THE PREVALENCE OF CHLAMYDIA TRACHOMATIS IN THE POPULATION LIVING IN ROMA SETTLEMENTS: A COMPARISON WITH THE MAJORITY POPULATION

Monika Halánová1, Pavol Jarčuška2, Zuzana Kalinová1, Katarina Cáríková1, Jaroslava Oravcová1, Peter Jarčuška1, Daniel Pella3, Mária Mareková1, Andrea Madarasová Gecková4, Lýdia Čisláková1; HepaMeta Team*

1Department of Public Health, Faculty of Medicine, P. J. Šafárik University, Košice in Košice, Slovakia
2Department of Infectology and Travel Medicine, Faculty of Medicine, P. J. Šafárik University in Košice, Košice, Slovakia
31st Department of Internal Medicine, Faculty of Medicine, P. J. Šafárik University in Košice, Košice, Slovakia
4Department of Medical and Clinical Biochemistry and LABMED, Faculty of Medicine, P. J. Šafárik University in Košice, Košice, Slovakia
51st Department of Internal Medicine, Faculty of Medicine, P. J. Šafárik University in Košice, Košice, Slovakia
6Health Psychology Unit, Department of Public Health, Faculty of Medicine, P. J. Šafárik University in Košice, Košice, Slovakia
7Olomouc University Social Health Institute, Palacký University in Olomouc, Olomouc, Czech Republic

SUMMARY

Background: We aimed to study the occurrence of Chlamydia trachomatis infection in the population living in Roma settlements and to compare the obtained results with the prevalence in the majority population.

Methods: We examined 340 people for the presence of bacterium C. trachomatis, 208 of them were Roma (66 men, 142 women) and 132 were from the majority population (75 men, 57 women). Respondents were aged 18–55 years (mean age = 33.44, STD = 9.57). The occurrence of C. trachomatis was detected by direct proof of the pathogen by polymerase chain reaction (PCR).

Results: Of 340 respondents included in the study, 22 (6.5%) showed positivity for C. trachomatis infection, 15 of them were Roma (7.2%) and 7 non-Roma (5.3%). The highest positivity was detected in Roma women (8.5%), while positivity in both non-Roma women and men was 5.3%, and in Roma men 4.5%. We did not confirm any significant contribution of age, gender or ethnicity to the occurrence of C. trachomatis infection.

Conclusions: Despite the increased number of people with risk factors in the Roma community, no significant difference in the occurrence of C. trachomatis infection was found. Neither age nor gender contributes to the probability of C. trachomatis infection. Nevertheless, there are other health consequences which might be more pronounced among the population living in Roma settlements due to barriers to the health care and their lower ability to benefit from health care services provided.

Key words: Chlamydia trachomatis, Roma population, non-Roma population, prevalence

Address for correspondence: Pavol Jarčuška, Department of Infectology and Travel Medicine, Faculty of Medicine, P. J. Šafárik University in Košice, Rastislavova 43, 041 90 Košice, Slovakia. E-mail: jarcuskaigupjs.sk

INTRODUCTION

Sexually transmitted infections are among the most common infections in adults. There are more than 30 bacterial, viral and parasitic sexually transmitted pathogens. If untreated, a number of them can lead to serious complications and sequelae (1).

Each year an estimated 340 million new cases of curable sexually transmitted infections occur worldwide, with the largest proportion in the region of South and South East Asia, followed by Sub-Saharan Africa, Latin America and the Caribbean (2). In Europe, the leading sexually transmitted infection is urogenital chlamydiosis, the reported incidence has increased dramatically over the last 20 years (3).

The risk factors for chlamydial infection include young age (<24 years), new sexual partners and sexual risk behaviour (multiple sexual partners, non-use of condoms). In Slovakia, one of the groups of population which has a large number of people with these risk factors is the Roma community.

