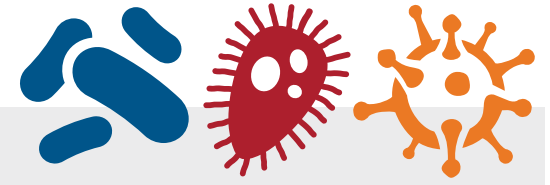


Sexually transmitted infections: get the facts

Introduction

Worldwide, more than 1 million **sexually transmitted infections** (STIs) are acquired daily. Chlamydia, gonorrhea, syphilis, and trichomoniasis account for an estimated 374 million new infections annually. An estimated 491 million people aged 15-49 years are infected with herpes simplex virus (HSV) type 2 [2]. Human papillomavirus (HPV), which is the most common viral infection of the reproductive tract, affects most sexually active men and women at some point in their lives [3]. The global prevalence of human immunodeficiency virus (HIV) and hepatitis B virus (HBV) infections, which can be acquired sexually, through blood and other bodily fluids, and during childbirth, is about 38.4 million and 296 million, respectively [4,5].

STIs are threats to sexual and reproductive health due to associated medical problems, such as pelvic inflammatory disease, infertility, pregnancy complications, and cancers [1,6]. In addition, **antimicrobial resistance among STIs has become a global public health crisis** that calls for improved antimicrobial stewardship and treatment optimizations [7].



Pathogens

More than 30 pathogens, including bacteria, parasites, and viruses, are known to cause STIs. Eight of these pathogens are the most common, causing four curable and four incurable STIs [1].

- Four curable infections:
 - Syphilis, gonorrhea, and chlamydia are caused by **bacteria** (*Treponema pallidum*, *Neisseria gonorrhoeae*, and *Chlamydia trachomatis*, respectively)
 - Trichomoniasis is caused by a **parasite** (*Trichomonas vaginalis*)
- Four incurable but controllable **viral** infections are caused by HSV, HPV, HIV, and HBV

Modes of infection

STIs are spread from one person to another mainly by unprotected sexual contact such as vaginal, oral, and anal sex. STIs can also be transmitted through transfusion of infected blood and blood products, shared needles for drug injections, and during pregnancy, childbirth, and breastfeeding [8,9].



Clinical features

Most cases of STIs are asymptomatic. However, when signs or symptoms are present, they include urethral or vaginal discharge, genital ulcers, and lower abdominal pain [8].



Syndromes caused by STIs can be broadly classified into **inflammatory infections** and **ulcerative infections** [10,11].

Inflammatory STIs can cause **pain and swelling** of the urethra (urethritis), vagina (vaginitis), cervix (cervicitis), upper female reproductive tract (pelvic inflammatory disease), male reproductive organs (epididymitis and orchitis), rectum (proctitis), and adjacent colonic tissue above the anus (proctocolitis) [7]. Common pathogens include *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and *Trichomonas vaginalis* [10].



Other signs and symptoms depend on the causative pathogens. For example, in urethritis, *Neisseria gonorrhoeae* infections may cause cloudy urethral discharge, while the discharge in *Chlamydia trachomatis* infections is often clear [10]. Patients with trichomoniasis may experience foul-smelling green-yellow vaginal discharge [10,12].

Ulcerative STIs are characterized by **genital, anal, perianal, or oral ulcers and vesicles**.



Common ulcer-causing pathogens include *Treponema pallidum* (causing syphilis) and HSV [10,11]. Both syphilis and HSV infection can produce systemic symptoms such as fever, body aches, and swollen lymph nodes. Untreated syphilis can affect multiple organ systems and cause pregnancy complications [13–15].

Another STI presenting with skin lesions is HPV. Its clinical presentations range from **anogenital warts** to cancers occurring at the back of the throat (oropharynx), reproductive tracts (cervix, vagina, vulva, penis), and anus [16].

The clinical manifestation of HIV and HBV differs depending on the stages of infection. Most HIV and HBV patients have no symptoms during the early stage [10]. Some HIV patients may experience influenza-like illness, skin rash, or diarrhea 2–4 weeks after initial infection [17–19]. Without treatment, individuals living with HIV may develop acquired immunodeficiency syndrome (AIDS), the late and potentially life-threatening stage of HIV infection [17,20]. Chronic HBV infection can lead to liver scarring (cirrhosis) and liver cancer [10].



Testing options

The common testing options for STIs include the following [22,23]:

- **Direct microscopy** to look for pathogenic features during microscopic examination
- **Microbial culture** to identify pathogens and check for antimicrobial sensitivity
- **Antigen and/or antibody detection**, e.g., rapid diagnostic test (RDT), enzyme immunoassay (EIA), and blood serology
- **Molecular diagnostics (MDx)**, such as polymerase chain reaction (PCR), a type of nucleic acid amplification test (NAAT), to test for the presence of pathogenic DNA or RNA



Urgent detection

Why are urgent detection and treatment important for STIs?

If left undiagnosed and untreated, **STIs can quickly infect others and cause serious complications**. A diagnosis dependent only on medical history and physical examination can frequently be inaccurate. Early detection and accurate diagnosis of STIs are therefore crucial for treatment and infection control [19,21].



Management

The keys to eliminating STIs as a public health threat are preventing transmission and providing effective treatment and follow-up [27].

Prevention is far more cost-effective than treatment [18]. Preventive measures include accurate risk assessment, education, and counseling such as using condoms correctly and consistently, and pre-exposure vaccination against HPV and HBV [1,19].

