



complications. In the United States, the rate of gonorrhea declined in 2009 to a nadir of 98.1 cases per 100,000 people. Much of this was attributed to screening and treatment programs. Since 2009, however, cases of gonorrhea have increased each year to 104.2 cases per 100,000, with more than 300,000 cases reported in 2011.

Most individuals diagnosed with gonorrhea are adolescents or young adults. MSM have also emerged as an important at-risk group. Risk factors for infection include younger age, multiple sexual partners, race or ethnicity, low socioeconomic status, and previous STIs. African Americans and Latinos have significantly higher rates of gonorrhea than whites in the United States.

Pathology

N. gonorrhoeae is a gram-negative bacterium with an outer membrane, peptidoglycan cell wall, and cytoplasmic membrane. Several components contribute to the virulence of the organism. Attachment to columnar epithelial cells is facilitated by pili, which extend from the cell surface and allow entry into the host cell by endocytosis. Organisms without pili are thought to be noninfectious. Gonococci are able to replicate within host epithelial cells and phagocytes. After mucosal infection, immune activation of neutrophils produces significant inflammation and exudate as pus.

Clinical Presentation

Gonorrhea is transmitted during sex with an infected partner. The risk of infection ranges from 20% to 50% per single act of sexual intercourse and increases with multiple acts. The incubation period is 2 to 7 days. When symptomatic, individuals with gonorrhea tend to have more purulent discharge than individuals with nongonococcal urethritis. In men, urethritis is the most common symptom at clinical presentation. Ten percent of men may be asymptomatic. Other manifestations of gonorrhea include epididymitis, proctitis, and pharyngitis. Rare but severe complications include abscesses and urethral strictures.

Between 50% and 80% of women with gonorrhea are asymptomatic. Typical symptoms include those of cervicitis, such as pelvic or adnexal pain, discharge, dysuria, and abnormal bleeding. As in men, gonorrhea can cause proctitis and pharyngitis in women. Most of these infections are asymptomatic. The most common complication of gonorrhea is PID, which occurs in 10% to 40% of women. It may result in severe infection, chronic pelvic pain, and infertility. Infection during pregnancy may lead to complications such as premature labor, rupture of membranes, and spontaneous abortions.

Gonorrhea infection may also be associated with perihepatitis (Fitz-Hugh–Curtis syndrome). In less than 3% of individuals, disseminated gonococcal infection can lead to a classic triad of tenosynovitis (i.e., affecting multiple tendons), dermatitis (i.e., painless, few transient pustular lesions), and polyarthralgias (i.e., nonpurulent forms). Alternatively, individuals with disseminated infection may have purulent arthritis alone. Clinical presentation usually includes fever and other nonspecific systemic symptoms.

Diagnosis and Differential Diagnosis

N. gonorrhoeae is a gram-negative diplococcus that can be visualized easily on Gram stain of purulent material. However, the most

common method of diagnosis is NAAT, which has more than 98% sensitivity. The major disadvantage of NAAT is the inability to evaluate antibiotic susceptibilities. *N. gonorrhoeae* can also be cultured from swab specimens from the rectum, urethra, pharynx, or cervix. Samples often contain many different microorganisms. Selective media such as modified Thayer-Martin media (with vancomycin, colistin, nystatin, and trimethoprim) is used to inhibit growth of indigenous flora. The sensitivity of cultures varies from 65% to 95%. When drug resistance is a concern, cultures should be sent for sensitivity testing.

Treatment

Antibiotic resistance of *N. gonorrhoeae* continues to be a worldwide problem. In the last decade, treatment of gonorrhea has been complicated by a slow and progressive increase in higher minimum inhibitory concentrations (MICs) for commonly used antibiotics, including first-line cephalosporins. The resistance patterns of gonorrhea vary by region.

To address the concern of antibiotic resistance, uncomplicated urogenital gonorrhea should be treated with dual therapy; one agent should be ceftriaxone (250 mg given once intramuscularly) and the other azithromycin (1 g taken once orally). Azithromycin can also treat concurrent chlamydia. Alternatively, doxycycline (100 mg taken orally twice each day for 7 days) may be given instead of azithromycin. High resistance rates (10% to 20%) limit the use of tetracyclines. This regimen is 99% effective in curing gonorrhea. Cefixime (400 mg taken once orally) should be reserved only if there is ceftriaxone resistance. In patients allergic to ceftriaxone, azithromycin monotherapy (2 g taken orally once) may be used cautiously. Gastrointestinal side effects are common with the higher dose of azithromycin.

Other antibiotics with activity against gonorrhea include spectinomycin. Antibiotics that should not be used to treat gonorrhea due to resistance include penicillins and fluoroquinolones. Disseminated or complicated gonococcal infections should be treated with intravenous ceftriaxone and doxycycline or azithromycin. The duration of these regimens depend on the clinical course and response to therapy.

Prognosis

Gonorrhea is curable with proper antibiotic therapy. Untreated disease often resolves over several weeks, but prompt treatment halts transmission and prevents complications.

Vaginitis

Definition and Epidemiology

The term *vaginitis* refers to disorders of the vagina characterized by inflammation or irritation of the vulva and an abnormal vaginal discharge. Although a separate entity from urethritis, there is significant overlap of symptoms and the organisms that cause vaginitis and urethritis. The three main types of infectious vaginitis are *Candida* vulvovaginitis, bacterial vaginosis, and trichomoniasis. The latter two are strongly associated with sexual transmission.

Trichomoniasis is the most common nonviral STI worldwide. In the United States, 3.1% of women between the ages of 14 and 49 years are infected with *Trichomonas vaginalis*. Screening is recommended for trichomoniasis in women who are at high risk for