

ORIGINAL ARTICLE

OPPOSITE TRENDS OF INCIDENCE OF GONORRHEA AND OTHER STIS IN THE EASTERN BOHEMIA DURING PAST 15 YEARS

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Summary

The epidemiology of selected venereal diseases in the Czech Republic has been carefully evaluated for many years. This report containing data from the period 1981-2011 from the eastern Bohemia shows a sharp decrease in the incidence of gonorrhea in 1993-1994 and very low incidence thereafter with slightly higher prevalence in males. However, syphilis and genitourinary infection by *Chlamydia trachomatis* show entirely opposite trends. Also, for the similar number of diagnostic tests performed, chlamydia showed 10 fold higher ratio of positive cases. This underscores the changing epidemiology of STIs and necessity for adapting the reporting algorithms.

Key words: gonorrhea; epidemiology; Czech Republic

INTRODUCTION

Gonorrhea is a sexually transmitted infection caused by *Neisseria gonorrhoeae*, a gram-negative diplococcal organism that can grow and multiply easily in the genitourinary tract, including the cervix, uterus, and fallopian tubes in women, and in the urethra

in both women and men. The causative agent can also affect mucous membranes of the oral cavity, conjunctiva and anus. The disease could result in severe consequences leading to the involvement of skin and joints in disseminated forms [1].

The infection is predominantly transmitted by the sexual intercourse. In very rare cases, the transmission can occur by contaminated clothes and under impaired hygienic conditions. The incubation period is two to eight days. In women, the symptoms of gonorrhea are often fairly mild, i.e. oligosymptomatic, and many women are asymptomatic. Even when symptoms are present, these may be non-specific and

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mistaken for a bladder or vaginal infection. The most common clinical presentation – the infection of the lower genital tract – primarily manifests as male urethritis and female endocervicitis. Infections of the pharynx, rectum and female urethra occur frequently but are more likely to be asymptomatic or minimally symptomatic. Initial symptoms and signs in women include a painful or burning sensation when urinating (dysuria), increased vaginal discharge, or vaginal bleeding between periods. Women with gonorrhea are at risk of developing serious complications from the infection, which do not correlate to the presence or severity of symptoms. Men have symptoms that appear two to five days after infection and present as a burning sensation when urinating. Objectively, there is a white, yellow, or green discharge from the urethra. Complicated cases in men could be characterized by painful or swollen testicles. Symptoms of rectal infection in both men and women include rectal discharge, anal itching, soreness, bleeding, or painful bowel movements. Oral infection may lead to a sore throat, but usually causes no symptoms [2].

An undiagnosed and untreated gonorrhea can cause serious and persistent health problems in both women and men, which may lead to the secondary infertility. In women, these complications may result in pelvic inflammatory disease (PID). The symptoms can be quite mild or very severe and can include abdominal pain and fever. PID leads to the formation of internal abscesses and chronic pelvic pain. PID can damage the fallopian tubes (post-inflammatory blockage) and cause infertility, or increase the risk of the ectopic pregnancy in the fallopian tube, which is regarded as a life-threatening condition. In men, gonorrhea can cause a painful epididymitis, which may lead to the infertility, if untreated. Furthermore, gonorrhea can disseminate through the blood and involve skin and joints causing disseminated gonococcal infection (DGI). In addition, similarly to other sexually transmitted infections the patients with gonorrhea can more easily contract HIV [2].

There are several laboratory methods available to diagnose gonorrhea – direct and indirect. The direct ones include a quick laboratory test for gonorrhea that performed by Gram stain. The Gram stain of a discharge specimen from a urethra or a cervix allows the identification of *Neisseria gonorrhoeae* in a light microscope. This test works better for men than for women. Positive predictive value is high for urethral infection, but a negative Gram stain does not rule out infection in

asymptomatic men. Sensitivity and specificity of the Gram stain are lower for endocervical specimens and rectal specimens [3]. According to EU specifications this test could be regarded as the diagnostic method only in an uncomplicated male urethritis (Decision 2000/96/EC).

A bacterial culture from the infection site, which was used to establish the diagnosis in the current study, is a standard diagnostic method for all potential manifestations and can be helpful for the management of the disease by determining the antibiotic sensitivity [3]. Cultures are particularly useful in cases when the clinical diagnosis is unclear, a failure of treatment has occurred, contact tracing is problematic or when legal questions arise.

Nucleic acid amplification tests (NAATs) are designed to amplify sequences of DNA unique to *Neisseria gonorrhoeae*. These tests are more sensitive and specific than non-amplification techniques [3]. Several FDA-approved NAATs are available for the detection of *Neisseria gonorrhoeae* in urethral swab specimens obtained from males, endocervical swabs from women, and urine specimens obtained from both men and women. These tests are more rapid than culture, more specific than immunoassays and do not require viable organisms. However, they do not allow for the determination of the antibiotic sensitivity.

