

Epidemiology and Control of STIs, HIV/AIDS

Sexually transmitted infections (STI) include a series of diseases of diverse infectious etiology, in which sexual transmission plays a primary epidemiologic role, although sometimes they can also spread differently, such as from mother to child or through blood products and tissue transfer.

Worldwide, most adults acquire at least one sexually transmitted infection (STI), and many remain at risk for complications. In all societies, STIs rank among the most common of all infectious diseases, with >30 infections now classified as predominantly sexually transmitted or as frequently sexually transmissible. These infections are caused by viruses, bacteria, protozoa, fungi and ectoparasites. (Table 1)

Sexually transmitted herpes simplex virus (HSV) infections now cause most genital ulcer disease throughout the world and an increasing proportion of cases of genital herpes in developing countries with generalized HIV epidemics, where the positive-feedback loop between HSV and HIV transmission is a growing, intractable problem.

STIs are:

- Among the most common infectious diseases in all societies.
- STI may result in severe sequelae, particularly in women.
- Facilitate the transmission of human immunodeficiency virus (HIV)
- In pregnancy they may result in perinatal morbidity and mortality.

Women's sequelae:

- pelvic inflammatory disease, tubal infertility, ectopic pregnancy
- untreated cases of *C. trachomatis* or *N. gonorrhoeae* resulting in pelvic inflammatory disease (PID) account for much of the infertility, ectopic pregnancy and chronic pelvic pain in women.

HIV transmission:

- All STIs increase the potential for acquisition of human immunodeficiency virus (HIV), up to 10-fold.

Table1. Sexually Transmitted and Sexually Transmissible Microorganisms

| Bacteria | Viruses | Other ^a |
|--|---|--|
| Transmitted in Adults Predominantly by Sexual Intercourse | | |
| <i>Neisseria gonorrhoeae</i> | HIV (types 1 and 2) | <i>Trichomonas vaginalis</i> |
| <i>Chlamydia trachomatis</i> | Human T-cell lymphotropic virus type I | <i>Phthirus pubis</i> |
| <i>Treponema pallidum</i> | Herpes simplex virus type 2 | |
| <i>Haemophilus ducreyi</i> | Human papillomavirus (multiple genital genotypes) | |
| <i>Klebsiella (Calymmatobacterium) granulomatis</i> | Hepatitis B virus ^b | |
| <i>Ureaplasma urealyticum</i> | Molluscum contagiosum virus | |
| <i>Mycoplasma genitalium</i> | | |
| Sexual Transmission Repeatedly Described but Not Well Defined or Not the Predominant Mode | | |
| <i>Mycoplasma hominis</i> | Cytomegalovirus | <i>Candida albicans</i> |
| <i>Gardnerella vaginalis</i> and other vaginal bacteria | Human T-cell lymphotropic virus type II | <i>Sarcoptes scabiei</i> |
| Group B <i>Streptococcus</i> | Hepatitis C virus | |
| <i>Mobiluncus</i> spp. | (?) Hepatitis D virus | |
| <i>Helicobacter cinaedi</i> | Herpes simplex virus type 1 | |
| <i>Helicobacter fennelliae</i> | (?) Epstein-Barr virus | |
| | Human herpesvirus type 8 | |
| Transmitted by Sexual Contact Involving Oral-Fecal Exposure; of Declining Importance in Men Who Have Sex with Men | | |
| <i>Shigella</i> spp. | Hepatitis A virus | <i>Giardia lamblia</i> <i>Entamoeba histolytica</i> |
| <i>Campylobacter</i> spp. | | |

^aIncludes protozoa, ectoparasites, and fungi.

World

Globally, 350 million new cases of five curable STIs—gonorrhea, chlamydial infection, syphilis, chancroid, and trichomoniasis—were reported annually in the mid-1990s.

In developing countries, with three-quarters of the world's population and 90% of the world's STIs, factors such as population growth (especially in adolescent and young-adult age groups), rural-to-urban migration, wars, limited or no provision of reproductive health services for women, and poverty create exceptional vulnerability to disease resulting from unprotected sex.

Distribution

Certain STIs, such as syphilis, gonorrhea, HIV infection, hepatitis B, and chancroid, are most concentrated within "core populations" characterized by high rates of partner change, multiple concurrent partners, or "dense," highly connected sexual networks—e.g., involving sex workers and their clients, some men who have sex with men (MSM), and persons involved in the use of illicit drugs, particularly crack cocaine and methamphetamine. Other STIs are distributed more evenly throughout societies. For example, chlamydial infections, genital infections with HPV, and genital herpes can spread widely, even in relatively low-risk populations.

Risk factors:

More common among:

- People living in urban areas
- People who are single and young
- Higher number of sexual partners
- underutilization of preservatives (condom nonuse)
- Illicit drug users

Age: Adolescents and young adults (15–24 years old) are responsible for only 25% of the sexually active population, yet they represent almost 50% of all newly acquired STIs

Literacy: Populations with low literacy are often at increased risk of acquiring sexually transmitted infections (STI)

Sexual behaviours: Multiple partners especially in a short period of time and little or no use of barrier contraception

Male circumcision is associated with lower risk of STIs as well as HIV transmission.

Prevention

In general, the product of three factors determines the initial rate of spread of any STI within a population: rate of sexual exposure of susceptible to infectious people, efficiency of transmission per exposure, and duration of infectivity of those infected. Accordingly, efforts to prevent and control STIs aim to decrease the rate of sexual exposure of susceptibles to infected persons (e.g., through individual counseling and efforts to change the norms of sexual behavior and through a variety of STI control efforts aimed at reducing the proportion of the population infected), to decrease the duration of infectivity (through early diagnosis and curative or suppressive treatment), and to decrease the efficiency of transmission (e.g., through promotion of condom use and safer sexual practices, through use of effective vaccines, and recently through male circumcision).

