

AWARENESS OF TICK-BORNE BACTERIAL INFECTION IN THE STUDENTS OF NON-MEDICAL UNIVERSITIES IN TERNOPIL REGION (WESTERN UKRAINE)

ŚWIADOMOŚĆ STUDENTÓW KIERUNKÓW NIEMEDYCZNYCH W TARNOPOLU (UKRAINA ZACHODNIA) W ZAKRESIE RYZYKA ZAKAŻEŃ PATOGENAMI PRZENOSZONYMI PRZEZ KLESZCZE

Svitlana Nykytyuk^{1(A,B,C,D,E,F)}, Anna Pańczuk^{2(A,B,D)}, Mariia Shkilna^{1(A,B,C,D,E,F)},
Małgorzata Tokarska-Rodak^{3(A,B,D)}, Adam Szepeluk^{4(C)},
Larysa Melnyk^{1(C)}, Mykhailo Korda^{1(A,B,D,E)}

¹I. Horbachevsky Ternopil State Medical University, Ukraine

²Institute of Physical Education and Physiotherapy, Pope John Paul II State School of Higher Education in Biala Podlaska, Poland

³Institute of Health Sciences, Pope John Paul II State School of Higher Education in Biala Podlaska, Poland

⁴Innovation Research Centre, Pope John Paul II State School of Higher Education in Biala Podlaska, Poland

Authors' contribution

Wkład autorów:

- A. Study design/planning
zaplanowanie badań
- B. Data collection/entry
zebranie danych
- C. Data analysis/statistics
dane – analiza i statystyki
- D. Data interpretation
interpretacja danych
- E. Preparation of manuscript
przygotowanie artykułu
- F. Literature analysis/search
wyszukiwanie i analiza literatury
- G. Funds collection
zebranie funduszy

Summary

Background. The aim of the study was to evaluate the awareness of Lyme borreliosis prevention and exposure to ticks in non-medical students of 2 universities in Ternopil Region (Western Ukraine). **Material and methods.** The study was conducted by surveying 252 young persons studying at non-medical universities in Ternopil (Western Ukraine): 119 students of Ternopil Volodymyr Hnatyuk National Pedagogical University (TNPU) and 133 of Ternopil Ivan Puluj National Technical University (TNTU), aged 18-23 years old. All the participants completed a questionnaire. **Results.** The students of Ternopil Volodymyr Hnatyuk National Pedagogical University (TNPU) and Ternopil Ivan Puluj National Technical University (TNTU), Ternopil, understand that the risk of being infected with Lyme borreliosis does not only appear in forests, but also in gardens, parks, and countryside. Still, 16.5% of the students of both Ternopil universities showed very low awareness about Lyme borreliosis. Most TNPU respondents in the study group (40.7%) were bitten by a tick in the abdomen area; 31.3% of the TNTU students declared being bitten in lower limbs. Students of both universities recorded the fewest bites in the chest area (7.1% in TNTU and 13.0% in TNPU respectively). As for the most frequent methods of tick removal, 71.4% of the respondents lubricated it with fat (e.g. butter, oil) and 42.0% twisted it out with tweezers.

Conclusions. Education towards proper methods of tick removal, prevention of tick bites (clothes, repellents) should become an important element of protection measures in students in the regions of high Lyme borreliosis frequency, including Ternopil.

Keywords: Lyme borreliosis, knowledge, prevention, students, Ternopil (Western Ukraine)

Streszczenie

Wprowadzenie. Celem pracy była ocena świadomości studentów na kierunkach niezwiązanych z medycyną na dwóch uniwersytetach w regionie Tarnopola (Zachodnia Ukraina) w zakresie zapobiegania boreliozie z Lyme. **Materiał i metody.** Badanie zostało przeprowadzone wśród 252 młodych osób studiujących na uniwersytetach w Tarnopolu (Zachodnia Ukraina): 119 studentów z Narodowego Uniwersytetu Pedagogicznego im. Hnatyuka (TNPU) oraz 133 z Narodowego Uniwersytetu Technicznego im. Ivana Puluga (TNTU) w wieku 18 lat – 23 lata. Jako narzędzie badawcze wykorzystano autorski kwestionariusz ankiety. **Wyniki.** Studenci z Narodowego Uniwersytetu Pedagogicznego (TNPU) i Narodowego Uniwersytetu Technicznego (TNTU) w Tarnopolu rozumieją, że ryzyko zarażenia boreliozą z Lyme pojawia się nie tylko w lasach, ale także w ogrodach, parkach i na wsi. Mimo to, 16,5% studentów szkół wyższych w Tarnopolu wykazało bardzo małą świadomość na temat tej choroby. Większość respondentów z TNPU, w grupie badanej (40,7%), została ugryziona przez kleszcze w okolicy brzucha; 31,3% uczniów TNTU stwierdziło, iż zostali pogryzieni w okolicach kończyn dolnych. Studenci obu uczelni zanotowali najmniej pogryzień na klatce piersiowej (odpowiednio 7,1% w TNTU i 13,0% w TNPU). Jeśli chodzi o najczęstsze metody usuwania kleszczy, 71,4% respondentów stwierdziło, iż smarowało kleszcza tłuszczem (np. masłem, olejem) zaś 42,0% pozbyło się go za pomocą pincety.

