VIA MEDICA

ORIGINAL PAPER

Int Marit Health
2014; 65, 3: 137–141
DOI: 10.5603/IMH.2014.0028
www.intmarhealth.pl

ISSN 1641–9251

Occurrence of *Chlamydia trachomatis* in military environment on the example of professional soldiers in the Polish Armed Forces

Krzysztof Korzeniewski[1], Monika Konior[1], Anna Lass[2], Aneta Guzek[3]

[1]Department of Epidemiology and Tropical Medicine in Gdynia, Military Institute of Medicine, Warsaw, Poland
[2]Department of Tropical Parasitology in Gdynia, Medical University of Gdansk, Poland
[3]Department of Medical Diagnostics, Medical Institute of Medicine, Warsaw, Poland

ABSTRACT

This article presents the results of a preliminary study concerning cases of Chlamydia trachomatis *infections among professional soldiers in the Polish Armed Forces. Soldiers who declared casual sexual contact with women were investigated in this study regarding the transmission of chlamydial infections by sexual activity. In total, 66 healthy, sexually active professional Polish soldiers, aged between 27 and 44, who didn't report any symptoms of urogenital infection were investigated. Urine samples taken from these patients were investigated using molecular methods (Cobas TaqMan, real-time PCR) in March–April 2012 in the Military Institute of Medicine, Warsaw, Poland. In the investigated group of 66 Polish soldiers, two 33–34 year old men were asymptomatic carriers of* Chlamydia trachomatis *(3.0%). They confirmed having casual sexual activity without prevention with many women. In the examined group of Polish soldiers the relatively low level of chlamydial infections found may result from the use of preventive measures during sexual activity. According to the examined men, the common use of condoms is mainly connected with the fear of HIV infection. Screening tests for* Chlamydia trachomatis *in the Polish Armed Forces are not performed, therefore incidence rates of chlamydial infections remain unknown. The authors plan further investigations with a larger group of professional soldiers.*

(Int Marit Health 2014; 65, 3: 137–141)

Key words: *Chlamydia trachomatis*, epidemiology, Polish soldiers

INTRODUCTION

Urogenital *Chlamydia trachomatis* belongs to the most common sexually transmitted bacterial pathogens. Infection is easy to diagnose and single-dose treatment is generally available. However, the asymptomatic course of the infection, which can be up to 90% in men and 70% in women, as well as the easy transmission by sexual activity means chlamydiosis can be considered one of the most significant health problems in the world. It is estimated that approximately 90 million new cases of the infection are recorded each year [1]. The *Chlamydia trachomatis* infection is problematic not only because of lack of symptoms, but also due to long incubation time and a commonly seen chronic course lasting for years. Early diagnosis and therapy are key to stop the transmission of this infection to future sexual partners. Moreover, it helps to avoid delayed complications including epididymitis, orchitis, infertility in men and pelvic inflammatory disease, ectopic pregnancy and infertility in women [2, 3]. Screening tests are usually performed among women. This is a result of regular gynaecological care and more commonly observed symptoms of urogenital system infections, and, consequentially, more regular diagnostic procedures [4]. In adults, urethral, cervical or vaginal swabs and urine are used as diagnostic material. A screening study of asymptomatic chlamydial infections was impossible, or at least very difficult, because of patient's reluctance or refusal to have material taken from genitals. The situation changed when molecular techniques were introduced that

✉ Krzysztof Korzeniewski, MD, PhD, Professor at Military Institute of Medicine, Department of Epidemiology and Tropical Medicine, ul. Grudzińskiego 4, 81–103 Gdynia, Poland, e-mail: kktropmed@wp.pl

detect bacterial nucleic acids in urine samples (nucleic acid amplification NAA, nested PCR, LCR, real-time PCR). The easy availability of diagnostic material, without necessary contact with patients, allowed large scale research to estimate the prevalence of *Chlamydia trachomatis*. The military environment has recently aroused the special interest of epidemiologists and infectious disease specialists. Soldiers are a group with a specific professional activity, living in a closed community and often displacing. They are usually young, healthy, sexually active men that have contact with regular as well as casual partners. Performing military duties away from home in difficult environmental conditions, especially when troops are deployed to an area of operations overseas, favours stress relief during free time. Sexual service is a common pastime and prostitution is a source of sexually transmitted diseases. One such disease is chlamydiasis which is becoming more and more prevalent in the world. The aim of the study was to estimate the number of cases of *Chlamydia trachomatis* infections in a military environment using the example of professional soldiers in the Polish Armed Forces.