Early and effective diagnosis, treatment, counseling, and follow-up of individuals with STIs and their sex partners are crucial in reducing the risks of transmission [19].

Antimicrobial therapy: Depending on the types of pathogens and the stages of infection, the success of treatment involves appropriate antimicrobial selection, correct duration of therapy, and proper treatment adherence and follow-up [1,19].



Clinical value of molecular testing

Screening and detection of asymptomatic infections:

Most STIs do not present with any specific signs or symptoms [7]. Validated screening and accurate molecular diagnostic tests are particularly useful to detect asymptomatic infections [1,24].

- **MDx, such as PCR assays, have shown higher sensitivity and specificity than culture**, allowing more accurate detection. Molecular methods are particularly useful for microorganisms that are difficult to culture [23,25]. The WHO recommends performing molecular assays such as NAAT to differentiate different pathogens in patients presenting with urethral discharge and genital ulcers [26].
- **Detection of coinfections:** Coinfections are common in STIs, with a significant proportion of patients harboring multiple pathogens at any time point. **Multiplex** polymerase chain reaction can be used as a sensitive and rapid method for simultaneous detection of STIs caused by multiple pathogens [25].



References:

1. [who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-\(stis\)](https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis))
2. [who.int/news-room/fact-sheets/detail/herpes-simplex-virus](https://www.who.int/news-room/fact-sheets/detail/herpes-simplex-virus)
3. [who.int/news-room/fact-sheets/detail/cervical-cancer](https://www.who.int/news-room/fact-sheets/detail/cervical-cancer)
4. [who.int/data/gho/data/themes/hiv-aids](https://www.who.int/data/gho/data/themes/hiv-aids)
5. [cdc.gov/globalhealth/immunization/diseases/hepatitis-b/data/fast-facts.html](https://www.cdc.gov/globalhealth/immunization/diseases/hepatitis-b/data/fast-facts.html)
6. pubmed.ncbi.nlm.nih.gov/28701272/
7. pubmed.ncbi.nlm.nih.gov/32569625/
8. [who.int/health-topics/sexually-transmitted-infections#tab=tab_1](https://www.who.int/health-topics/sexually-transmitted-infections#tab=tab_1)
9. [cdc.gov/hiv/basics/hiv-transmission/injection-drug-use.html](https://www.cdc.gov/hiv/basics/hiv-transmission/injection-drug-use.html)
10. [elsevier.com/books/comprehensive-review-of-infectious-diseases/spec/978-0-323-56866-1](https://www.elsevier.com/books/comprehensive-review-of-infectious-diseases/spec/978-0-323-56866-1)
11. [cdc.gov/std/treatment-guidelines/genital-ulcers.htm](https://www.cdc.gov/std/treatment-guidelines/genital-ulcers.htm)
12. [mayoclinic.org/diseases-conditions/trichomoniasis/symptoms-causes/syc-20378609](https://www.mayoclinic.org/diseases-conditions/trichomoniasis/symptoms-causes/syc-20378609)
13. [cdc.gov/std/syphilis/stdfact-syphilis-detailed.htm](https://www.cdc.gov/std/syphilis/stdfact-syphilis-detailed.htm)
14. [mayoclinic.org/diseases-conditions/syphilis/symptoms-causes/syc-20351756](https://www.mayoclinic.org/diseases-conditions/syphilis/symptoms-causes/syc-20351756)
15. [mayoclinic.org/diseases-conditions/genital-herpes/symptoms-causes/syc-20356161](https://www.mayoclinic.org/diseases-conditions/genital-herpes/symptoms-causes/syc-20356161)
16. [cdc.gov/cancer/hpv/basic_info/cancers.htm](https://www.cdc.gov/cancer/hpv/basic_info/cancers.htm)
17. [who.int/news-room/fact-sheets/detail/hiv-aids](https://www.who.int/news-room/fact-sheets/detail/hiv-aids)
18. accessmedicine.mhmedical.com/book.aspx?bookID=2816
19. [cdc.gov/std/treatment-guidelines/default.htm](https://www.cdc.gov/std/treatment-guidelines/default.htm)
20. [hiv.gov/hiv-basics/overview/about-hiv-and-aids/what-are-hiv-and-aids/](https://www.hiv.gov/hiv-basics/overview/about-hiv-and-aids/what-are-hiv-and-aids/)
21. [ncbi.nlm.nih.gov/pmc/articles/PMC6715950/](https://pubmed.ncbi.nlm.nih.gov/pmc/articles/PMC6715950/)
22. [who.int/publications/i/item/WHO-MVP-EMP-2019_05](https://www.who.int/publications/i/item/WHO-MVP-EMP-2019_05)
23. [ncbi.nlm.nih.gov/pmc/articles/PMC4555911/](https://pubmed.ncbi.nlm.nih.gov/pmc/articles/PMC4555911/)
24. [who.int/teams/global-hiv-hepatitis-and-stis-programmes/stis/testing-diagnostics](https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/stis/testing-diagnostics)
25. [ncbi.nlm.nih.gov/pmc/articles/PMC9550954/](https://pubmed.ncbi.nlm.nih.gov/pmc/articles/PMC9550954/)
26. [who.int/publications/i/item/9789240024168](https://www.who.int/publications/i/item/9789240024168)
27. [who.int/news/item/15-07-2021-launch-who-guidelines-for-the-management-of-symptomatic-sexually-transmitted-infections](https://www.who.int/news/item/15-07-2021-launch-who-guidelines-for-the-management-of-symptomatic-sexually-transmitted-infections)

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