All patients with a suspected diagnosis of gonorrheal infection should be tested for syphilis at 3 months following gonorrhea infection and *Chlamydia trachomatis* genitourinary infection. Testing for HIV may be indicated and is always highly recommended [4, 5].

The indirect diagnosis includes serologic tests, which are, however, not routinely indicated in gonorrhea [6].

The follow-up care and a control bacterial culture with antibiotic sensitivity testing is mandatory in the Czech Republic. Patients should be counseled about the risks of complications caused by gonococcal infection and the risk of other STDs. Patients always should be instructed to refer any sex partners (up to 6 weeks before onset of disease in acute forms, up to 2 months in chronic gonorrhea cases) for prompt evaluation and treatment. Patients should avoid sexual contact until medication is finished and until their partners are fully evaluated and treated. They should avoid unprotected contact

thereafter. Negative clinical, serological and other laboratory tests results enable to dismiss the patients from a further follow-up.

The entire sexually active population is at risk of contracting gonorrhea and the level of risk directly correlates with the number of sex partners and the presence of other STI's.

This study analysis data on the epidemiological surveillance of gonorrhoea within the period of 1981–2011 and presents a comparison of these data to the country-wide data as well as to the trends in the incidence of syphilis within the corresponding time frame. The data was collected in the eastern Bohemia within the area of the East Bohemian region for the period until 2001, and thereafter

in the Kralovehradecky region, which was established by redistricting within about a half of the corresponding geographical area.

The data on reported cases of gonorrhoea and other STIs were collected under a program of mandatory tracing of select STIs, which had been carried out country-wide as a regular component of guidelines recommended by the Czech Society of Dermatology and Venereology. The data were anonymized and are accessible only for 4 categories of health professionals - attending physician, nurse, nurse specialized in follow-up care and authorized physicians of state supervision. The East Bohemian region was inhabited in the year 2000 by 1 231 459 people, 631 000 of whom were women (51%), where 308 000 women were in the age group of 15-49.

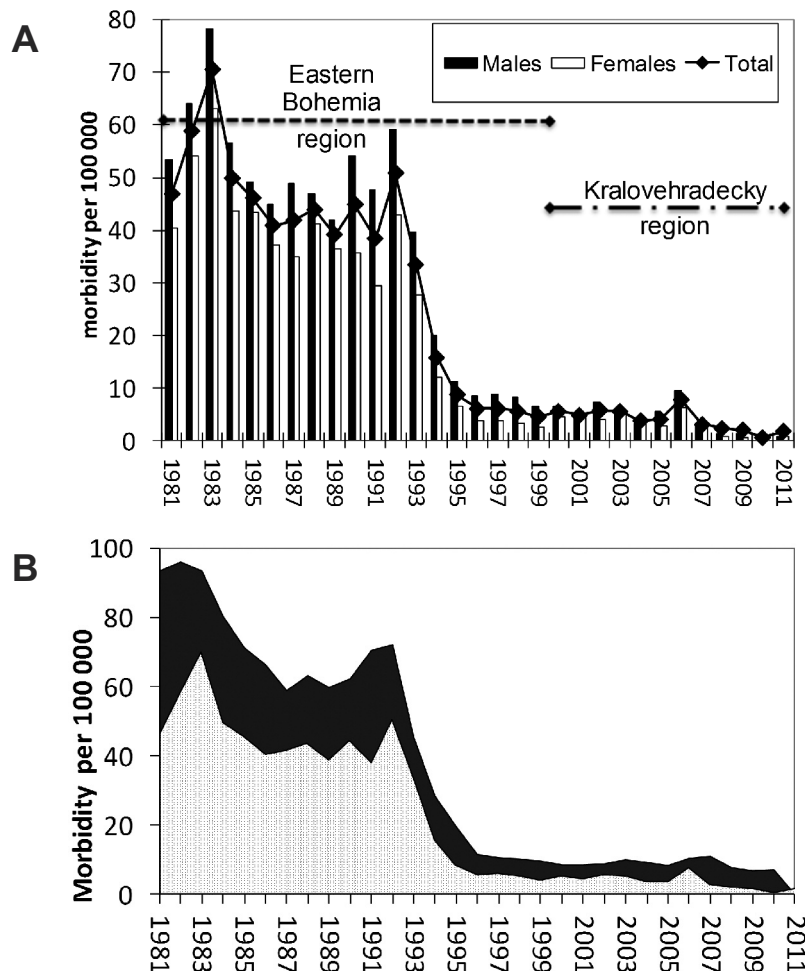


Figure 1. Prevalence of gonorrhea 1981-2011. The prevalence of diagnosed cases per 100 000 of inhabitants of gonorrhea was followed in A) the eastern Bohemia (full bars-males, open bars - females, line - total cases) and B) compared to the country-wide incidence in the Czech Republic (Czech Republic - dark, eastern Bohemia - dotted).