According to the Statistical Office of the Slovak Republic, 105,738 citizens from the total population of 5,397,036 in Slovakia are of Roma nationality, which represents only 2% of the population (4). However, the actual estimated number of Roma citizens in Slovakia ranges from around 320,000–500,000, which represents between 8.0 to 10% of the total population. Almost half of the Roma population in Slovakia is under the age of 18 years (5). Geographically, the highest number of Roma (approximately 60%) lives in the eastern part of Slovakia. Aside from education, housing and employment, health is also one of the most critical areas of inequality of the Roma population. Around 150,000 Roma live in segregated places often located in rural areas without the necessary basic infrastructure and access to health care. Such settlements are concentrated into a small area with a large number of people whose health status is unsatisfactory.

*HepaMeta Team members are listed in Appendix.
The majority of urogenital chlamydial infections in both women (80%) and men (50%) are asymptomatic; thus, *Chlamydia trachomatis* can be spread unknowingly and remains largely undiagnosed (6, 7). A laboratory examination is necessary to confirm diagnosis. But studies in Slovakia have confirmed that worse health in Roma is partially mediated by worse access to health services, apart from the large educational gap between Roma living in settlements and the majority population (8).

Therefore, the aim of this work was to study the occurrence of *Chlamydia trachomatis* infection in the population living in Roma settlements and to compare the obtained results with the prevalence in the majority population.

**MATERIALS AND METHODS**

**Study Population**

A total of 340 people were examined for the presence of the bacterium *Chlamydia trachomatis* during the cross-sectional population-based HepaMeta study conducted in Eastern Slovakia in 2011 (primarily focused on detection of viral hepatitis B and C and metabolic syndrome) in the population living in separated and segregated Roma settlements. For comparison, we also examined people from the majority population. This study is described in detail elsewhere (9).

People from the Roma population were recruited directly in the settlements with the cooperation of local Roma community workers. Participation in the study was fully voluntary and anonymous.

Of 340 people examined, 208 were Roma (66 men, 142 women) and 132 were from the majority population (75 men, 57 women). Respondents were aged 18–55 years (mean age = 33.44, STD = 9.57).

The study was performed in accordance with the principles of the Declaration of Helsinki and approved by the Ethics Committee of the Faculty of Medicine at P. J. Šafárik University in Košice (No. 104/2011).

**Collection of Samples**

The first portion of the urine sample was used for analysis: 20–25 ml of urine was collected in a dry sterile container and stored immediately at 4°C until processed. In the laboratory, 1 ml of urine from each sample was collected in a sterile 1.5 ml microtube and centrifuged at 10,000 r/min for 5 min. The supernatant was discarded, and the pellet resuspended in 0.2 ml of transport medium, which was then mixed thoroughly by vortexing.

**Laboratory Methods**

The occurrence of *Chlamydia trachomatis* was detected by direct proof of the pathogen by polymerase chain reaction (PCR) using the commercial DNA-sorb-AM nucleic acid extraction kit and the AmpliSens® Chlamydia trachomatis-EPh PCR kit (the Federal Budget Institution of Science, Moscow, Russia).

Extraction and purification of DNA as well as PCR analysis were performed according to the manufacturer’s instructions.

**Statistical Methods**

Basic descriptive statistics were used for the analysis of the obtained results. Relative risks (RR) and their 95 percent confidence intervals (95% CI) were estimated for the occurrence of *Chlamydia trachomatis*. The contributions of age, gender and ethnicity to the prevalence of *Chlamydia trachomatis* infection were assessed using a logistic regression model.

**RESULTS**

A sample was considered to be positive for *Chlamydia trachomatis* DNA if the 330-bp band was present in the gel.

Of 340 respondents included in the study, 22 (6.5%) showed positivity for *Chlamydia trachomatis* infection, 15 of whom were Roma (7.2%) and 7 non-Roma (5.3%). The highest positivity was detected in Roma women (8.5%). Positivity in both non-Roma women and men was 5.3% vs. 4.5% in Roma men (Table 1).

