

Abstract

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CLINICAL AND EPIDEMIOLOGICAL FEATURES OF LYME BORRELIOSIS

Lyme borreliosis (LB) is the most common transmissible disease of tick-borne origin. This disease is a significant medical challenge due to the damage to many organs and systems and the tendency to chronicity and long-term disability in the future. Currently, there is an upward trend in the incidence of Lyme disease in Sumy Oblast. Thus, in Ukraine in 2015 the incidence was 7.96 per 100,000 population, and in 2019 it increased to 10.62. The average level of indicators was exceeded in Kyiv Oblast (29.0), Cherkasy Oblast (25.4), Vinnytsia Oblast (23.09), Sumy (25.89) Oblast, and Kyiv (2.54). The peak of tick activity in Ukraine is registered in May and has increased by 4.23 times. The maximum number of patients falls within the working population and causes significant state financial damage.

The increase in the number of cases indicates a spread of Lyme disease in Sumy Oblast. In order to prevent the spread, it is necessary to study all possible causes of this disease and find ways to eliminate them. This was the ground for the creation of a unified anonymous questionnaire, which covers the main issues regarding this disease from the standpoint of different population groups.

A unified anonymous "Questionnaire for Lyme disease patients" contains 16 multiple choice questions and an option for comments. The first group of questions concerned gender, age, and social data of respondents (the largest part of patients fell within the working population – 42.86%). The next group of questions clarified the epidemiological features of this pathology (circumstances, date, time, location, body part bitten). Most often tick bites occurred during walks in the urban forests (42.86% of cases). Most respondents reported that tick bites had happened in June and July (39.29%).

Other questions were designed to determine patients' awareness about Lyme borreliosis prevention. The next group of questions was aimed at clarifying the clinical features of the disease (lower extremities were the most frequent site of a tick bite) (46.43%), with erythema dominating among the clinical manifestations of Lyme borreliosis (91.07%).

According to the anonymous questionnaire, we analyzed and evaluated awareness of diagnosis, clinical signs, and measures of

Lyme disease prevention in the patients who were receiving treatment at Municipal Non-Commercial Enterprise of Sumy Regional Council "Medical Clinical Center of Infectious Diseases and Dermatology Named After Z. Krasovytskyi" and SSU University Clinic.

Keywords: borreliosis, survey, questionnaire, ticks.

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Резюме

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КЛІНІКО-ЕПІДЕМІОЛОГІЧНІ ОСОБЛИВОСТІ ЛАЙМ-БОРЕЛІОЗУ

Лайм-бореліоз (ЛБ) є найпоширенішим трансмісивним захворюванням, що передається кліщами. Дана хвороба є значною медичною проблемою з огляду на можливість ураження багатьох органів і систем, схильністю до хронізації та тривалої втрати працездатності та інвалідності. На даний час існує тенденція до зростання захворюваності на хворобу Лайма в Сумській області. Так, в Україні у 2015 р. інцидентність складала 7,96 на 100 тис. населення, а у 2019 р. – зросла до 10,62. Перевищення середнього рівня показників реєструється у Київській (29,0), Черкаській (25,4), Вінницькій (23,09), Сумській (25,89) областях та м. Київ (2,54). Пік активності кліщів в Україні реєструється в травні, який збільшився у 4,23 рази. Найбільший відсоток хворих припадає на працездатне населення, та завдає значних збитків державі.

Збільшення кількості випадків захворювання говорить про масове поширення збудників хвороби Лайма у Сумській області. Для того, щоб попередити їх розповсюдження, необхідно вивчити усі можливі причини даної хвороби та знайти шляхи їх вирішення. Це і стало підставою для створення уніфікованого анонімно-опитувальника, який висвітлює основні питання стосовно даного захворювання з позиції різних категорій населення.

Уніфікована анонімна «Анкета хворого на хворобу Лайма» вміщує 16 питань із варіантами відповідей та можливістю вносити власні коментарі. Перша група запитань стосується гендерних, вікових та соціальних даних осіб, що проходять анкетування (найбільший відсоток хворих припадає на працездатне населення (42,86 %). У наступній групі запитань з'ясовуються епідеміологічні особливості даної патології (обставини, дата, час, місцевість, локалізація присмокування кліща). Найчастіше напади кліщів відбувалися при відвідуванні лісопаркових осередків міста, що встановлено у 42,86 % випадків та більша частина опитаних відмічають напади кліщів у червні та липні, що становить 39,29 %.