Wnioski. Edukacja na temat właściwych metod usuwania kleszczy, zapobiegania pogryzieniu (odzież, środki odstraszające) powinna stać się ważnym elementem środków ochronnych u studentów w regionach o wysokiej częstotliwości występowania boreliozy z Lyme, w tym w Tarnopolu.

Słowa kluczowe: borelioza z Lyme, wiedza, zapobieganie, studenci, Tarnopol (Zachodnia Ukraina)

Tables: 4
Figures: 0
References: 8
Submitted: 2017 May 31
Accepted: 2017 Jun 20

Nykytyuk S, Pańczuk A, Shkilna M, Tokarska-Rodak M, Szepeluk A, Melnyk L, et al. Awareness of tick-borne bacterial infection in the students of non-medical universities in Ternopil region (western Ukraine). *Health Problems of Civilization*. 2017; 11(2): 99-102. doi: 10.5114/hpc.2017.69026.

Address for correspondence / Adres korespondencyjny: Svitlana Nykytyuk, I. Horbachevsky Ternopil State Medical University, m.Voli, 1, Ternopil, 46001, Ukraine, e-mail: nadiya20743@gmail.com, phone: +380 352 524492

Copyright: © 2017 Pope John Paul II State School of Higher Education in Biala Podlaska, Svitlana Nykytyuk, Anna Pańczuk, Mariia Shkilna, Małgorzata Tokarska-Rodak, Adam Szepeluk, Larysa Melnyk, Mykhailo Korda. This is an Open Access journal, all articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License (<http://creativecommons.org/licenses/by-nc-sa/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material, provided the original work is properly cited and states its license.

Introduction

Lyme disease (also known as systemic disease, Lyme borreliosis or chronic migratory erythema) is a natural-focal disease transmitted by *Borrelia burgdorferi*. It is spread by ticks, and manifests itself by migratory ring-shaped erythema, fever, disorders of central and peripheral nervous system, heart and large joints [1]. Cases of that disease have been reported in large areas of Eurasian forests and forest-steppe zones [2, 3]. Western Ukraine, including Ternopil Region, is an endemic territory of Lyme borreliosis [3]. The main natural reservoir of *Borrelia burgdorferi sensu lato* are *Ixodes* mites. The territories where ticks of the genus *Ixodes* were found comprise 57 settlements in 14 districts of our region and in the city of Ternopil [4]. Typically, primary lesions appear in spring and summer, which is determined by the period of tick activity [5]. However, the highest morbidity rates are recorded in the countries of Central Europe, Scandinavia and the Baltic States [6].

The aim of the study was to evaluate the awareness of Lyme borreliosis prevention and exposure to ticks in non-medical students of 2 Ternopil universities: Volodymyr Hnatyuk National Pedagogical University (TNPU) and Ivan Puluj National Technical University (TNTU).

Material and methods

The study group consisted of 252 young people, aged 18-23 years old ($=18.4 \pm 1.0$), who were examined because of high risk of exposure to Lyme borreliosis: 119 students (47.2%) represented Volodymyr Hnatyuk National Pedagogical University (TNPU), and 133 (52.8%) – Ivan Puluj National Technical University (TNTU).

The main research tool was a questionnaire which consisted of 15 questions. The inquiries concerned possible preventive measures taken while staying in the areas where ticks prevail, i.e. the use of repellents and examining the body after returning from the green areas, as well as the awareness of the correct methods of tick removal from the skin. Students of two different universities were also asked to assess their own knowledge on prevention of tick-borne diseases and to evaluate the awareness. Besides, the respondents indicated whether they had been bitten by ticks. The results of the study were subjected to statistical analysis.