Upon comparison of the relative risk of *Chlamydia trachomatis* infection occurrence in the group of Roma and the group of non-Roma, we found the risk of infection to be nearly 1.4-times higher in the Roma group than in the group of majority population. This risk was 1.6-times higher for Roma women compared with the group of women from the majority population. Upon comparison of the group of Roma men with the group of non-Roma men, the relative risk for both groups was approximately the same. No significant difference was therefore observed between positive cases in the Roma and non-Roma groups (Table 2).

**Table 1. Prevalence of C. trachomatis infection**

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roma</td>
<td>N n (%)</td>
<td>N n (%)</td>
<td>N n (%)</td>
</tr>
<tr>
<td></td>
<td>Roma</td>
<td>Non-Roma</td>
<td>Roma</td>
</tr>
<tr>
<td></td>
<td>Roma</td>
<td>Roma</td>
<td>n (%)</td>
</tr>
<tr>
<td></td>
<td>66 3 (4.6)</td>
<td>142 12 (8.5)</td>
<td>208 15 (7.2)</td>
</tr>
<tr>
<td>Non-Roma</td>
<td>75 4 (5.3)</td>
<td>57 3 (5.3)</td>
<td>132 7 (5.3)</td>
</tr>
</tbody>
</table>

**Table 2. Difference between positive cases of Roma and non-Roma by gender**

<table>
<thead>
<tr>
<th></th>
<th>Roma n (%)</th>
<th>Non-Roma n (%)</th>
<th>Relative risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>3 (4.8)</td>
<td>4 (5.3)</td>
<td>0.85 (0.2-3.67)</td>
</tr>
<tr>
<td>Women</td>
<td>12 (8.5)</td>
<td>3 (5.3)</td>
<td>1.8 (0.47-5.48)</td>
</tr>
<tr>
<td>Σ</td>
<td>15 (7.2)</td>
<td>7 (5.3)</td>
<td>1.4 (0.57-3.25)</td>
</tr>
</tbody>
</table>

**Table 3. The contribution of age, gender and ethnicity to the probability of C. trachomatis infection positivity**

<table>
<thead>
<tr>
<th></th>
<th>No. of positive cases (%)</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.99 (0.95-1.04)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7 (5.0)</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>15 (7.5)</td>
<td>1.49 (0.58-3.87)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Roma</td>
<td>7 (5.3)</td>
<td>1</td>
</tr>
<tr>
<td>Roma</td>
<td>15 (7.2)</td>
<td>1.28 (0.49-3.33)</td>
</tr>
</tbody>
</table>
We did not confirm any significant contribution of age, gender or ethnicity to the occurrence of *C. trachomatis* infection (Table 3).

**DISCUSSION**

The aim of the study was to explore the occurrence of the *Chlamydia trachomatis* infection in the population living in Roma settlements and compare it with the prevalence in the majority population. Despite the increased number of people with risk factors in the Roma community, no significant difference in the occurrence was found. Neither age nor gender contributes to the probability of the occurrence of *C. trachomatis* infection.

The Roma population is the largest and most disadvantaged ethnic minority group in Europe, and is believed to be vulnerable to sexually transmittable diseases due to early initiation of sexual life, higher prevalence of unprotected sexual behaviour (10–14) and barriers in access to health care system (8).

Urogenital chlamydial infection is the leading sexually transmitted disease in Europe and a reason of considerable acute morbidity and long-term reproductive health problems. In women, chlamydial infection can lead to reproductive morbidity. Infection of the lower genital tract occurs in the endocervix. Some women develop urethritis with symptoms of dysuria without frequency or urgency. Others may develop an ascending infection that causes acute salpingitis with or without endometritis, also known as pelvic inflammatory disease (PID), which long-term consequences are chronic pain, ectopic pregnancy and tubal factor infertility (15). In men, chlamydial infection is the most common cause of non-gonococcal urethritis and epididymitis, however, approximately 50% of men are asymptomatic (6, 7). Urethritis is secondary to *C. trachomatis* infection in approximately 15 to 55% of men. Symptoms, if present, include a mild to moderate clear to white urethral discharge. Untreated chlamydial infection can spread to the epididymis. Men with an asymptomatic infection serve as carriers of the disease spreading the infection while only rarely suffer long-term health problems themselves.