Інші питання спрямовані на знання профілактики Лайм-бореліозу. Наступна група запитань направлена на з'ясування клінічних особливостей перебігу хвороби (частим місцем присмокування кліща є нижні кінцівки (46,43 %), серед клінічних форм Лайм-бореліозу переважає еритемна (91,07 %).

За даними анонімно-анкетування було проаналізовано та оцінено інформованість хворих, які отримували лікування в КНП СОР МКЦИХТД імені З. Й. Красовицького та Університетській

клініці СумДУ, щодо діагностики, клінічних ознак та заходів профілактики хвороби Лайма.

Ключові слова: бореліоз, опитування, анкета, кліщі.

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Introduction

Lyme borreliosis (LB) is the most common transmissible disease of tick-borne origin. This disease is a significant medical challenge due to the damage to many organs and systems and the tendency to chronicity and long-term disability in the future. LB was first diagnosed as an individual disease in 1976 in Old Lyme, Connecticut, USA [1].

In 1982, W. Burgdorfer discovered the causative agent of this disease when studying the intestinal contents of the Ixodes mite and showed that the disease was of spirochetic nature [3].

Official statistics records on the incidence of Lyme disease in various countries around the world were started in the 80s of the 21st century. Over the past 20 years, the number of reported cases in the United States has tripled and has been steadily increasing in the northern regions of Europe [4]. Tens of thousands of new infections are reported every year. In the United States, LB accounts for > 90% of all reported transmissible diseases, which is ≈300,000 cases per year. LB ranks second among the fastest spreading infectious disease trailing only the HIV infection. Numerous epidemiological studies confirm that the average annual number of reported LB cases in Europe exceeds 65,400 (the incidence rate varies from 1 to 350 per 100,000 population), including some regions with more than 100 cases per 100,000 population annually (Slovenia, Germany and Austria, the Baltic coast, southern Sweden, and some islands in Estonia and Finland) [4]. In the south of Sweden, 69 cases of Lyme disease were registered per 100,000 people in 2019, with a peak incidence at the age of 5–9 years and 60–69 years. The incidence of Lyme borreliosis in Slovenia is 206 cases per 100,000 population, and in Austria, it is 135 per 100,000 population, which are the highest rates in Europe [5]. The incidence of verified disseminated LB cases in Finland has increased from 44 per 100,000 in 2011 to 61 per 100,000 in 2018 [6].

Epidemiological indicators of Lyme borreliosis (LB) incidence in the countries neighboring Ukraine are also indicative of the urgency of this problem [7]. In the Republic of Belarus, the values increased by 15 times in 1996–2012 – from 0.74 to

11.6 per 100,000 population. In Poland in 2013, the incidence of LB increased by 45% as compared to 2012 and amounted to 33.3 per 100,000 population [8].

Official registration of patients with Lyme disease in Ukraine started in 2000, with 58 LB infection cases detected (which was 0.12 per 100,000 population). According to the Laboratory Center of Ukraine, 4,482 people contracted tick-borne borreliosis (10.62 per 100,000 population) in 2019. Thus, the incidence of Lyme disease has increased by 88 times over a 19-year period of official statistics recording. Analysis by regions of Ukraine revealed high LB incidence in Kyiv Oblast, Vinnytsia Oblast, Zhytomyr Oblast, Poltava Oblast, Sumy Oblast, Ternopil Oblast, Cherkasy Oblast, Chernihiv Oblast. However, despite a 20-year period of research, LB still remains one of the "new" nosologies and is paid too little attention [9].

In Ukraine, LB takes a dominant place in the structure of infectious pathologies according to the degree of negative impact on public health. Based on the results of studies, *Borrelia burgdorferi* was found to be the cause of unexplained neurological (16.7%) and pseudorheumatological (20.7%) pathologies [2].

Untimely diagnosis and treatment lead to late-onset lesions of various organs and systems, which in turn makes conditions for chronicity (in 3.5–10.6% of total cases), long-term disability, and in some cases mortality. Chronic LB can mimic the clinical picture of multiple sclerosis, Alzheimer's disease, Lyme-induced arthritis, systemic scleroderma, chronic fatigue syndrome, fibromyalgia and others [2].