MATERIALS AND METHODS

STUDY POPULATION

Soldiers who declared casual sexual contact with women were investigated in this study regarding the transmission of chlamydial infections by sexual activity. In total, 66 healthy, sexually active professional Polish soldiers, aged between 27 and 44 who didn't report any symptoms of urogenital infection were examined. Urine samples taken from these patients were tested using a molecular method (COBAS TaqMan CT Test) in March–April 2012 in the Military Institute of Medicine, Warsaw, Poland.

MOLECULAR ANALYSIS

The COBAS TaqMan CT Test, v2.0 (Roche Diagnostics GmbH, Mannheim, Germany) is an *in vitro* nucleic acid amplification test for the qualitative detection of *Chlamydia trachomatis* DNA in i.a. urine specimens. The urine samples are processed using the AMPLICOR® CT/NG Specimen Preparation Kit for manual specimen preparation and the COBAS® TaqMan® 48 Analyser for automated amplification and detection. After manual specimen preparation to obtain CT DNA, simultaneous PCR amplification of the target DNA takes place. The Master Mix reagent contains primers and probes specific for the CT cryptic plasmid DNA, the CT chromosomal *ompA* gene DNA and CT Internal Control DNA. Internal Control DNA is amplified and detected simultaneously with the specimen. The detection of amplified DNA is performed using target-specific and Internal Control-specific dual fluorescent dye-labelled oligonucleotide probes that permit independent identification of all targets.

Table 1. Distribution of age of Polish soldiers (n = 66)

	N	Mean age	Median age	Age range	P
Soldiers:	**66**	36.6 ± 4.1	**37.0**	**27–44**	**0.2864**
Infected	2	33.5 ± 0.7	35.5	33–34	
Non-infected	64	36.7 ± 4.2	37.0	27–44	

STATISTICS

The statistical analysis was performed using the statistical suite StatSoft. Inc. (2011) STATISTICA (data analysis software system), version 10.0. www.statsoft.com and Excel.

The quantitative variables were characterised by the arithmetic mean of standard deviation or median or max/ /min (range). The qualitative variables were presented with the use of count and percentage. In order to check if a quantitative variable derives from a population of normal distribution the W Shapiro-Wilk test was used. Statistical significance of differences between two groups (unpaired variables model) was processed with U Mann-Withney test.

In all the calculations the statistical significance level of $p = 0.05$ was used.

RESULTS

In the group of 66 Polish soldiers investigated, 2 (3.0%) men were asymptomatic carriers of *Chlamydia trachomatis*. They confirmed having casual sexual activity without protection with many women. The average age of the investigated soldiers was 36.6 ± 4.1 (range 27–44 and median 37 years old, respectively). The average age of *Chlamydia trachomatis* infected men was 33.5 ± 0.7 (range 33–34 and median 33.5 years old, respectively) (Table 1). There were no statistically significant age differences depending on infection observed (U value of Manna-Whitney test 1.07, $p = 0.2864$).

All individuals investigated declared sexual contact with at least a few partners during last few years. The fear of HIV infection was the reason that the vast majority of soldiers used condoms. However, one of the infected individuals confirmed contact with many sexual partners without using preventive measures which could be the reason of symptomatic, laboratory confirmed and treated gonorrhoea. *Chlamydia trachomatis* infection was not recognised at that time. The second man also declared sexual activity without protection, but did not undergo medical examination because of lack of manifestations.

DISCUSSION

Sexually transmitted diseases (STD's) have always been a considerable problem in a military environment. The incidence of STD's among soldiers in the past was divided into 4 periods. The first lasted until the beginning of the

