacteria such as *Staphylococcus saprophyticus*.^{7,8}

The bacteriological finding of lactobacilli, enterococci, group B streptococci and coagulase-negative staphylococci is usually caused by a poorly collected, contaminated specimen.⁹ However, it may be reasonable to consider such organisms as a cause of cystitis if they are found in urine with high counts and with pure growth.

Antibiotic resistance is common in patients with complicated cystitis who have obstructive renal disease, functional abnormalities, foreign bodies, diabetes, pregnancy, renal failure or immunosuppression, or who are in hospital.

Risk factors

Previous recurrent cystitis is a strong risk factor. Sexual intercourse and diaphragm use have been clearly linked to a predisposition for women to develop cystitis. Sexual intercourse brings about cystitis through the mechanical effect of introducing bacteria into the urinary tract, and it may also cause trauma.³

The use of beta-lactam antibiotics facilitates colonisation by *E. coli* by altering the vaginal flora. Oestrogen deficiency in postmenopausal women increases the risk of cystitis. It has been shown that oestrogen therapy, by normalising the vaginal flora, reduces the risk of urinary tract infection.^{10,11}

Urogenital surgery, incontinence, the presence of a cystocele and high residual volume after voiding are also predisposing factors, especially in postmenopausal women.

Symptoms

Dysuria, frequency and urgency of micturition, suprapubic pain and haematuria are classic symptoms of cystitis. In elderly women, the symptoms can be very subtle. Older women may have nonspecific urinary symptoms (such as dysuria or urinary incontinence), or a general sense of being unwell, that mimic symptoms of cystitis, even when there is no evidence of urinary tract infection.

Diagnosis

A clinical examination should include taking the patient's temperature, looking for suprapubic tenderness and excluding vaginitis and urethritis by performing a pelvic examination.

Urinalysis by microscopy or dipstick is the first line of investigation, followed by a urine culture for bacterial susceptibility. The presence of white cells in the urine is pathognomonic of cystitis. A result greater than 10 leucocytes/mcL is considered abnormal. The presence of haematuria aids the diagnosis, as it is common in the presence of cystitis.

Dipsticks are commercially available

strips that detect the presence of leucocyte esterase and nitrites. The sensitivity of dipsticks is 75% and the specificity is 82%.¹² Because of this relatively low sensitivity and specificity, treatment should not be based on a positive dipstick test result alone.

Urine culture is the gold standard of diagnosis, and treatment can be planned and administered based on its results. With the increasing prevalence of antibiotic resistance, obtaining a urine culture before initiating therapy is advised.

Imaging studies are not routinely needed for cystitis and would only be required if the infection is recurrent.

Differential diagnosis

The symptoms of dysuria, frequency and urgency of urination, suprapubic pain and haematuria may also be caused by vaginitis, urethritis, structural urethral abnormalities, interstitial cystitis and urinary stones. A pelvic examination will confirm a diagnosis of vaginitis and some urethral abnormalities.

Treatment

Before beginning specific antibiotic therapy, general measures of increased fluid intake and urinary analgesics, such as over-the-counter sodium citrotartrate three times daily, may be useful to relieve discomfort caused by severe dysuria. A two-day course of sodium citrotartrate is usually sufficient and allows time for symptom abatement and reduction in inflammation. In fact, dysuria is usually diminished within a few hours after starting therapy. This agent should not be used long term as it may mask clinical symptoms requiring clinical evaluation.

Acute uncomplicated cystitis in premenopausal women can be treated effectively by short-term therapy with appropriate antibiotic agents (Flowchart). The advantage of short-term therapy is that it reduces the development of adverse events. A three-day regimen can be recommended for trimethoprim alone or in combination with a sulfonamide and

for fluoroquinolones with moderately long half-lives, such as ciprofloxacin or norfloxacin. Fosfomycin trometamol may be used as a single-dose treatment but is not listed on the PBS. Nitrofurantoin over a five to seven-day period is highly effective. If beta-lactam antibiotics cannot be used, ciprofloxacin or levofloxacin are reasonable alternatives.¹³

None of the available antibiotics clearly outweighs the others in terms of optimal outcome. The choice should be made based on efficacy, risk of adverse reaction and known resistance rates in the community. Ideally, urine culture and antibiotic susceptibility results should be available before choosing the appropriate antibiotic. Acute cystitis in women has a high spontaneous cure rate; within one week of onset, about 20 to 50% of women become asymptomatic without antibacterial therapy.¹⁴ Empirical therapy is appropriate while awaiting the results of urine culture when symptoms are severe and distressing, such that the patient can not or does not want to wait for the results of the urine culture before beginning treatment. It is important to always follow up the results of the urine culture so that a change in antibiotic regimen can be made if appropriate.

Empirical antibiotic therapy should be initiated promptly in women with complicated cystitis, with subsequent adjustment guided by the antimicrobial susceptibility findings.

Recurrent cystitis

Recurrent cystitis is usually defined as three episodes of documented infection in the previous 12 months or two episodes in the previous six months. It is common in young, healthy women, with one study finding 27% of women developing a second infection within six months of the first, and 2.7% having a second recurrence during this period.⁵

Continuous antibiotic prophylaxis for six to 12 months reduces the rate of recurrence, although there is no

consensus about when to start the treatment or how long it should last. Trimethoprim, trimethoprim–sulfamethoxazole (co-trimoxazole), nitrofurantoin, cefaclor and quinolones all seem equally effective at reducing recurrence rates.¹⁵ Note that authority is required on the PBS for trimethoprim prophylaxis for urinary tract infections. Postcoital antibiotics (taken within two hours of intercourse) reduce the rate of clinical recurrence of cystitis as effectively as continuous treatment.¹⁶

Cranberry products (either juice or capsules) seem to significantly reduce the recurrence of symptomatic cystitis.¹⁷ There is no clear evidence about the amount and concentration of cranberry juice that needs to be consumed or the length of time needed for the treatment to be most effective.