In 2001, the Kralovehradecky region reported 554 000 inhabitants with a maintained ratio of women (51%).

The incidence of gonorrhea in the eastern Bohemia was fairly within a period of 1981-1992 and then shows a sharp decline over the following two years (Figure 1A). The morbidity then levels off at low numbers, which are maintained over the rest of the surveillance period. The data show, that with a few exceptions (2001, 2003, 2004, 2007) male cases always outnumber female cases. During the 4 exceptional years the total reported number of cases was extremely low, therefore it would be difficult to make any conclusions. When the eastern Bohemian data are compared to the country-wide statistics, one could see similar trends in the gonorrhea incidence over most of the reporting period, with lower morbidity in the region compared to the country-wide data (Figure 1B). However, in the last 4 years (since 2007), there is a significant decrease on reported cases

of gonorrhea in the Kralovehradecky region compared to the incidence in the Czech Republic.

Next we compared trends in incidence of the two most common STIs - gonorrhea and syphilis in our region (Fig 2A). The chart shows only the second half of the surveillance period (1995-2011), because the numbers for the first half for both diseases were much higher on the scale and therefore including them would make it difficult to see any trends in low numbers later. Interestingly, we can see opposite trends in the morbidity of gonorrhea and syphilis. While cases of gonorrhea are on a stable decline, cases of syphilis seem to be increasing. There is also a marked difference in the incidence of these diseases among foreign national, the number of which increased to over 16 000 in 2009 due to the increased migration following 1989. Thus the proportion of gonorrhea cases in foreigners has declined similarly to the majority population. This is rather

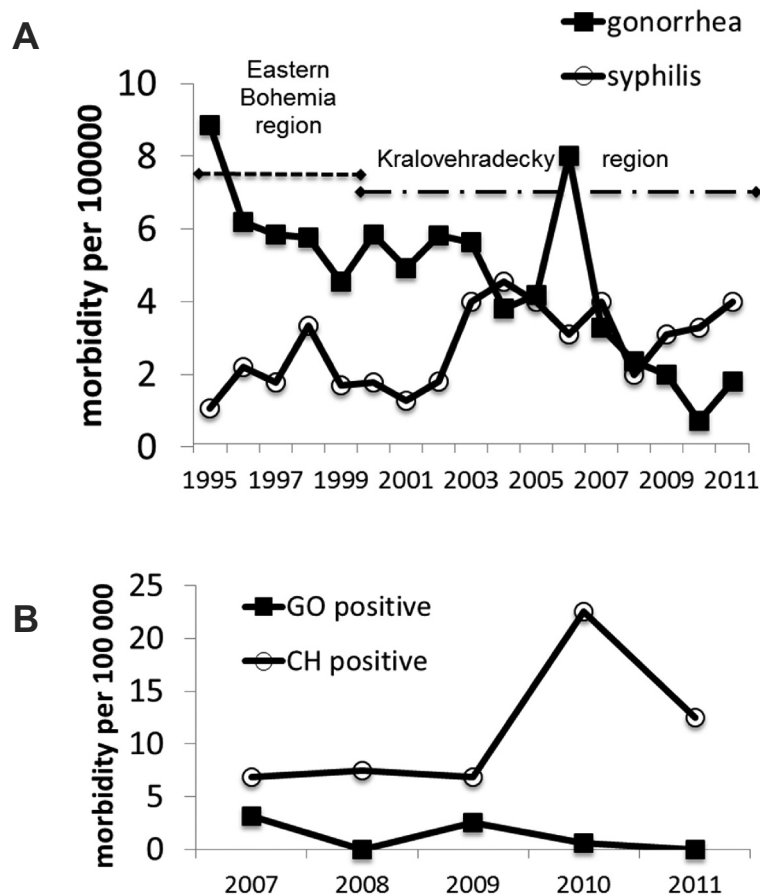


Figure 2. Incidence of STIs. A) Incidence of gonorrhea (closed squares) and syphilis (open circles) in the eastern Bohemia for the period 1995-2011. B) The comparison of incidence of gonorrhea (GO positive, closed squares) and Chlamydia trachomatis infection (CH positive, open circles) within Hradec Kralove county for years 2007-2011.

different from syphilis, where there has been a disproportionately higher increase in the diagnosed cases of syphilis in foreign residents compared to the Czech nationals. The incidence of gonorrhea according to the age is also rather different to syphilis. The highest incidence in men is of about 35-40 cases per 100 000 inhabitants in the age groups of 15-24 and 25-34 years, whereas lower incidence of 10-30 cases per 100 000 inhabitants was found in females of corresponding age groups.