20th century when the effects of venereal infections were noticed but widely ignored. The second phase, which lasted until the 1940s, covered the period of intensive scientific development (including laboratory diagnostics which made it possible to identify sexually transmitted pathogens). It was also the time of the implementation of certain preventive measures such as criminal procedure in the case of prostitution. The third period started in the 1940s from when penicillin was introduced as a means of treating syphilis and gonorrhoea on a mass scale [5]. The fourth period in the history of STD's started in the 1980s and lasts until today. This stage is dominated by viral infections caused by HIV, HSV, HPV as well as bacterial infections caused by *Chlamydia trachomatis*, which commonly occur all over the world, both among civilians and soldiers [6–9]. The institution which has gathered the most comprehensive data on the incidence of STD's among military personnel is undoubtedly health service of the United States Armed Forces. American soldiers remain the best diagnosed and medically consulted professional group in the United States; although they represent merely 1% of the working population aged 18–45 [10]. The incidence of venereal diseases diagnosed among soldiers serving in their home countries are comparable to those seen in the local civilian population. However, the situation may change drastically if troops are deployed to an area of operations overseas. The prevalence of venereal diseases in combat troops is likely to be much higher than during peacetime and it is then strictly connected with ongoing military activities in the theatre operations [11, 12]. Within the last 2 decades the incidence of STD's among American troops was highly irregular. For the duration of such operations as *Desert Shield/Desert Storm* (the Persian Gulf War), *Restore Hope* (Somalia) it did not exceed 1% of the total number of all diagnoses. Several factors are considered to have influenced such a huge reduction in the number of STD's infections. In the case of nearly all contemporary military operations, especially those conducted in Muslim countries, contact with local people has always been kept to a minimum [13, 14]. Also, alcohol is prohibited, and if soldiers are entitled to leave, it always takes place outside the zone of operations. Health prevention measures undertaken by medical services in mission areas are directed towards preventing STD's by offering soldiers unlimited access to condoms [15]. Yet, despite all the prevention measures taken by medical services, the incidence of STD's in United States military personnel, especially in those under 25, has been increasing. At the beginning of the 1990s 15.6% of United States soldiers were diagnosed with *Chlamydia* infections [16, 17]. In the period 2004–2009 research on the prevalence of chlamydiasis was carried out in the population of American soldiers serving in Iraq and Afghanistan. *Chlamydia* infection rates increased every year, peaking in 2009 with a total rate of 246.3/100,000 deployed personnel with higher rates in females (770.9/100,000) than in men (192.6/100,000) [18]. Research carried out in the population of American soldiers (n = 7,000) deployed to Bagram, Afghanistan from March to August 2005 demonstrated that 17 out of 2,870 admissions to the United States Combat Support Hospital (on an outpatient basis) were due to STD's, mostly chlamydiasis [19]. *Chlamydia* infection remains the most commonly reported STD in the United States Forces [20]. American soldiers are a high-risk group as far as the incidence of STD's is concerned. Approximately 40% of the United States military personnel are aged 17–24. In contrast, the United States civilian population at the same age accounts for only 14% of the entire population [21]. Reports prepared in the United States within the framework of the Defence Medical Surveillance System in the period 2000–2012 among active component service members demonstrated overall incidence of 1,073 cases per 100,000 person-years (657/100,000 person-years in the Navy; 1,480/100,000 person-years in the Army); 1,246 cases per 100,000 person-years among enlisted soldiers and 191 cases among officers; 1,660 cases per 100,000 person-years among single and 593 cases among married soldiers, 3,266 cases per 100,000 person-years among women and 702 cases among men [22]. A total of 103,257 *Chlamydia* cases (95% lab-confirmed) were reported during the 2000–2008 period in the study of Jordan et al. [23]. In the period 2000–2009 over 12,000 United States soldiers had recurrent diagnoses of a *Chlamydia* infection within a single year [24].

In the United States alone up to 18.9 million new venereal diseases are diagnosed per year and the astronomical amount of 17 billion USD is allocated for the medical treatment of STD's [25]. The highest incidence of STD's is reported in the population under 25, i.e. young people who appear to be more inclined to risky behaviours (such as unprotected sex) than the older section of society. 1.2 million cases of chlamydiasis (401.3 cases/100,000 population), the most commonly occurring contagious disease in the United States, was reported by Centres for Disease Control and Prevention in 2008 [26]. The largest number of infections was diagnosed in girls and young women aged 15–24. The majority of *Chlamydia* infections prevailing in the United States remain undiagnosed. The number of chlamydiasis among American citizens is estimated at 2.8 million new cases per year [26]. In the period 2002–2008 detection of *Chlamydia* infections in male population had increased by 45%, which was largely due to the accessibility of less invasive diagnostic procedures. Although the reported number of chlamydiasis in males is lower than in females, the Centres for Disease Control and Prevention has estimated that the current numbers of new infections