In order to test whether the above mentioned variables are independent of each other the Pearson's chi-squared test (χ^2) was used. For statistical inference, the significance level of 0.05 was chosen. Statistical analyses were performed by STATISTICA Software v. 10 (StatSoft, Poland).

Results

Measures taken to prevent Lyme borreliosis and ticks associated diseases

Table 1. Areas to apply a repellent most often indicated by the surveyed non-medical students of TNTU and TNPU

	In the forest	In the park	In the garden	On the meadows
TNTU	98.5 %	79.7 %	57.9 %	19.5 %
TNPU	98.3 %	77.3 %	39.5 %	26.9 %

Students of both Ternopil universities understood that Lyme borreliosis, an infectious disease, is spread not only in forests but also in gardens, parks, and the countryside of the region.

In the study, various methods of tick removal were presented. Most respondents (71.4% of TNPU and 62.4% of TNTU respectively) stated that they lubricated the tick with fat (e.g. butter, oil) in order to remove it, which was thought to be the most proper method (Table 2).

Table 2. Methods of removing ticks anchored in the skin that were considered to be proper by the surveyed non-medical students of TNTU and TNPU

Tick removal method	Students of the surveyed group		Statistical significance
	(TNTU) (%)	(TNPU) (%)	
Pull out with fingers	1.5	1.7	$p = 0.9107, \chi^2 = 0.01$
Remove with tweezers by a single move	26.3	34.5	$p = 0.1600, \chi^2 = 1.97$
Twist out with tweezers	28.6	42.0	$p = 0.254, \chi^2 = 5.00$

Scrape off with a fingernail	0.8	0.8	$p = 0.3723, \chi^2 = 0.80$
Apply an antiseptic	30.8	36.1	$p = 0.3723, \chi^2 = 0.80$
Lubricate with fat (e.g. butter, oil) to make it get out	62.4	71.4	$p = 0.1293, \chi^2 = 2.30$
Other methods	19.2	4.2	$p = 0.0002, \chi^2 = 13.7$

Awareness of Lyme disease and ticks in students of TNTU and TNPU

16.5% of the students of Ivan Puluj National Technical University (TNTU) and 16% of Volodymyr Hnatyuk National Pedagogical University (TNPU) evaluated their awareness of Lyme borreliosis as minimal, 21.8% of TNPU students and 26% of TNTU students – as average.

The lack of knowledge of Lyme borreliosis in TNPU students was more visible in TNTU students as it concerned 42.9% of the surveyed group, whereas in TNPU it could be said about 40.3%. The students of both Ternopil universities were asked to deepen their knowledge of Lyme borreliosis. A willingness to do that was expressed by 62.4% of TNTU students and 74.8% of TNPU.

About 16% of the young people of both Ternopil universities considered their awareness of Lyme borreliosis as minimal. Only 1.5% of TNPU and 4.5 % of TNTU students regarded their knowledge as sufficient: $p=0.4065, \chi^2=2.90^* - p<0.05$.

A single tick bite was reported by 31.6% of the students of the technical university and 45.4% of the pedagogical one and as many as 53.8% of TNPU and 68.4% of TNTU respondents were bitten repeatedly.

Most of the TNPU respondents (40.7%) were bitten by a tick in the abdomen area, and 31.3% of TNTU students declared being bitten into lower limbs. The chest area was the least likely bite area according to the students of both universities (7.1% of TNTU and 13.0% of TNPU respectively) (Table 3).

Table 3. Bite areas indicated by the surveyed non-medical students

The area of a tick bite	Students of non-medical universities		Statistical significance
	(TNTU)	(TNPU)	
Upper limb	16.7	25.9	$p = 0.2763, \chi^2 = 1.19$
Lower limb	31.3	35.2	$p = 0.6625, \chi^2 = 0.19$
Neck	19.1	20.4	$p = 0.08718, \chi^2 = 0.03$
Chest	7.1	13	$p = 0.3544, \chi^2 = 0.86$
Shoulders	9.5	13.	$p = 0.08, \chi^2 = 6.8$
Head	20.0	14.4	$p = 0.57, \chi^2 = 0.4519$
Abdomen	21.45	40.7.	$p = 0.0447, \chi^2 = 4.03$
Other	14.3	13.0	$p = 0.1455, \chi^2 = 2.12$

Further, the respondents referred to the question concerning Lyme disease symptoms. The answers given are presented in Table 4. 93.0% of TNTU students considered that the main symptom of this disease is impaired concentration; 35.3% of TNPU students pointed to headaches as the main manifestations of the disease.

