

*Aktuelne teme/  
Current topics*

EPIDEMIOLOGICAL CHARACTERISTICS OF  
SEXUALLY TRANSMITTED INFECTIONS

EPIDEMIOLOŠKE KARAKTERISTIKE  
SEKSUALNO PRENOSIVIH BOLESTI

**Correspondence to:**

**Slobodan Subotić,**

High Medical College of Professional  
Studies „Milutin Milankovic”,  
Crnotravska 27,  
11002 Belgrade, Serbia  
tel +381692707922  
e mail:slobasubotic@yahoo.com

Slobodan Subotić <sup>1</sup>, Vesna Šuljagić<sup>2</sup>

<sup>1</sup> High Medical College of Professional Studies „Milutin Milankovic”,  
Crnotravska 27, 11002 Belgrade, Serbia

<sup>2</sup> School of Medicine, the Academy of Military Medical University of  
Defence, Belgrade, Serbia, Department for the prevention and control of  
nosocomial infections, Military Medical Academy, Belgrade, Serbia

*Ključne reči*

SPI, faktori rizika, prevencija

*Key words*

STIs, risk factor, prevention

*Abstract*

Sexually transmitted infections (STIs) are infections that are transmitted through sexual contact. STIs have a profound impact on sexual and reproductive health worldwide, and rank among the top 5 disease categories for which adults seek health care. Each day more than a million people are infected with some of the STI, and it represents a major health problem. The rate of spread of sexually transmitted infections (STIs) within a population depends on several factors: population size, exposure to infected individuals, modes of transmission and the duration of infection. Risk factors for STIs include early sexual relations, a large number of sexual partners, partners who are in the risk group, an inconsistent condom use, and the use of psychoactive substances. It is necessary to have a two-level approach to the prevention of STIs: implement primary prevention i.e. Prevention of STI in uninfected persons, and secondary prevention i.e. Early diagnosis and treatment of already existing infection.

*INTRODUCTION*

Sexually transmitted infections (STIs) are infections that are transmitted through sexual contact. They are also called the „behavior“ disease. There are more than 30 different microorganisms that can be transmitted through sexual contact. Clinical manifestations of STI, can be on the genital organs but not necessarily (1-4).

STIs could be classified into 2 groups, those that can be cured and pathogens of this infections are *Neisseria gonorrhoea*, *Chlamydia trachomatis*, *Trichomonas vaginalis*, *Treponemapallidum*, as well as those that can not be cured, but the symptoms and signs of diseases can be mitigated by using symptomatic therapy. Pathogens of the second group are *HIV*, *Human papilloma virus*, *Herpes simplex*, *Hepatitis B*, *Hepatitis C* (5). Some of the STI, for example infections of HIV, hepatitis B and syphilis can be transmitted through medical equipment (syringes, needles, and other medical equipment for reusable, which are not adequately sterilized). Transmission is possible through biological products, such as blood and its derivatives, breast milk, as well as tissues or organs used for transplantation (6).

According to estimates by WHO and the latest published data from 2008, annually worldwide recorded around 498.9 million new cases of four curable STIs (Gonorrhoea, Chlamydia, Trichomoniasis, Syphilis), primarily in the category of individuals aged 15-49 years old, and 53% of infected are men (7). The overall incidence by region is: Africa (92.6 per 1.000.000), North and South America (125.7 per 1.000.000), South-East Asia Region (78.5 per 1.000.000), European Region (46.8 per 1.000.000), Eastern Mediterranean Region (26.4 per 1.000.000), Western Pacific Region (128.2 per 1.000.000) (8). The most common causes of STIs are: *Neisseria gonorrhoea*, *Chlamydia trachomatis*, *Trichomonas vaginalis*, *Treponema pallidum*, *human immunodeficiency virus (HIV)*, *Human Papilloma Virus*, *Hepatitis* (7).