in both populations are comparable [27]. Incidence rates of STD's reported in a military environment are relatively stable. Military personnel are predominantly young, single and sexually active men and women. Increased incidence of venereal diseases has been reported in the population of lower ranking enlisted personnel, whereas, there is not much data on incidence rates among officers, warrant officers, and senior non-commissioned officers. It has been assessed that higher-ranking, older and better educated soldiers who follow health prevention measures (the use of condoms) rarely acquire an STD [15]. The most common risk factors resulting in STD's infections, both inside and outside the military environment include risky sexual behaviours, such as sexual contact with prostitutes, casual sex with strangers, sex with multiple partners (even if a person practices serial monogamy), homosexuality, sex with partners taking drug injections, sex with a partner who has had multiple sex partners, sex with partners likely to be STD carriers, unprotected sex. Another group of risk factors include early sexual initiation, delayed medical diagnostics and avoiding medical treatment. Risk markers, which indicate presence of risk factors, include marital status, race, urban residence, low socioeconomic status [28]. Other variables may also function as risk factors or risk markers, e.g. age, sex, smoking, use of alcohol or drugs, previous STD infections, lack of circumcision [15]. However, the dominant role in the spread of STD's, especially in developing countries, belongs to female sex workers [29, 30]. In areas of military deployment where contact among soldiers and the local population is unrestricted and where unwritten social norms do not exist, there is a specific kind of symbiosis between the population of soldiers who have money and wish to entertain themselves and the population of local female sex workers who need a means of support. Prostitution is cheap and commonplace in most of the Third World countries. Due to low prices of sex services, prostitutes need a large number of customers to earn their living, while soldiers can afford multiple sex services. In areas where multinational troops are deployed there are a large number of makeshift shops, bars, and restaurants all around military bases which provide military personnel not only with stimulants such as alcohol and drugs but also with sex services [15]. Sexually transmitted diseases do not pose a serious epidemiological risk among army personnel under the condition of regular clinical and laboratory supervision of the soldiers' health status. Screening conducted among personnel of the United States Forces revealed clinical symptoms and/or lab-confirmed cases of STD's. The results clearly indicate that detailed tests need to be carried out among male and female soldiers before relocating to military service overseas as well as in the theatre operation. Out of sexually transmitted diseases, chlamydiasis prevails in military personnel. The epidemiological services of the United States Army recommend screening for *Chlamydia trachomatis* in all candidates entering the United States Armed Forces [31].

CONCLUSIONS

Screening studies for *Chlamydia trachomatis* in the Polish Armed Forces are not performed. Therefore incidence rates of chlamydial infections remain unknown. This preliminary study is the first attempt to estimate the occurrence of *Chlamydia trachomatis* infections in the Polish military environment. The authors plan further investigations using larger group of professional soldiers.

REFERENCES

1. Cook RL, Hutchison SL, Ostergaard L, Braithwaite RS, Ness RB. Systematic review: noninvasive testing for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Ann Intern Med 2005; 142: 914–925.
2. Cunningham KA, Beagley KW. Male genital tract chlamydial infection: implications for pathology and infertility. Biol Reprod 2008; 79: 180–189.
3. Haggerty CL, Gottlieb SL, Taylor BD, Low N, Xu F, Ness RB. Risk of sequelae after *Chlamydia trachomatis* genital infection in women. J Infect Dis 2010; 201 (suppl. 2): S134–S155.
4. Dielissen PW, Teunissen DA, Lagro-Janssen AL. Chlamydia prevalence in the general population: is there a sex difference? a systematic review. BMC Infect Dis 2013; 13: 534.
5. Greenberg JH. Venereal disease in the Armed Forces. Med Clin North Am 1972; 56: 1087–1100.
6. Gaydos CA, Howell MR, Pare B et al. *Chlamydia trachomatis* infections in female military recruits. N Engl J Med 1998; 339: 739–744.
7. Gaydos CA, Quinn TC, Gaydos JC. The challenge of sexually transmitted diseases for the military: what has changed? Clin Infect Dis 2000; 30: 719–722.
8. Kotloff KL, Wassermann SS, Russ K et al. Detection of genital human papillomavirus and associated cytological abnormalities among college women. Sex Transm Dis 1998; 25: 243–250.
9. Fleming DT, McQuillan GE, Johnson RE et al. Herpes simplex virus type 2 in the United States, 1976 to 1994. N Engl J Med 1997; 337: 1105–1111.
10. Hoge CW, Lesikar SE, Guevara R et al. Mental disorders among U.S. military personnel in the 1990s: association with high levels of health care utilization and early military attrition. Am J Psychiatry 2002; 159: 1576–1583.
11. Malone JD, Hyams KC, Hawkins RE, Sharp TW, Daniell FD. Risk factors for sexually transmitted diseases among deployed US military personnel. Sex Transm Dis 1993; 20: 294–298.
12. Melton LJ. Comparative incidence of gonorrhea and nongonococcal urethritis in the United States Navy. Am J Epidemiol 1976; 104: 535–542.
13. Hyams KC, Hanson K, Wignall FS. The impact of infectious diseases on the health of U.S. troops deployed to the Persian gulf during operations desert shield and desert storm. Clin Infect Dis 1995; 20: 1497–1504.
14. Wasserman GM, Martin BL, Hyams KC. A survey of outpatient visits in a United States army forward unit during operation desert shield. Mil Med 1997; 162: 374–379.
15. Berg SW. Sexually transmitted diseases and human immunodeficiency virus infection. In: Kelley PW ed. Military preventive medicine: mobilization and deployment. Borden Institute Wal-