Prevention and control of STIs require the following:

1. Reduction of the average rate of sexual exposure to STIs through alteration of sexual risk behaviors and behavioral norms among both susceptible and infected persons in all population groups. The necessary changes include reduction in the total number of sexual partners and the number of concurrent sexual partners.
2. Reduction of the efficiency of transmission through the promotion of safer sexual practices, the use of condoms during casual or commercial sex, vaccination against HBV and HPV infection, male circumcision (which reduces risk of acquisition of HIV, chancroid, and perhaps other STIs), and a growing number of other approaches (e.g., early detection and treatment of other STIs to reduce the efficiency of sexual transmission of HIV). Longitudinal studies have shown that consistent condom use is associated with significant protection of both males and females against all STIs that have been examined, including HIV, HPV, and HSV infections as well as gonorrhea and chlamydial infection. The only exceptions are probably sexually transmitted *Pthirus pubis* and *Sarcoptes scabiei* infestations.
3. Shortening of the duration of infectivity of STIs through early detection and curative or suppressive treatment of patients and their sexual partners.

U.S. Preventive Services Task Force Guidelines recommend screening sexually active female patients 25 years of age for *C. trachomatis* whenever they present for health care (at least once a year); older women should be tested if they have more than one sexual partner, have begun a new sexual relationship since the previous test, or have another STI diagnosed.

Screening

All patients with newly detected STIs or at high risk for STIs according to routine risk assessment as well as all pregnant women should be encouraged to undergo serologic testing for syphilis and HIV infection, with appropriate HIV counseling before and after testing. Randomized trials have shown that risk-reduction counseling of patients with STIs significantly lowers subsequent risk of acquiring an STI; such counseling should now be considered a standard component of STI management. Preimmunization serologic testing for antibody to HBV is indicated for unvaccinated persons who are known to be at high risk, such as homosexually active men and injection drug users. In most young persons, however, it is more cost-effective to vaccinate against HBV without serologic screening.

Vaccination:

HBV: Universal hepatitis B vaccination should be implemented for all unvaccinated adults in settings in which a high proportion of adults have risk factors for HBV infection (e.g., STD clinics, HIV testing and treatment facilities, drug-abuse treatment and prevention settings, health care settings targeting services to injection drug users or MSM, and correctional facilities).

HPV:

In 2007, the ACIP recommended routine immunization of 9- to 26-year-old girls and women with the quadrivalent HPV vaccine (against HPV types 6, 11, 16, and 18) approved by the U.S. Food and Drug Administration; the optimal age for recommended vaccination is 11–12 years because of the very high risk of HPV infection after sexual debut. In 2009, the ACIP added bivalent HPV vaccine (against types 6 and 11) as an option and expanded the groups in which immunization (with either quadrivalent or bivalent vaccine) is safe and effective to include boys and men 9–26 years old. HPV vaccines offering broader protection against additional oncogenic HPV types are anticipated.

Partner notification

Partner notification is the process of identifying and informing partners of infected patients about possible exposure to an STI and of examining, testing, and treating partners as appropriate. In a series of 22 reports concerning partner notification during the 1990s, index patients with gonorrhea or chlamydial infection named a mean of 0.75–1.6 partners, of whom one-fourth to one-third were infected; those with syphilis named 1.8–6.3 partners, with one-third to one-half infected; and those with HIV infection named 0.76–5.31 partners, with up to one-fourth infected. Persons who transmit infection or who have recently been infected and are still in the incubation period usually have no

symptoms or only mild symptoms and seek medical attention only when notified of their exposure. Therefore, the clinician must encourage patients to participate in partner notification, must ensure that exposed persons are notified and treated, and must guarantee confidentiality to all involved. In the United States, local health departments often offer assistance in partner notification, treatment, and/or counseling. It seems both feasible and most useful to notify those partners exposed within the patient's likely period of infectiousness that is often considered the preceding 1 month for gonorrhea, 1–2 months for chlamydial infection, and up to 3 months for early syphilis.

Expedited Partner Therapy(EPT)

Persons with a new-onset STI always have a *source* contact who gave them the infection; in addition, they may have a *secondary (spread or exposed)* contact with whom they had sex after becoming infected. The identification and treatment of these two types of contacts have different objectives. Treatment of the source contact (often a casual contact) benefits the community by preventing further transmission; treatment of the recently exposed secondary contact (typically a spouse or another steady sexual partner) prevents both the development of serious complications (such as PID) in the partner and reinfection of the index patient. A survey of a random sample of U.S. physicians found that most instructed patients to abstain from sex during treatment, to use condoms, and to inform their sex partners after being diagnosed with gonorrhea, chlamydial infection, or syphilis; physicians sometimes gave the patients drugs for their partners. However, follow-up of the partners by physicians was infrequent. A randomized trial compared patients' delivery of therapy to partners exposed to gonorrhea or chlamydial infection with conventional notification and advice to partners to seek evaluation for STD; patients' delivery of partners' therapy (PDPT), also known as *expedited partner therapy* (EPT), significantly reduced combined rates of reinfection of the index patient with *N. gonorrhoeae* or *C. trachomatis*. State-by-state variations in regulations governing this approach have not been well defined, but the 2010 CDC STD treatment guidelines and the EPT final report of 2006 describe its potential use. Currently, EPT is commonly used by many practicing physicians. Its legal status varies by state, but EPT is now permissible in 22 states and potentially allowable in another 20.

In summary, clinicians and public health agencies share responsibility for the prevention and control of STIs. In the current health care environment, the role of primary care clinicians has become increasingly important in STI prevention as well as in diagnosis and treatment.