**Gonorrhoea** is sexually transmitted infection caused by the bacterium *Neisseria gonorrhoeae*. Acute infections can be symptomatic and asymptomatic. If the infection is not treated or if it is treated improperly, it can lead to numerous complications such as inflammatory processes on genital and reproductive organs and infertility (9). The total number

of infected of gonorrhoea at the global level for the year 2005 is amounted (87.7 million), and according to the latest WHO data from 2008 was recorded (106.0 million), which shows a significant increase of 21% (8).

According to the WHO for 2008 regional presence of gonorrhoea is:

Continent	Incidence (per 1 000 000 cases)	Prevalence (per 1 000 000 cases)
African Region	21.1	8.2
North i South America	11.0	3.6
South-East Asia Region	25.4	9.3
European Region	3.4	1.0
Eastern Mediterranean Region	3.1	1.0
Western Pacific Region	42.0	13.3

(8).

**Chlamydial** is caused by the bacterium *Chlamydia trachomatis*. This bacterium causes infections of urogenital organs and provides a wide spectrum of clinical manifestations. Epidemiological is very important that the infection can persist in the body 8 to 10 years, because besides harmful effects on the body it has immeasurable consequences for the spread of infection in the conditions of promiscuous behavior. Besides the spread of infection through sexual intercourse, possible transmission is also from mother to child (10). Epidemiological studies show that the total number of new cases in the world population in 2005 was (101.5 million), and in 2008 (105.7 million). It is a 4.1% increased number of new cases (8).

According to the WHO for 2008 regional presence of *Chlamydia* is:

Continent	Incidence (per 1 000 000 cases)	Prevalence (per 1 000 000 cases)
African Region	8.3	9.1
North i South America	26.4	25.2
South-East Asia Region	7.2	8.0
European Region	20.6	17.3
Eastern Mediterranean Region	3.2	3.0
Western Pacific Region	40.0	37.8

(8).

**Trichomoniasis** is an infection caused by protozoa *Trichomonas vaginalis*. In women, causes inflammation of the uterus, and in men inflammation of the urethra. The infection is usually transmitted through sexual intercourse, but it is not excluded transferring by items (towels, bath sponge, objects used for gynecological examinations, etc.) (10) numerous studies indicate that at least 80% of the infections remain asymptomatic (11,12). The infection is associated with an increased risk of getting HIV, with the development of pelvic inflammatory disease and preterm labor in pregnant women (13, 14). According to WHO data, in the period from 2005 to 2008 number of new cases was increasing by 11.2%. In 2005 amounted 248.5 million, and in 2008 was 276.4 million.

According to the WHO for 2008 regional presence of *Trichomoniasis* is:

Continent	Incidence (per 1 000 000 cases)	Prevalence (per 1 000 000 cases)
African Region	59.7	42.8
North i South America	85.4	57.8
South-East Asia Region	42.9	28.7
European Region	22.6	14.3
Eastern Mediterranean Region	20.2	13.2
Western Pacific Region	45.7	30.1

(8).

**Syphilis** is caused by a spirochete *T. pallidum*. Most commonly affects people aged 25 to 44 years old. Today this infection is most frequent among homosexual, then people who provide sexual services for commercial purposes and their clients, but the infection occurs in heterosexuals who do not belong to the aforementioned categories (15). The global incidence has not change in the period of 2005-2008 years for this infection, and it is estimated to be 10.6 per 1.000.000 (8).

According to the WHO for 2008 regional presence of *Syphilis* is:

Continent	Incidence (per 1 000 000 cases)	Prevalence (per 1 000 000 cases)
African Region	3.4	14.3
North i South America	2.8	6.7
South-East Asia Region	3.0	12.3
European Region	0.2	0.3
Eastern Mediterranean Region	0.6	1.6
Western Pacific Region	0.5	1.2

(8).