Early treatment is the best prevention not only for secondary complications but also for other STD. Screening is of great value among risk groups, mainly promiscuous individuals, intravenous drug users, people with low education level, and those refusing to use contraception. The question is whether the same approach used for this “selective” screening can be used for the general population (16).

Screening for *C. trachomatis* has medical and economic impact and has been introduced in most of European countries at the regional and national level (17). However, comparing the prevalence of *Chlamydia trachomatis* infections across countries is complicated, because most countries do not have mandatory reporting of urogenital chlamydial infections and in countries which have adopted mandatory reporting legislation, quality of the reporting system is poor (18). Such a comparison is also complicated due to the different diagnostic methods and sample selection techniques applied (19).

In Slovakia, there is no specific law establishing a systematic screening for this infection, and the disease is not included in the category of notifiable diseases. Therefore, data on prevalence of urogenital chlamydial infections differ significantly depending mainly on the diagnostic method used.

Screening for *C. trachomatis* infection in the Slovak population is only opportunistic; there is no system for regular screening. The lowest prevalence of *C. trachomatis* infection was measured in the university population (only 1.9%), while the highest was recorded in the subgroup of HIV-positive patients, sterile women and professional soldiers. Studies covering the general popula-

<table>
<thead>
<tr>
<th>Author</th>
<th>City/place</th>
<th>Population</th>
<th>Gender</th>
<th>Diagnostic method</th>
<th>Measured material</th>
<th>Prevalence of <em>C. trachomatis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kacena et al. (20)</td>
<td>Jarovnice</td>
<td>Roma</td>
<td>women</td>
<td>LCR</td>
<td>1st void urine</td>
<td>3.9%</td>
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<td>Košice</td>
<td>general</td>
<td>woman</td>
<td>PCR</td>
<td>urethral swab</td>
<td>7.0%</td>
</tr>
<tr>
<td>Šimko et al. (22)</td>
<td>Bratislava</td>
<td>general</td>
<td>women</td>
<td>PCR</td>
<td>cervical swab</td>
<td>4.8%</td>
</tr>
<tr>
<td>Batogová (23)</td>
<td>Košice</td>
<td>university students</td>
<td>women, men</td>
<td>PCR</td>
<td>1st void urine</td>
<td>1.9%</td>
</tr>
<tr>
<td>Špláková et al. (24)</td>
<td>Košice, B. Bystrica</td>
<td>general</td>
<td>woman</td>
<td>PCR</td>
<td>vaginal swab</td>
<td>4.2%</td>
</tr>
<tr>
<td>Jarčuška et al. (25)</td>
<td>Košice</td>
<td>university students</td>
<td>women</td>
<td>PCR</td>
<td>vaginal swab</td>
<td>2.2%</td>
</tr>
<tr>
<td>Točková et al. (26)</td>
<td>Košice</td>
<td>general</td>
<td>woman</td>
<td>PCR</td>
<td>cervical swab</td>
<td>4.7%</td>
</tr>
<tr>
<td>Batogová et al. (27)</td>
<td>Košice</td>
<td>Roma</td>
<td>woman</td>
<td>PCR</td>
<td>1st void urine</td>
<td>4.4%</td>
</tr>
<tr>
<td>Batogová et al. (27)</td>
<td>Košice</td>
<td>patients with chronic hepatitis</td>
<td>woman</td>
<td>PCR</td>
<td>1st void urine</td>
<td>3.3%</td>
</tr>
<tr>
<td>Batogová et al. (27)</td>
<td>Košice</td>
<td>sterile women</td>
<td>woman</td>
<td>PCR</td>
<td>1st void urine, cervical swab</td>
<td>17.4%</td>
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<td>Vološínová et al. (28)</td>
<td>Banská Bystrica</td>
<td>professional soldiers</td>
<td>women, men</td>
<td>PCR</td>
<td>1st void urine, cervical swab</td>
<td>22.2%</td>
</tr>
<tr>
<td>Vološínová et al. (28)</td>
<td>Banská Bystrica</td>
<td>general population</td>
<td>women, men</td>
<td>PCR</td>
<td>1st void urine, cervical swab</td>
<td>5.3%</td>
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<td>Vološínová et al. (28)</td>
<td>Banská Bystrica</td>
<td>HIV positive</td>
<td>women, men</td>
<td>PCR</td>
<td>1st void urine, cervical swab</td>
<td>10.5%</td>
</tr>
</tbody>
</table>
tion of Slovakia have reported prevalence between 4.2 to 7.0%. An overview of Slovak screening studies is presented in Table 4.