Many factors contribute to the annual spread of natural sites of infection and create the conditions for *Borrelia burgdorferi* transmitting agents and reservoirs in Ukraine. These include irrational use of natural resources disregarding environmental requirements, changes in the structure of vegetation and climate, no insecticide-acaricide treatments for many years [10].

Thus, the rapid spread of Lyme borreliosis in Ukraine and in the world as a whole, lack of public vigilance towards this disease, frequency of chronicity of the process, and frequent adverse

effects make it necessary to assess public awareness about the etiology, transmission, diagnosis, treatment, and prevention of this disease.

Objective. To study clinical and epidemiological features of Lyme borreliosis and to assess public awareness about the disease.

Materials and methods. The study was conducted using a sociological survey (face-to-face, one-time, individual) under conditions of confidentiality.

The study was conducted at Municipal Non-Commercial Enterprise of Sumy Regional Council "Medical Clinical Center of Infectious Diseases and Dermatology Named After Z. Krasovytskyi" and SSU University Clinic. We surveyed a total of 56 subjects who were undergoing outpatient and inpatient treatment for Lyme disease.

Statistical processing of the results was performed using the Microsoft Office software package. Student's t-test was used to calculate the significance of the difference between quantitative traits in groups; the dependence of traits was evaluated using the Pearson correlation coefficient.

Results and discussion. Among all surveyed subjects, women outnumbered men 1.2 to 1 (53.58% and 46.42%, respectively). The majority of respondents were young (47.86%) and middle-aged people (41.07%), the elderly respondents totaled 16.07%.

Among the surveyed, the distribution of subjects was as follows: forestry workers (the risk group) – 2 persons (3.57%), the military – 2 (3.57%), medical workers – 4 (7.14%), persons of retirement age and unemployed – 13 (23.22%), other professions (accountants, teachers, drivers, cashiers, security guards) – 35 (62.5%).

"How do you know about Lyme disease?" – 48.21% of respondents said that they had already had Lyme disease. 35.71% of subjects read about this disease, which is 2.2 times more as compared to those who had their relatives or acquaintances diagnosed with the disease (16.08%).

53.57% of respondents noticed the tick bite, and 46.43% did not remember it. This may indicate that after a walk in a forest or other places inhabited by ticks, people do not carry out self- and mutual inspection to check for embedded ticks. Most respondents were bitten by ticks in Sumy – 37.50%, which is almost twice as much as the cases in Sumy district – 19.64%; 10.71% of cases were registered in Krasnopillia district and 7.14% – in Trostyanets district. 3.57% of subjects were bitten by ticks in Lebedyn district, Velyka Pysarivka district, Shostka district, and Romny district. In Nedrygailiv district and Okhtyrka district each 1.79% of subjects were bitten. Outside Sumy Oblast the comparative indexes are: in Chernihiv and Yavoriv district (Lviv Oblast) the rate is 3.57% (Fig. 1).

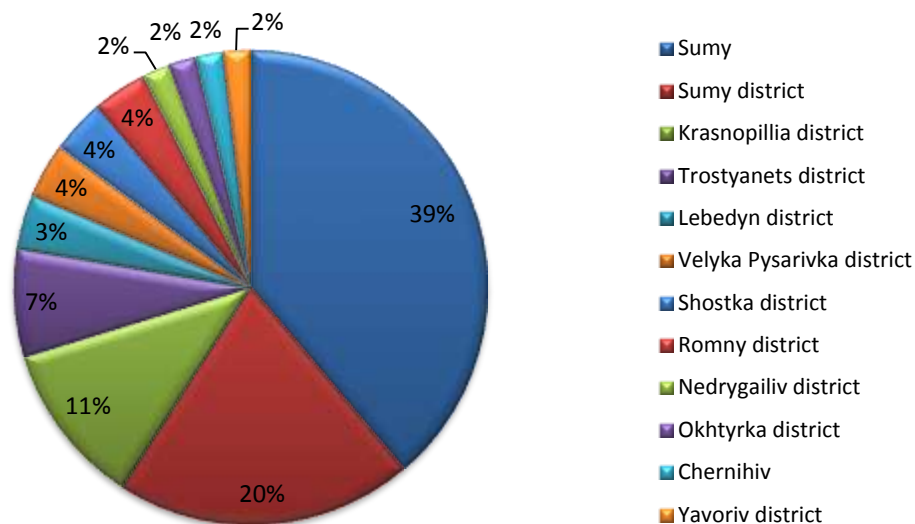


Figure 1 – Location of a tick bite event

Based on our observations, we registered different locations of tick bite event and different body parts bitten. Most often tick bites occurred during walks in the urban forests (42.86% of cases). During country cottage stay and work in the

backyard, tick bites were reported in 25.0% and 14.28%, respectively. In 17.86% of cases, tick bites were registered in the forest, where people were having their leisure time (picking berries, mushrooms) (Fig. 2).