**Acquired immune deficiency syndrome (AIDS)** is adisease caused by *Human immunodeficiency virus (HIV)*. The virus destroys the basic regulatory cell defense systems of the body, enabling the development of infection by other viruses, fungi, parasites and bacteria. It is a major medical and social problem due to the inability of healing and eventual fatal outcome, because of a large number of patients and the risk of further spread, significant social reactions (fear and panic), the high costs of treating patients, difficulties in the implementation of prevention, etc. (10). Number of people living with HIV is according to the latest published data from 2013, 35 million, of which 3.2 million are children under the age of 15, and 16 million are women. The incidence of HIV is 2.1 per 1.000.000, of which 1.9 million are adults. The death rate from AIDS in 2013 is 1.5 per 1.000.000 (16). Almost 70% of the total numbers of new HIV infections at the global level in 2013 are in Sub-Saharan Africa. Other regions that are significantly affected by this problem are Asia and the Pacific, South America and the Caribbean, Eastern Europe and Central Asia (17).

**HPV infection** causes the *human papillomavirus (HPV)*. This is the most common viral infection of the reproductive tract. HPV is most commonly transmitted during sexual

activity, which involves skin to skin contact. There are over 100 types of HPV, of which at least thirteen are linked to various cancers, and strains 16 and 18 are directly related to 70 % of cervical cancer and precancerous lesions of the cervix (18).

The precise incidence of HPV infection are not available from several reasons: Most infections do not give symptoms. Tests which confirm the presence of HPV virus in the body are not operate even in the patients who have severe signs (genital warts). Repeated infections (HPV) are very common. Due to the asymptomatic nature of the infection it is difficult to distinguish between new cases of repeated, and that must be established to determine the incidence (19-21).

Prevalence is also difficult to determine. Long-established technique in determining the prevalence is the measurement of the amount of antibodies in the serum. The problem is that only 50% of infected with HPV develop antibodies, which may show a lesser number of patients. Despite the limitations, there are a couple of studies on this topic. It is estimated that 15 % (20-24 million) of adults in the USA are infected with HPV, 9.2 million are between the ages 15 and 24 (19-21).

**Hepatitis B** is the infection of the liver caused by the *virus of hepatitis B*. This is a major global health problem. It can cause chronic liver disease and chronic infection and increased mortality rate from liver cirrhosis and liver cancer. The virus is transmitted through blood or other body fluids. More than 240 million people worldwide have chronic hepatitis B; 780.000 people die each year from acute or chronic consequences of Hepatitis B. The prevalence was highest in Sub-Saharan Africa and East Asia, and then in the southern parts of eastern and central Europe. Most people in these regions are infected during childhood, and 5-10% of adults have chronic infection (1).

#### *Risk factors for sexually transmitted infection*

Nearly one million people worldwide became infected daily from some of the sexually transmitted infections(1). The rate of spread of sexually transmitted infections (STIs) within a population depends on several factors: population size, exposure to infected individuals, modes of transmission and the duration of infection. The characteristics of each infection depend on the interaction between these factors and socio, economic environment. At the individual level risk factors for STIs include early sexual relations, a large number of sexual partners, partners who are in the risk group, an inconsistent condom use, and the use of psychoactive substances. The main limitation for any initiative suppressing STI is that these infections are asymptomatic nature, and the patients either do not have symptoms or if they have them they do not recognize them as symptoms of sexually transmitted infections. This means that, unless infected persons were not tested on regular examination to any of STI, will remain undetected and untreated (22). Classic risk factors of being affected with chlamydia are low socio-economic status, members of high-risk groups, and frequent change of sexual partners. Age are very important factor, people younger than 26 years old are more vulnerable than older ones. This bacterium infects the column cells

of the cervix which are in younger women at the entrance of the cervix. In older women, these cells retreat in higher part of cervical canal, and the chance of getting this infection is reduced (23). In the USA, Afro/Americans women disproportionately are more vulnerable than white ones. According to the CDC from 2010, the infected rate is 8 times higher in black woman than in white (24).