Another STI reported increasingly during recent years is caused by *Chlamydia trachomatis*, which is, however, not on the list of STIs, which require mandatory reporting in the Czech Republic, and therefore it is difficult to obtain relevant data. However, we were able to collect data on the diagnosed cases of the chlamydial infection (diagnosis performed by immunofluorescence) of the genital tract, but only for the period of 2007-2011 and only in Hradec Kralove county, which is situated within the region, includes the county capital and has about 160 000 inhabitants. Figure 2B shows, that while the gonorrhea cases are on very low level within this area, the positive diagnoses of *Chlamydia* show an increasing trend. Altogether, there were within this time frame 825 tests performed for gonorrhea, 10 of which were positive (1,2%), but a total of 729 tests performed for *Chlamydia* yielded 90 positive diagnoses (12%). Some recent reports indicate varying rates of co-infections, but none of the patients in this study suffered from a double infection with both pathogens [7, 8].

Neisseria gonorrhoeae has been causing one of the most common STI worldwide for at least most of the 20th century, with an estimated 200 million new cases annually. Public health initiatives in the developed world have resulted in declining incidence of the disease since the mid-1970s, but gonorrheal infection is still the second most common reportable disease in the United States [3]. More than 350 000 cases were reported in the United States in 2007, but that number may underestimate the true case rate by 50% due to both the underdiagnosis and underreporting. In the United States, the disease is most commonly diagnosed among the urban poor and minorities. This may reflect bias due to data collection site preference (e.g. STD clinics) as well as true differences in prevalence. In Canada, there has been a more than tenfold reduction in gonorrhea incidence between 1981 and 1995 with 226 and 19 per 100 000 reported, respectively [9]. In the United States, the peak incidence of reported cases

of gonorrhea was 473 per 100 000 in 1975. There was a plateau in the rate until 1982, followed by a decrease until 1984, then a slight increase until 1986, followed by a steady decrease continuing to the present. The latter decrease was not as significant as what occurred in the Czech Republic after 1993. In 1995, the incidence rate of reported cases of gonorrhea in the United States was still around 150 per 100 000. The slower decrease in the USA may be explained by several factors. First, in the United States, the epidemiology of gonococcal infection varies according to ethnicity. The incidence in blacks is much higher and has declined less quickly (from 2 000 per 100 000 in 1981 to 1 450 per 100 000 in 1992) than in non-blacks (from 200 per 100 000 in 1981 to less than 50 per 100 000 in 1992) (CDC 1992). Also, differential access to the health care according to socio-economic status in the United States has led to difficulties in implementing large-scale screening and partner notification programs [9]. It is currently thought that this decline in gonorrhea incidence has been related largely to behavioral changes resulting from the fear of AIDS [10].

The dramatic decline in the incidence of gonorrhea has been reported in the Czech Republic as well, particularly following 1993. Thus in the year 2005 there was a total of 859 reported cases of gonorrhea in the Czech Republic (incidence about 8.6 cases/100 000 inhabitants) compared to thousands of reported cases before 1993. Such decline could be based on reduced virulence of *Neisseria gonorrhoeae*, but empiric self-therapy, unreported and not routinely diagnosed cases as well as low awareness of STI's in the HIV era seem much more likely. Due to asymptomatic cases of gonorrhea in women and maybe due to the insufficient epidemiological tracing, such women could become the reservoir of infection.

The only feature of gonorrhea epidemiology that is shared by both developing and developed countries is the increasing importance of antibiotic resistant strains of *Neisseria gonorrhoeae*. In view of this dramatic decline, it is now possible to put forward goals for the elimination of locally transmitted cases of gonorrhea or a reduction to a very low incidence [3].

Strategic measures resulting in possible reduction of reported cases of gonorrhea cases should be focused on consistent epidemiologic tracing, counseling and follow-up, as well as further disease research and the regular use of national and international programmes on STI's.

An epidemiological contact-tracing service connecting the data from the dermatologists from the entire country was gradually implemented in the Czech Republic, which has been functioning well. This service included the prevention, follow-up, tracing of contacts and sources of the disease, meticulous statistical analysis and creation of network of workplaces for the education of relevant personnel [11]. The successful tracing of contacts and sources reached 83% in the case of syphilis and 56% with respect to gonorrhea. In the view of the presented data, the increasing prevalence of diagnosed genital infections caused by *Chlamydia* requires an increased attention. The county-wide data clearly show that for a similar number of tests performed, the positive diagnosis of *Chlamydia* was made about 10 times more often than gonorrhea. At the same time, chlamydial infection is not mandatory to report, but can lead to severe complications. One of the current goals of the Czech Society of Dermatology and Venereology is therefore include chlamydia infection on the list of reportable sexually-transmitted diseases.

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