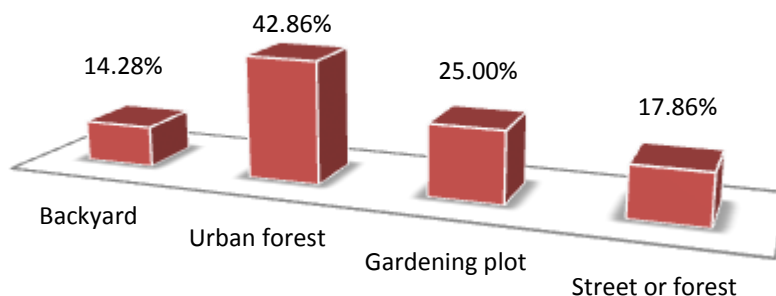


Figure 2 – Distribution of zoonotic foci

Most respondents reported that tick bites had happened in June and July (39.29%); 19.63% of cases happened in April-May; 17.86% – in August-September period and in October-November period each.

26.78% of respondents did not remember a tick bite, 46.43% of subjects noticed a tick bite once,

14.29% – twice, and 12.50% – remembered being bitten 3 times and more.

Most often the bites were observed on the lower extremities – 46.43%, trunk – 26.79%, abdomen – 12.50%, upper extremities – 10.71%, head – 8.93%, neck – 1.79% (Fig. 3)

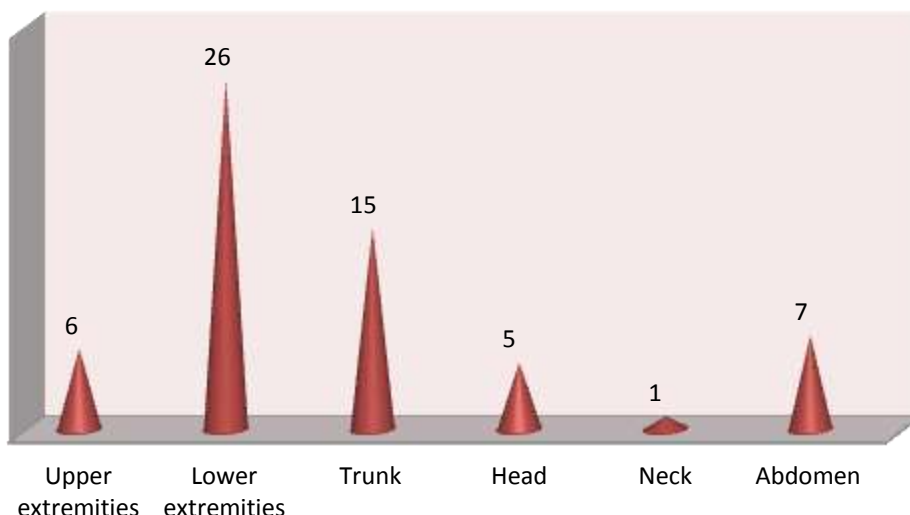


Figure 3 – The body part bitten

Only 7.14% of ticks were removed by surgeons. Half of the respondents (50%) removed the tick themselves, 14.29% of subjects had it removed by the other person. 5.36% of subjects disinfected the bite site, 8.93% of respondents lubricated the site with oil, which is strictly prohibited.

78.57% of people did not receive antibiotics and did not realize that they were meant to do so. 21.43% of subjects undertook preventive treatment for borreliosis, of whom 66.68% received doxycycline, 16.66% received ampicillin and 16.66% took other antibiotics. Of these, 4 respondents (33.33%) underwent a course of antibiotic prophylaxis for as long as 1 to 3 days and 4 persons (33.33%) – for 10

days. A few patients (2 – 16.68%) had a prophylactic course using antibiotics for as long as 5 to 7 days. 8.33% of subjects took antibiotics for as long as 10–14 days and 8.33% – for more than 14 days.