Risks factors for Trichomoniasis include all the factors, as well as for others STI. More than 30% of women who have a Chlamydial infection have trichomoniasis, which is one of the important risk factors for this infection (25). The prevalence of gonorrhea varies drastically from population to population, so when determining potential risk factors of a given patient population, one should take into account the prevalence of gonorrhea within the population. Risk factors that lead to an increase in the rate of disease development are promiscuous behavior and the less use or no-use condoms during sexual intercourse, which is more associated with the younger population. HIV-infected persons represent a risk group because their body is more sensitive and more susceptible to infections (STIs) (26). Individuals who are at high risk for acquiring and transmitting syphilis are those with risky behavior, those who have diagnosed STIs, including HIV, homosexual, prostitutes, prisoners, drug users. The incidence of syphilis in the population and number of sexual partners reported by each individual, should be a good way to identify those individuals who are at high risk for getting infected. Lacks of prenatal care, late or limited prenatal care, drug use by the mother are associated with congenital syphilis (27).

Because multiple modes of transmission of the HIV virus, it is very important to know the risk factors and systematic reviews of risk groups. In the high-risk group are intravenous drug users, sex partners of injecting drug users, people who provide sex for money or drugs, sexual partners of HIV infected people, homosexuals, promiscuous persons, persons receiving treatment for tuberculosis. At the world level 75-85% of the total number of infected people is infected through sex (25).

The rate of HPV is clearly associated with sexual activity. Risk groups for acquiring infections are sexually active adolescents and adults of 19-30 years old (28). People who have had 10 or more sexual partners have a 58% greater chance of becoming ill than those who had one or no sexual partners in their life (29).

The most common mode of transmission of HBV is from mother to child during childbirth in developing countries (Sub-Saharan Africa), while in countries with a lower rate of prevalence (USA), sexual contact and intravenous routes are the primary modes of transmission (15).

#### *Prevention of sexually transmitted infections*

To organize preventing STI and HIV, should be taken into consideration human psychology, behavior patterns, as well as the socio-cultural impact. Other factors such as family and family values, employment, education, religion, culture, gender, age, etc. should always be in mind as important factors. It is necessary to have a two-level approach to the prevention of STIs: implement primary prevention i.e.

Prevention of STI in uninfected persons, and secondary prevention i.e. Early diagnosis and treatment of already existing infection (24).

#### *Primary prevention*

Primary prevention activities are essentially the same for classic STI as well as sexually transmitted HIV, because the main mode of transmission with both groups are sexual relations. In primary prevention, the main objective is to prevent the occurrence of infections and disease. This can be achieved by promoting safe sexual behavior, use of condoms in all sexual activities, education population with a focus on people who are in the risk group and the application of vaccination. Vaccination is a safe and effective manner recommended prevention of hepatitis B and HPV. HPV vaccine can protect against some of the most common diseases of the same name. It is recommended that vaccination (three doses) in period of life before having sex (12 years old) (24).

Only activities of primary prevention can have an effect on the incurable STIs (viral infections). Most of the prevention messages are essential in order to increase awareness and knowledge about STIs in people's minds, and thereby improve their sexual behavior. This information includes: that many STIs can be cured; that early treatment is necessary in order to avoid complications and side effects; symptoms and signs may be unrecognized, especially in women, until complications arise; description of recognizable signs and symptoms; list of institutions that provide advice on STIs; the belief that whatever institution is concerned, priva-

cy, respect and reliability are guaranteed. In order to provide realistic and appropriate messages on STIs is important to respect the knowledge, practices, and attitudes of the target group (30).