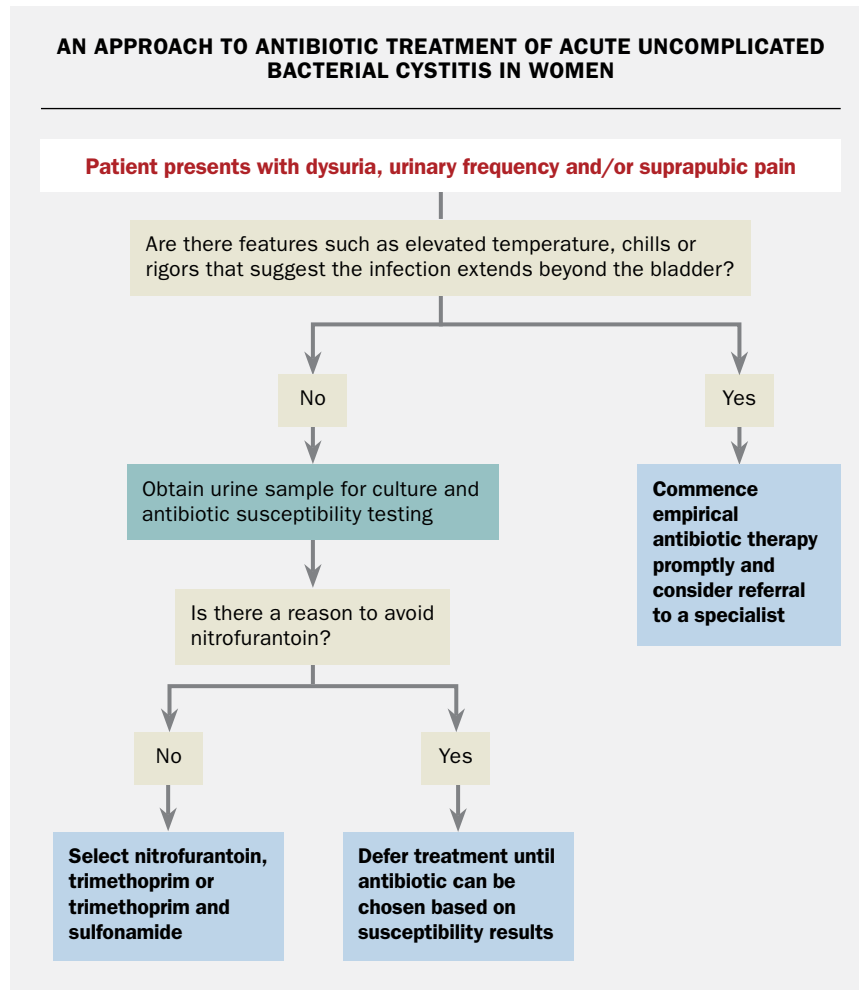
There is no evidence regarding whether passing urine after intercourse is effective at preventing urinary tract infections.¹⁸

Referral to a specialist is rarely required. However, if suspicion arises about complicating factors, such as structural or functional abnormalities of the urinary tract, a referral is appropriate. The isolation of *P. mirabilis* (often associated with the presence of kidney stones) and relapsing infections are examples of situations that may require referral.

Bacterial cystitis in pregnancy

Bacteriuria occurs often in pregnancy, typically during early pregnancy. Without treatment, as many as 30 to 40% of pregnant women with asymptomatic bacteriuria will develop a symptomatic urinary tract infection.¹⁹ Additionally, untreated bacteriuria may be associated with an increased risk of preterm birth, low birthweight and perinatal mortality.

E. coli is the predominant organism found in both asymptomatic bacteriuria and symptomatic urinary tract infections in pregnant women. Screening for asymptomatic bacteriuria is performed at 12 to 16 weeks' gestation with a midstream



urine sample taken for culture.

Management of asymptomatic bacteriuria in pregnant women includes antibiotic therapy tailored to culture results, which reduces the risk of subsequent pyelonephritis and is associated with improved pregnancy outcomes.

After treatment, follow-up cultures are mandatory to confirm sterilisation of the urine. For those women with persistent bacteriuria, prophylactic or suppressive antibiotics may be warranted in addition to retreatment.

Conclusion

Bacterial cystitis is a common and often distressing condition seen frequently in general practice. The most common bacterial cause is *E. coli*, with occasional

P. mirabilis and *K. pneumoniae* infections. Clinical manifestations are dysuria, frequency and urgency of micturition, haematuria and suprapubic pain, and laboratory diagnosis is by urinalysis. Treatment is usually with nitrofurantoin, trimethoprim-sulfamethoxazole, fosfomycin, ciprofloxacin or levofloxacin, but ideally should be based on the results of microbiological examination. Based on simple assessment of symptoms and basic urinalysis, bacterial cystitis can be expeditiously treated. MT

References

A list of references is included in the online version of this article (www.medicinetoday.com.au).

COMPETING INTERESTS: None.

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