The prevalence of C. trachomatis infection in our sample (majority population: 5.3%, Roma settlements: 7.2%) corresponds with the findings of these studies. In the first Slovak study on the prevalence of C. trachomatis, prevalence among woman from the Roma population in Jarovnice (a Roma settlement neighbourhood Sabinov) was measured at only 3.9% using ligase chain reaction. In the same study the prevalence of C. trachomatis among university students was 8.2% (20). In another study conducted by Balogová et al. in 2009, the prevalence of C. trachomatis infection in the Roma population in Košice (a city with approx. 250,000 inhabitants) was 4.4% (27). Similar findings on the Roma population were reported in our study (Roma male: 4.5%, Roma female: 8.5%).

Despite the fact that Roma living in settlements do not differ from the majority population in the prevalence of C. trachomatis infection, the impact on health, particularly in terms of infertility, might be different and unfavourable compared with the majority population due to pregnancy at the earlier age among Roma women. Nevertheless, there are also other health consequences which might be more pronounced among the population living in Roma settlements due to barriers to the health care system and their lower ability to benefit from the health care services provided.

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Conflict of Interests
None declared.

APPENDIX


REFERENCES


FACULTY OF MEDICINE PAVOL JOZEF ŠAFÁRIK UNIVERSITY IN KOŠICE

The Faculty of Medicine at Pavol Jozef Šafárik University in Košice is an institution with over 65-year long history. Teaching of medical students began in September 1948, and since then it has educated over 12 thousand of them for their prospective profession. Since 1992, it enables international students to complete their medical studies in the English language - young people from forty countries of the world avail themselves of this opportunity at present.

The Faculty of Medicine at Pavol Jozef Šafárik University in Košice is the oldest faculty of this University. It provides doctoral study in the study branches of General Medicine and Dental medicine, as well as Bachelor’s and Magister’s degree study programmes in Nursing, Physiotherapy, and Public Health. It also offers PhD study and post-graduate training of health professionals, including specialized education. In addition to its teaching activity, the Faculty is engaged in abundance of scientific and research activities in both national and international projects, using its unique laboratories and equipment funded by the European Structural Funds. Orientation of the Faculty at major research projects increases the quality of research output, rating, and prestige of the Faculty of Medicine at Pavol Jozef Šafárik University in Košice, including the focus on the quality of learning that observes current knowledge of medical science.

The Faculty of Medicine consists of 60 units – institutes, departments, scientific research and experimental workplaces, and special-purpose facilities. Its modern high-rise building is located in close proximity to the L. Pasteur University Hospital, where students take the bulk of their practical training. Its teaching base represents a total of 11 medical institutions that allow students a direct contact with patients and employment of modern treatment methods.

The Faculty of Medicine at Pavol Jozef Šafárik University in Košice is an agile institution that enjoys its unique position in the development of medical science and in education of physicians in the field of human medicine not only for covering the societal demand of Slovakia, but also in many other countries of the world - Europe, Asia, Africa, America, and Australia. It is very successful in fulfilling its basic social mission - educating high-quality physicians and implementing top-quality medical research. Quality teaching at this Faculty provides a very good basis for employment of its graduates in the labour market.

Address: Trieda SNP 1, 040 11 Košice, Slovakia
Web: www.medic.upjs.sk