#### *Secondary prevention*

Secondary prevention involves providing treatment, care and therapy for infected persons and persons at risk of STIs. Activities may include the promotion of health care focused not only at those with symptoms of STIs, but also to those who are at high risk of STIs as well as HIV positive people; providing clinical services that are acceptable, affordable, effective for patients and their partner; counseling for patients with HIV or other sexually transmitted infections. Knowledge and experience of health care for women, men and youth are limited, so WHO and CDC places a high priority on the development of best practices in this area (30, 31).

#### *CONCLUSION*

Each day more than a million people are infected with some of the STI, and it represents a major health problem. On suppression of sexually transmitted infections in the first place should decrease the risk factors (often changing partners, non-use of condoms, providing sex for money, etc.). It is necessary to start with primary prevention (education, workshops for children, vaccination) in the period before becoming sexually active, in order to affect their consciousness, and thereby to prevent the spread of newly emerging STI.

---

### *Sažetak*

Seksualno prenosive infekcije (SPI), su infekcije koje se prvenstveno prenose seksualnim kontaktom i imaju veliki uticaj na seksualno i reproduktivno zdravlje u svetu. Svaki dan više od milion ljudi bude zaraženo nekom od STI što predstavlja veliki javno zdravstveni problem. STI su u grupi 5 najzastupljenijih bolesti za koje se odraslima pruža zdravstvena zaštita. Stopa širenja seksualno prenosivih infekcija unutar neke zajednice zavisi od nekoliko faktora: veličine populacije, izloženosti inficiranim individuama, načina prenošenja, i dužine trajanja same infekcije. Faktori rizika za SPI uključuju: rano stupanje u seksualne odnose, veliki broj seksualnih partnera, partneri koji spadaju u rizičnu grupu, nedovoljna upotreba kondoma, i upotreba droge. Neophodno je da postoje dva nivoa pristupa prevenciji SPI: sprovođenje primarne prevencije odnosno sprečavanje obolevanja neinficiranih osoba, i sekundarna prevencija odnosno rana dijagnoza i lečenje već postojeće infekcije.