Table 4. Symptoms of Lyme borreliosis

Main symptoms	(TNTU)	(TNPU)	Statistical significance
Headaches	25.6%	35.3%	$p = 0.2929, \chi^2 = 2.82$
Bone pain	11.3%	8.4%	$p = 0.4460, \chi^2 = 0.58$
Arthritis	13.5%	15.1%	$p = 0.7184, \chi^2 = 0.13$
Weakening of concentration	93%	10.1%	$p = 0.7744, \chi^2 = 0.08$
Damage of the nervous system	63%	7.6%	$p = 0.6248, \chi^2 = 0.24$
Inflammation of the brain membranes	5.3 %	10.9%	$p = 0.0970, \chi^2 = 2.75$

Changes in the skin	36.8%	43.7%	p = 0.2676, $\chi^2 = 1.23$
I do not know	49.6%	29.4%	p = 0.0026, $\chi^2 = 11.93$

Discussion

The skin of lower limbs, buttocks, groins and abdomen, as well as head in children, are the most frequent bite sites [7]. The largest group of the respondents taking part in the study (40.7%) were bitten in the abdomen area, and lower limbs (35.2%).

According to literature, about two thirds of the patients with Lyme disease removed the tick improperly [8]. In the presented study, various methods of tick removal were presented. The most frequent turned out to be: lubricating the tick with fat (e.g. butter, oil) – 71.4% of the provided answers, and twisting the tick out with tweezers – 42.0% of the respondents' choices.

51.9 % of the TNTU and 50 % of the TNPU students stated that checking the skin after coming back home ($p=0.7064$, $\chi^2=0.70$) is essential. The need of protective measures against ticks in a forest zone was understood only by 1.7% of TNPU and 12.5% of TNTU students respectively.

Conclusions

1. The students of both Ternopil universities understand that there is a risk of being infected with Lyme borreliosis, which can spread not only in forests, but also in gardens, parks, and the countryside.
2. 16.5% of the students of Volodymyr Hnatyuk National Pedagogical University (TNPU) and Ternopil Ivan Puluj National Technical University (TNTU) evaluate their awareness of Lyme borreliosis as minimal.
3. Education towards proper methods of tick removal, tick bite prevention (clothes, repellents) should become an important element of the measures taken to educate students living in the regions of high Lyme borreliosis incidence, including Ternopil.

References:

1. Andreychina MA (editor). Infectious disease in general practice and family medicine. Ternopil: TDMU, Ukrmedkknnya; 2007 (in Ukrainian).
2. Fedonyuk LYa, Chaban GP, Avsyukevich OE. Epidemiological characteristic, peculiarities of clinical course and diagnosis of systemic tick borreliosis in the Ternopil region. Tavrisheskiy Mediko-Biological Vesnik. 2013; 16(1): 198-202 (in Ukrainian).
3. Shkilna M. Lyme borreliosis in forestry workers of Ternopil region. Infectious diseases. 2016; 1(83): 36-40 (in Ukrainian).
4. Vasiliev NA, Ivakhiv OL, Kachor VO, et al. Lyme disease in Ternopil region. Infectious Diseases. 2011, 2: 50-53 (in Ukrainian).
5. Kramarev S.A. Lyme disease. Health of Ukraine. 2011: 58-59 (in Ukrainian).
6. Krūmiņa A, Vasiljeva G, Lucenko I, Karelis G, Logina I. Laimboreliozs: Literatūras un starptautisko vadlīniju apskats. Doctus. 2013; 8: 10–14 (in Lithuanian).
7. Bartosik K, Kubrak T, Olszewski T, Jung M, Buczek A. Prevention of tick bites and protection against tick-borne diseases in south-eastern Poland. Ann Agric Environ Med. 2008; 15: 181–185.
8. Slimību profilakses un kontroles centrs. Informācija un ieteikumi izglītības iestādēm ērču pārnesto slimību profilaksei. [cited 07 June 2017]. Available from: <http://www.spkc.gov.lv/ieteikumi-skolam-un-bernu-darziem/905/informacija-un-ieteikumi-izglitiba-iestadem-ercu-parnesto-slimibu-profilaksei> (in Lithuanian).