ter Reed Army Medical Center, Office of the Surgeon General at TMM Publications. Vol. 2. Washington DC, USA 2005; 1146–1175.
16. Cecil JA, Howell MR, Tawes JJ et al. Features of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infection in male Army recruits. J Infect Dis 2001; 184: 1216–1219.
17. Zenilman JM, Glass G, Shields T, Jenkins PR, Gaydos JC, McKee KT. Geographic epidemiology of gonorrhoea and *Chlamydia* on a large military installation: application of a GIS system. Sex Transm Infect 2002; 78: 40–44.
18. Aldous WK, Robertson JL, Robinson BJ, Hatcher CL, Hospenthal DR, Conger NG. Rates of gonorrhea and *Chlamydia* in U.S. military personnel deployed to Iraq and Afghanistan (2004–2009). Mil Med 2011; 176: 705–710.
19. Korzeniewski K. Health hazards in areas of military operations conducted in different climatic and sanitary conditions. Int Marit Health 2011; 62: 41–62.
20. Lee SE, Nauschuetz W, Jordan N et al. Survey of sexually transmitted disease laboratory methods in US Army laboratories. Sex Transm Dis 2010; 37: 44–48.
21. Armed Forces Health Surveillance Center. Defense Medical Epidemiology Database. Available from: http://www.afhsc.mil. Accessed: June 2009.
22. Armed Forces Health Surveillance Center. Sexually Transmitted Infections, Active Component, U.S. Armed Forces, 2000–2012. Medical Surveillance Monthly Report 2013; 20: 5–10.
23. Jordan NN, Lee SE, Nowak G, Johns NM, Gaydos JC. *Chlamydia trachomatis* reported among U.S. active duty service members, 2000–2008. Mil Med 2011; 176: 312–319.
24. Armed Forces Health Surveillance Center. Brief Report: Recurrent Chlamydia Diagnoses, Active Component, 2000–2009. Medical Surveillance Monthly Report 2010; 17: 15–17.
25. Weinstock H, Berman S, Cates W. Sexually transmitted diseases among American youth: incidence and prevalence estimates, 2000. Perspect Sex Reprod Health 2004; 36: 6–10.
26. Centers for Disease Control and Prevention, 2009. Sexually Transmitted Diseases in the United States, 2008. National Surveillance Data for Chlamydia, Gonorrhea, and Syphilis. Available from: http://www.cdc.gov/std/stats. Accessed: November 2009.
27. Datta SD, Sternberg M, Johnson RE et al. Gonorrhea and Chlamydia in the United States among persons 14 to 39 years of age, 1999 to 2002. Ann Intern Med 2007; 147: 89–96.
28. Aral SO, Holmes KK. Epidemiology of sexual behaviour and sexually transmitted diseases. In: Holmes KK, Mardh PA, Sparling PF, Wiesner PJ. eds. Sexually transmitted diseases. McGraw-Hill, New York, USA 1990; 19–36.
29. Day S. Prostitute women and AIDS: anthropology. AIDS 1988; 2: 421–428.
30. Padian NS. Prostitute women and AIDS: epidemiology. AIDS 1988; 2: 413–419.
31. Gaydos CA, Howell MR, Quinn JC, McKee KT, Gaydos JC. Sustained high prevalence of *Chlamydia trachomatis* infections in female army recruits. Sex Transm Dis 2003; 30: 539–544.

EDITORIAL COMMENT

The problem of chlamydiasis may also apply to seafarers exposed to casual sexual relationships, and should act as an impulse to similar research on a population of sailors and fishermen, and among migrant workers on the disease somewhat neglected between major STD threats: AIDS and gonorrhea.