## REFERENCE

1. World Health Organization, Health Topics. Sexually transmitted infections. (<http://www.who.int>) (12.10.2014.)
2. Edwards A, Sherrard J, Zenilman J, Fast Facts: Sexually Transmitted Infections, Second edition, Oxford OX14 3LN, UK, 2007, str. 5-7
3. Makwe E, Ovaioza A. M, Awareness of Sexually Transmitted Infections (STIs) Including HIV/AIDS among Undergraduate Students of University of Abuja, Nigeria, *British Journal of Applied Science & Technology* 4(4):2014, p.705-717. ([www.sciencedomain.org](http://www.sciencedomain.org)) (14.10.2014.)
4. World Health Organization, Sexually transmitted infections; GLOBAL STRATEGY FOR THE PREVENTION AND CONTROL OF SEXUALLY TRANSMITTED INFECTIONS: 2006–2015 (<http://whqlibdoc.who.int>) (12.10.2014.)
5. World Health Organization. Reproductive Health Strategy to Accelerate Progress Towards the Attainment of International Development Goals and Targets. Geneva: World Health Organization; 2004, (<http://www.who.int>) (17.12.2014.)
6. World Health Organization, Sexually transmitted Infections, Issues in Adolescent Health and Development. (<http://whqlibdoc.who.int>) (29.04.2014.)
7. World Health Organization, Global incidence and prevalence of selected curable sexually transmitted infections – 2008. Geneva: World Health Organization; 2012, (<http://www.who.int>) (23.11.2014.)
8. World Health Organization, Antimicrobial resistance: global report on surveillance, WHO Library Cataloguing-in-Publication Data, 2014, p.27-28 (<http://whqlibdoc.who.int>) (11.12.2014.)
9. Karadaglić Đ, Krstić Lj, Bolesti koje se prenose polnim kontaktom, IP „MEDICINSKA KNJIGA“, Beograd, 1995. godina, str. 23-187.
10. Allsworth JE, Ratner JA, Peipert JF. Trichomoniasis and other sexually transmitted infections: results from the 2001–2004, National Health and Nutrition Examination Surveys. *Sex. Transm. Dis.* 2009; 36:738–44.
11. Sutton M, Sternberg M, Koumans EH, et al. The prevalence of *Trichomonas vaginalis* infection among reproductive-age women in the United States, 2001–2004. *Clin. Infect. Dis.* 2007;45: 1319–26.
12. McClelland RS, Sangare L, Hassan WM, et al. Infection with *Trichomonas vaginalis* increases the risk of HIV-1 acquisition. *J. Infect. Dis.* 2007;195:6987–02.
13. Laga M, Manoka A, Kivuvu M, et al. Non-ulcerative sexually transmitted diseases as risk factors for HIV-1 transmission in women: results from a cohort study. *AIDS* 1993; 7: 95–102
14. Malla N, Sexually Transmitted Infections, *InTech*, 2012, p.70-101.
15. World Health Organization, Global summary of the AIDS epidemic 2013, (<http://www.who.int>) (13.12. 2014.)
16. Centers for Disease Control and Prevention., HIV/AIDS, Basic statistic (<http://www.cdc.gov>) (13.12.1014.)
17. Stanberry I, Rosenthal S, Sexually Transmitted Diseases, Vaccines, Prevention, and Control Second Edition, Elsevier Ltd, 2013, p.10.
18. World Health Organization, Human papillomavirus (HPV) and cervical cancer 2014, (<http://www.who.int>) (18.12.2014.)
19. Cates Jr W. Estimates of the incidence and prevalence of sexually transmitted diseases in the United States. American Social Health Association Panel. *Sex. Transm. Dis.* 1999;26: S2–7.
20. Myers ER, McCrory DC, Nanda K, Bastian L, Matchar DB. Mathematical model for the natural history of human papillomavirus infection and cervical carcinogenesis. *Am J Epidemiol.* 2000; 151:1158–71.
21. Weinstock H, Berman S, Cates Jr W. Sexually transmitted diseases among American youth: incidence and prevalence estimates, 2000. *Perspect Sex Reprod Health.* 2004;36:6–10
22. Stanberry I, Rosenthal S, Sexually Transmitted Diseases, Vaccines, Prevention, and Control Second Edition, Elsevier Ltd, 2013, p.10.
23. Jacobson DL, Peralta L, Graham NM, Zenilman J. Histologic development of cervical ectopy: relationship to reproductive hormones. *Sex. Transm. Dis.* 2000; 27(5): 252–8.
24. Centers for Disease Control and Prevention. Sexually transmitted diseases surveillance. Atlanta, GA: Centers for Disease Control and Prevention; 2010. (<http://www.cdc.gov>) (14.12.2014.)
25. Skolnik N, Clouse A. L, Woodward J, Sexually Transmitted Diseases, Humana press, 2013., p.97– 127.
26. Hwang LSM. Chlamydia trachomatis infection in adolescents. *Adv. Pediatr.* 2004;51:379–407.
27. Cunningham G, Leveno K, Bloom S, et al, editors. Sexually transmitted diseases. In: Williams obstetrics. 23rd ed. New York: McGraw Hill; 2010.
28. Sellors JW, Karwalajtys TL, Kaczorowski J, et al. Incidence, clearance and predictors of human papillomavirus infection in women. *CMAJ.* 2003;168:421–5.
29. Bauer HM, Hildesheim A, Schiffman MH, et al. Determinants of genital human papillomavirus infection in low-risk women in Portland, Oregon. *Sex. Transm. Dis.* 1993;20:274–8.
30. World Health Organization, Sexually transmitted diseases: policies and principles for prevention and care p. 10-11 (<http://www.who.int>) (15.12.2014.)
31. Centers for Disease Control and Prevention, Sexually Transmitted Diseases (STDs) prevention, 2014, (<http://www.cdc.gov>) (15.12.2014.)