Most respondents reported erythema migrans (91.07%). Erythema migrans appeared as a red macula or papule at the tick bite site. 62.74% of respondents reported redness on day 15 and later, 23.53% – on day 10 to 15, and 13.73% of patients observed erythema up to the 10th day after a tick bite.

The redness area around the bite site expanded and separated from the unaffected skin by a bright red border. The size of the erythema ranged 3 to 70

cm. The color intensity of the affected skin was uniform; sometimes at the site of erythema, a few red rings with central clearing appeared – a "bull's eye" pattern (Fig. 5). In some patients, the signs of the disease were limited to skin lesions at the site of a tick bite and mild general symptoms.

Most commonly, erythema was localized on the lower extremities (66.67%), less often – on the body (25.49%) and upper extremities (13.73%). In a small

number of patients, there were: fatigue (48.21%), performance impairment (42.86%), muscle and joint pain (39.29%). 21.43% of subjects had a fever. Sweating and chills were reported by 17.86% of patients, reduced vision was observed in 7.14%, and high blood pressure – in 7.14% of respondents. Memory impairment was registered in 5.36% of subjects, other complaints were observed in 8.93% of patients (Fig. 4).

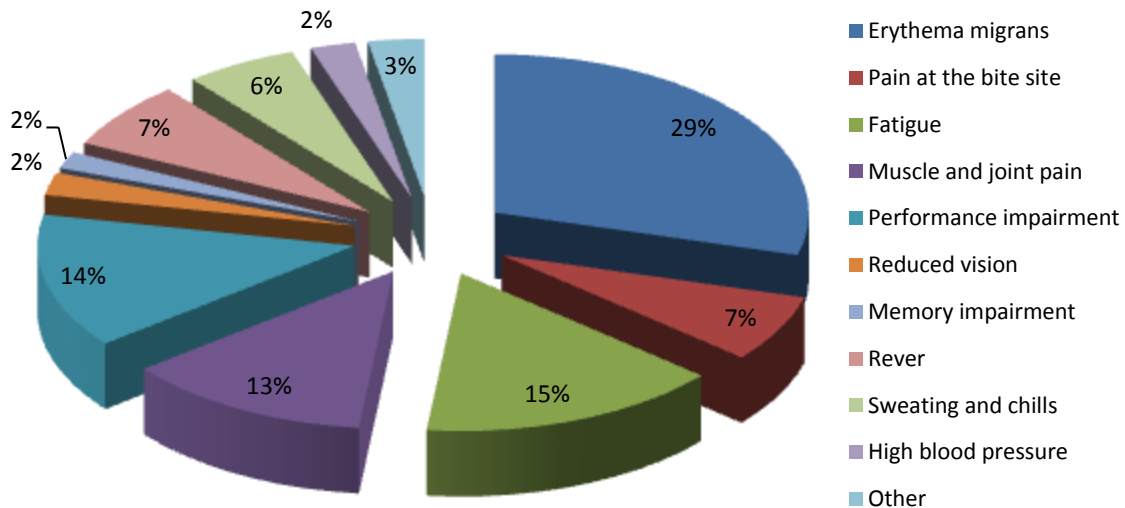


Figure 4 – Clinical signs of Lyme disease



Figure 5 – Primary affect and erythema migrans at the tick bite site (5a – a 56-year-old male patient; 5b – a 34-year-old female patient)

Conclusions

1. The largest part of patients falls within the working population (42.86%), which leads to significant material damage to the state.
2. Most often tick bites occurred during walks in the urban forests (42.86% of cases).
3. The lower extremities were the most

- frequent site of a tick bite (46.43%).
4. Erythema dominated among the clinical manifestations of Lyme borreliosis (91.07%), though joint and nervous system damage were also common.
5. The survey of people bitten by ticks demonstrated poor public awareness of prevention measures and correct methods of tick removal.

Prospects for future research

The study of the clinical and epidemiological situation regarding Lyme borreliosis in 2021 is to be a promising direction.

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(received 26.02.2021, published online 29.03.2021)

(одержано 26.02.2021, опубліковано 29.03.2021)

Conflict of interest

The authors declare no conflict of interest.

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